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ENVIRONMENTAL PROTECTION AGAINST DUMPING AND ILLICIT TRADE OF ELECTRONIC WASTE IN METRO MANILA

By

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ABSTRACT

This study assessed the degree of environmental safeguarding on the practices, obstacles, and scope of implementation in combating the dumping and illegal trafficking of electronic trash. The study employed a descriptive survey method to examine the practices, challenges, and level of implementation regarding e-waste management (specifically dumping and illicit trade). The research involved 45 participants who were employed in the City Environmental and Natural Resources Office (CENRO), Environmental Management Bureau (EMB), and Metro Manila Development Authority (MMDA). The study revealed that efforts to combat the disposal of electronic trash were frequently successful, whereas the illegal trade of electronic garbage was occasionally successful. Assessing the composite of difficulties related to e-waste dumping and illicit trade yielded positive results. Furthermore, on the level of enforcement against the dumping and illegal trafficking of e-waste, both received consistent verbal affirmation. In summary, the behavior of individuals in building new social norms for e-waste trade, use, and dumping can be influenced by personal qualities and the perceived effectiveness of the outcomes. The researcher suggests the establishment of e-waste facilities and environmental systems and aligning extension activities with research findings utilizing qualitative or mixed design.

KEYWORDS: Environmental Protection, Dumping and Illicit Trade of Electronic Waste, Practices, Implementation, Challenges

INTRODUCTION

The world is transforming so fast, just like a person's awakening from the dream of reality. The world's transition in terms of modern technology affects the entire fabric of people's lives. People should adapt to the innovation of modern technology. Rapid technological changes continuously create new electronic products, give rise to obsoleteness, and result in electronic devices being discarded before the end of their useful life. However, the over-dependence on these devices has resulted in a growing number of electronic items being produced and waste generation.

The term "E-waste" is commonly used to refer to electronic items that are approaching the end of their useful lifespan. E-waste, in essence, refers to a broad category of electrical and electronic equipment that is no longer valuable to its owners. As defined by Puckett et al. (2002), E-waste encompasses a vast and expanding array of electronic devices, including large household appliances like refrigerators and air conditioners and smaller consumer electronics such as cell phones, personal stereos, and discarded laptops. India and Europe have authored numerous articles in peer-reviewed publications asserting that e-waste encompasses all electrically powered devices that have reached the end of their useful life (Sinha-Khetriwal, 2018).

Meanwhile, a publication by Dagle (2020) in the National Library of Medicine has highlighted the growing worries over electronic trash, namely the illicit trading and disposal of such waste. This is due to the presence of harmful components in these items that cannot be naturally broken down. In contrast, on July 3, 2020, the United Nations (UN) announced that the global production of electronic garbage (e-waste) in 2019 reached an unprecedented 53.6 million tons, equivalent to the weight of 350 large cruise ships. According to the survey, electronic trash from battery or plug products has increased by 21 percent in the last five years. It is projected to reach 74 million tons by 2030, nearly double the electronic waste generated in just 16 years. E-waste is the rapidly expanding category of home garbage worldwide, mostly driven by increased consumption of electric and electronic equipment, short product lifecycles, and limited repair alternatives.

In 2018, the United Nations Environment Program (UNEP) stated that organizations within the UN system have increased their efforts to tackle the global issue of electronic waste (e-waste). They have done so by signing a letter of intent, which aims to facilitate coordination and collaboration among UN organizations to promote effective e-waste management and encourage collective action and cooperation in this area. Furthermore, the United Nations Organization (2018) recognized the global problem of electronic waste. The agreement formalized a collaboration to enhance cooperation and collective actions in managing electronic waste within the United Nations organization. The UN agencies have implemented measures to tackle e-waste through the Environment Management Group. They aim to improve their collaboration after signing the Letter of Intent. Expected results encompass increased awareness of the e-waste initiatives conducted by these organizations, expanded dialogues with electronics manufacturers and recyclers, ongoing negotiations for the formation of an E-waste Coalition, and cooperation with interested private sector entities to develop a knowledge-sharing platform for hosting information on United Nations e-waste projects, global statistics, and data regarding e-products and e-waste.

In the Philippines, it is imperative for us to obtain the requisite knowledge and expertise to appropriately dispose of, recycle, and discard faulty electronic waste equipment. To address this problem on a worldwide and national scale and to supervise and administer the measures concerning harmful substances and hazardous waste, the government implemented Republic Act No. 6969, also referred to as the Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990. The Act offers a thorough comprehension of the appropriate governance of toxic substances and dangerous and radioactive waste. The main objective is to set regulations and restrictions on the import, manufacture, processing, sale, distribution, consumption, and disposal of chemical compounds and mixtures that provide an unwarranted danger or damage to human health or the environment. Furthermore, its objective is to prohibit the introduction, including during the process of transportation, of hazardous and radioactive materials into the territorial limits of the Philippines for any reason. Moreover, its objective is to encourage and optimize research and studies on hazardous substances. Hence, it is widely recognized that the use or exposure to chemicals, as well as the reckless handling or disposal of hazardous wastes, including electronic waste, pose significant risks to both the public and the environment, resulting in enduring damage. The Department of Environment and Natural Resources (DENR) is responsible for carrying out the tasks, with support from the Inter-Agency Advisory Council.

In order to efficiently and safely handle hazardous wastes, the DENR mandates the following requirements: waste generators must register and provide detailed reports on the type and amount of waste generated, as well as any waste that is treated or transported outside of the facility; waste generators must utilize the services of waste transporters and treaters whom the DENR has authorized; waste transporters must obtain permits from the DENR before transporting any quantity of hazardous waste; and waste generators, transporters, and treaters must maintain records and submit reports to the DENR regarding the transportation of waste from its origin to its final

storage, export, treatment, and disposal locations, among other obligations. The Department of Environment and Natural Resources (DENR), led by Assistant Secretary Rommel Abesamis, publicly announced on March 2, 2017, the commencement of a five-year project aimed at tackling the growing problem of electronic trash (e-waste). The presence of hazardous substances like mercury and lead makes e-waste more worrisome. The Department of Environment and Natural Resources (DENR), through its Environmental Management Bureau (EMB), conducted an introductory workshop for a new project aimed at protecting human health and the environment by efficiently handling Polychlorinated biphenyls (PCBs) in electric cooperatives and Polybrominated diphenyl ethers (PBDEs) in electronic wastes (e-wastes). PCBs and PBDEs are very toxic substances that have global importance. The Philippines has ratified the Stockholm Convention on Persistent Organic Pollutants (POPs), an international pact with the goal of completely eradicating harmful pollutants. Dr. Carmela Centeno, a project manager and industrial development officer at UNIDO, noted in a project brief that the initiative's objectives include improving legislative and institutional capacity to effectively implement the PBDE Action Plan. Additionally, the project aims to reduce and ultimately eliminate the release of POP-PBDEs from electronic wastes, in order to mitigate potential adverse health and environmental effects (Duran, 2022).

Literature Review

The increasing worldwide problem of electronic trash (e-waste) poses a significant challenge to maintaining environmental sustainability and public health. This issue requires immediate attention from politicians, researchers, and the global society. The exponential growth of electronic gadgets, fueled by technological progress and rising consumer needs, has far exceeded the progress made in creating efficient waste management plans. As a result, numerous countries are experiencing environmental deterioration and health hazards.

The fact that China is the leading dumping place for electronic garbage highlights the global dilemma surrounding the disposal of electronic waste. According to Powell (2018), China has traditionally been a significant recipient of large amounts of electronic garbage (e-waste) from both industrialized and developing countries, such as the US, Europe, South Korea, and Japan. The significant increase in the number of hazardous waste imports into China, driven by the worldwide demand for electronics and China's economic expansion, has resulted in severe environmental consequences. As a response, the Chinese government has implemented strict regulations and has actively engaged in international agreements such as the Basel Convention to reduce the inflow of hazardous waste (Wong, 2018). China's 2018 prohibition on the importation of electronic garbage is a significant turning point in how e-waste is managed worldwide. It demonstrates China's dedication to safeguarding the environment and emphasizes that other countries should seek sustainable approaches to handling their electronic waste.

The challenge India faces in dealing with e-waste highlights the intricate nature of the problem. India is one of the top five countries in the world when it comes to manufacturing electronic garbage (e-waste). However, it confronts significant difficulties in effectively managing this material, as less than 2% of it gets recycled through formal channels (Manish & Chakraborty, 2019). The informal sector's involvement in e-waste recycling in India has positive and negative consequences. On one hand, it offers revenue opportunities. However, on the other hand, it often compromises environmental safety and worker health due to inadequate recycling methods.

In the Philippines, there is a similar problem where a significant amount of electronic waste is generated per person, and there is a need for adequate recycling facilities, resulting in incorrect disposal methods. Although it has agreed to the Basel Convention, the trading and disposal of electronic trash (e-waste) continue to occur illegally. This demonstrates the shortcomings of existing regulatory systems and emphasizes the importance of strengthening enforcement efforts and increasing public awareness (Global Environment, 2019; Nijman, 2019).

The IEMN workshop serves as a prime example of the cooperative endeavors necessary to address the issue of e-waste. The workshop aimed to facilitate knowledge exchange, enhance skills, and promote global collaboration in managing electronic waste by engaging stakeholders from different nations (Globe Telecom, Inc., 2021). These initiatives are essential for establishing the structure for internationally implementing ecologically sustainable methods to manage electronic trash.

The e-waste situation can be better understood and addressed through the essential contribution of academic research. Duran (2017) and Mor et al. (2021) highlight the detrimental consequences of electronic trash (e-waste) and the significance of efficient recycling and disposal techniques. Nevertheless, there needs to be more research that examines explicitly the execution of environmental policies and practices, especially in locations such as the National Capital Region of the Philippines (Duran, 2022; Alam, 2016). This gap highlights the necessity for a focused study to assess and improve the efficiency of e-waste management regulations and procedures.

Theoretical/Conceptual Framework

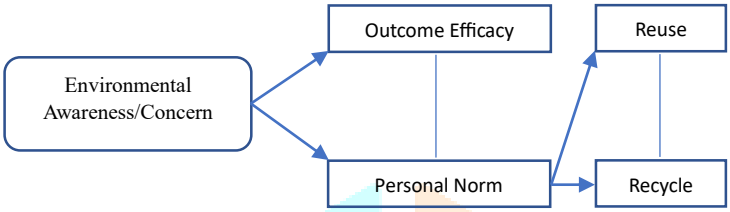
It is necessary to expand certain laws and initiatives for the enforcement of environmental protection against the disposal and illegal trafficking of electronic trash in Metro Manila, Philippines.

Dursun and colleagues (2017) examined responsible post-consumption behaviors, including recycling and reuse in transport, based on Sternberg's (2000) Value Belief Norm Theory (VBNT). In addition, Liobikiene & Poškus (2019), Ghazali et al. (2019), Han et al. (2017), and Wynveen et al. (2015) employed it to examine pro-environmental customer behavior. Theoretical models that incorporate values and/or norms as predictors of various individual environmentally significant consumption behaviors have effectively demonstrated the correlation between norms, values, and behaviors (e.g. Karp, 1996; Bratt, 1999; Thogersen, 1999a; Thogersen & Ölander, 2002; Thogersen & Ölander, 2006; Urien & Kilbourne, 2011). The VBN Model (Stern, 2000) expands the Norm Activation Model (NAM), which proposes a connection between values, norms, and behaviors. According to this model, when individuals become aware of the consequences of their actions and take personal responsibility, their activated norms positively impact altruistic and pro-environmental behaviors (Schwartz, 1977). According to VBN's causal chain, environmental awareness directly affects the assignment of responsibility, which directly influences personal norms. Personal standards, often known as individual moral obligation feelings, ultimately impact many pro-environmental behaviors.

The current study utilizes VBN Theory to examine individuals' level of engagement with their environment, their prioritization and valuation of environmentally friendly behaviors, such as recycling, and the factors influencing the movement of electronic waste. The VBN theory posits that individuals' actions are influenced by social norms, which are shaped by their personal views, the values of their peers, and the local environment. Furthermore, it suggests that people respond to environmental challenges in a manner that aligns with these norms (Seacat & Northrup, 2010). According to Werner, White, Byderly, & Stoll (2009), individuals are more likely to be persuaded by a message about recycling based on how well it aligns with their personal beliefs, rather than the content of the communication itself, regardless of their level of agreement or disagreement with the urge to recycle. An examination of this data suggests that finding a method to convey concerns about recycling goods, where individuals still perceive they have the freedom to interpret the message rather than simply complying with recycling instructions, can be a potentially effective way of communicating when a person is acting autonomously. Even individuals who adhere to environmental philosophy selectively choose to engage in eco-friendly behaviors based on convenience. In essence, individuals tend to behave based on their own anticipated actions and the anticipated actions of others in their surroundings (Whitemarsh & O'Neill, 2010).The repercussions of negative conduct also contribute to the establishment of fresh societal standards and the repetition of patterns. However, it is essential to note that consequences do not necessarily serve as the primary motivating element for fostering constructive transformation or behavior aligned with the desired objective. Essentially, individuals are more inclined to engage in environmentally friendly consumption behaviors if they perceive the cost of contributing to be minor. To promote recycling, it is advantageous to possess comprehensive information, such as knowledge on the collection and utilization of materials (Seacat et al., 2010). Uzzell et al., (2009) emphasize that conduct is not just determined by logical, deliberate, and individual assessment. Habitual patterns, cultural customs, emotional instincts, the impact of family and friends, social norms, and broader societal trends also influence it. Thus, to comprehend the actions and behaviors related to community recycling inclinations, it is also necessary to examine the cultural context around recycling.

The norms pertaining to recycling policies and the environmental performance of a community are influenced by the community itself, and the importance placed on these norms may differ. This has been shown in studies conducted by Cava and Mayer in 2007 and Seacat et al. in 2010. The valuation of a thing is subject to variation based on the nature of the product and the expectations held by individuals. Generally, individuals opt to replace these things due to perceived irreparable flaws, fulfillment of predicted lifespan, or a sense of entitlement to a new product as a replacement for the old one (Wilhelm et al., 2011).

In general, individuals often possess a psychological obstacle when it comes to substituting objects. They anticipate long-term durability, contrasting it with things they believe will have a limited lifespan due to either the perceived quality of the item or the marketing strategy that promotes frequent upgrades. Substituting a mobile phone has adverse ramifications in relation to electronic waste.Figure 1: Value Belief Norm Model Framework



The current study addresses various deficiencies in the existing body of knowledge. Although there has been much documentation of research and policy solutions in our country, there has been a lack of focus on the development of rules and regulations to reduce the detrimental impacts of e-waste (Death et al., 2008; Doelle, 2006; Hickle, 2013). Furthermore, there is a discrepancy between the waste management goals and methods of various districts, especially when seen from a planning standpoint (Garkowski et al., 2011). Furthermore, research pertaining to the evaluation of environmental waste strategies. Additional investigation is necessary to explore the emergence and negotiation of environmental regulations among individuals, as well as to expand our overall comprehension of encouraging each citizen to produce or improve their management of electronic trash (Uzzell et al., 2009).

This study aimed to investigate the elements that are taken into account when developing measures to combat illegal trafficking and dumping of e-waste. It also sought to propose policy suggestions based on the best practices of the respondents. The deliverables of this study encompassed acquiring understanding of the motivations of certain governmental bodies to launch and develop effective e-waste regulations.

Objectives of the Study

This research was conducted to describe the implementation of environmental protection against electronic waste dumping and illicit trade among environmental investigators in the NCR, specifically those assigned in CENRO, EMB, and MMDA. Specifically, it sought to answer the following questions:

1. What are the practices in implementing environmental protection against dumping and illicit e-waste trade?

2. What are the challenges in implementing environmental protection against dumping and illicit e-waste trade?

3. What is the extent of implementing environmental protection against dumping and illicit e-waste trade?

METHODOLOGY

Research Design

The present study gave weight to the use of quantitative design, wherein each respondent was asked the same questions, which ensured that the entire data sample could be analyzed relatively. The data were provided in a numerical format and examined in a measurable manner using statistical techniques. The research-made questionnaire about e-waste management, including illicit trade and dumping items, was constructed and validated. Using a Likert scale and open-ended statements, this survey aimed to investigate the extent of implementation and challenges of e-waste and the related profile of the respondents. Thus, the researcher used surveys to gather data to determine how the respondents experience the implementation of environmental protection against illicit trade and disposal of electronic waste for illicit trade and dumping.

Population and Sampling

The respondents of this study were selected government employees in the environmental investigations employed in CENRO, EMB, and MMDA. They were considered the most appropriate respondents for this study because they have at least a transparent background to the studies and have been designated on tasks related to environmental waste management (i.e., solid and e-waste).

As inclusive characteristics, the researcher used criteria as: (1) must be in the service for at least 5 years, (2) must be an implementor and enforcer of environmental protection or manage/supervise the programs about environmental protections, and (3) must be willing to take part in this study. Hence, out of 150 candidate respondents from CENRO, EMB, and MMDA, about 45 (33.4%) returned the questionnaire with valid responses despite the difficulty retrieving the questionnaire, which is a stable number to represent the environmental management specialist (aka environmental investigators).

Research Locale

The study was conducted in the National Capital Region, from the City Environmental and Natural Resources Office (CENRO), Environmental Management Bureau (EMB), and Metro Manila Development Authority (MMDA). The respondents have broad experience and are assigned to investigating and filing cases in their respective departments. The researcher chose NCR because it is the premier urban region and is considered the Philippines' political, economic, and social center. The deterioration of living conditions in some parts of Metro Manila has produced its share of environmental degradation, pollution, electronic waste problems, and other conditions that create fertile breeding grounds for environmental crimes.

The researcher surveyed respondents from selected government employees of CENRO, EMB, and MMDA based in Metro Manila to develop a diverse and factual analysis. Hence, the survey included officegoers, employees working in the IT division, and so forth. For every respondent selected, it was expected that they all would answer the questionnaire. Upon completion of the survey, the results were analyzed to find trends. The study was conducted in 2021 – 2022.

Research Instruments

The research instrument was a self-made survey questionnaire composed of four (4) parts formulated based on the existing literature and results of previous studies. As it was a self-made survey questionnaire, there was a need to validate its content. At least three (3) validators (i.e., lawyer, commissioner, environmental advocate) who possess extreme knowledge and understanding about e-waste dumping and illicit trade were tasked to deliver face and content validity for this questionnaire to evaluate whether the questions would effectively capture the topic under investigation. Likewise, there was also a need to conduct a pilot test to determine the internal validity and reliability of the self-made survey questionnaires. Hence, the self-made survey questionnaire underwent pilot testing to sharpen the measuring instruments, identify whether some ambiguities and questions might cause uneasiness, and ensure the workability of the data.

Procedure and Data Collection

The university's policy to obtain first permission and certification from the Ethics Committee before obtaining data gathering was followed. The researcher used the survey method to gather the primary data. The self-made survey questionnaire was administered to the target respondents. The data for this study were collected by distributing over 150 self-made survey questionnaires among the respondents from CENRO, EMB, and MMDA. However, only those with valid responses were subjected to analysis and interpretation.

The survey instrument focused on the various respondents' level of awareness of government regulations and their adherence to practices, challenges, and extent of environmental protection against illicit trade and dumping of e-waste, as well as their concern about the environment. It also investigated the respondents' mode of e-waste disposal, as well as their awareness of the harmful nature of the waste using their best practices, which served as the basis of activities to protect the environment.

Statistical Analysis

The frequency, percentage, and rank were used for the demographic profile of the respondents, While the measures of descriptive statistics like mean and standard deviation were used to interpret the numerical data on the practices, challenges, and extent of the implementation of environmental protection against illicit trade and dumping of e-waste. Added to treat the data was the Pearson Product Coefficient (aka Pearson R) to draw and analyze the relationship of the profile variables to the implementation of practices and challenges of environmental protection against illicit trade and the duping of e-waste.

Ethical Considerations

In conducting this study, the researcher observed respectful communication with the respondents. The researcher made sure that the respondents were informed correctly, and as a result, they were expected to participate voluntarily and willingly in the study. This study showed no harm to the environment and to the locals. More so, the researcher valued the covertness of the surveys and delivered the confidentiality of the information supplied by research subjects, and the anonymity of the respondents was respected. The gathered data were used and applied in the research without exposing any gathered data outside the project and were reasonable, credible, and valid. Thus, to ensure these ethical considerations would be addressed, the DLSU-D Ethics Review Committee provided a certification (DLSU-DERC-2021-00101T2) that confirmed that respondents and data collected would be treated and handled ethically.

RESULTS AND DISCUSSION

1. **Level of practices in implementing environmental protection against dumping and illicit e-waste trade.**

Using internal consistency measure known as Cronbach alpha, the computed value is .837, which marks acceptably good reliability on items about **practices against dumping of e-waste**. Table 1 depicts an array of dumping activities or practices expected of any environmental protection advocate to give full attention of.

Table 1
Practices of Implementation against Dumping of E-Waste (N=45)

Items	Mean	SD	Interpretation	Rank
1. Think twice before replacing a working gadget and buying new electronic gadget.	4.58	.657	Always	1
2. Store data online to reduce the need to purchase new storage electronic device.	4.31	.848	Always	2
3. Avoid use of extra gadget, instead try finding one device with multiple functions.	4.24	.908	Always	3
4. Practice buying environmentally or eco- friendly electronic products made with no toxic chemicals and recyclable parts and which have no adverse effect on the environment and uses a sustainable source of energy.	4.16	.796	Often	4
5. Disposal of e-waste thru:				
5.1 Identify collection points by manufacturers/suppliers (e.g., collection bins in malls, etc.)	4.00	.769	Often	5.5
5.2 Local Government Units (LGUs) separate collection for household special waste	4.00	.769	Often	5.5
5.3 Material Recovery Facilities (MRF)	3.98	.892	Often	7
5.4 selling/donating as second hand	3.91	.900	Often	8
5.5 recycling event	3.84	1.021	Often	9
5.6 collectors' event	3.69	1.083	Often	10
Overall Mean and Standard Deviation	**4.0711**	**.55540**	**Often**	

Using the scores of the assessment on the composite about practices toward dumping e-waste gained an overall rating of **often** (mean=4.0711, SD=.5554). This means that the respondents' perceived implementation of practices is good. Collectively, to see the people as they regularly exhibit proper storage, use, and purchase is an indication of their practices on environmental protection against dumping of e-waste.

Specific items post high scores: Think twice before replacing a working gadget and buying new electronic gadget (4.58, SD=.657), Store data online to reduce the need to purchase new storage electronic device (4.31, SD=.848), and Avoid use of extra gadget, instead try finding one device with multiple functions (4.24, SD=.908). The identified top items describe the executed implementation of practices as very good. This is supported by the article written by Poppenheimer (2013), mentioning that the first lines of defense in minimizing e-waste are to reduce purchases of new electronic devices and electrical equipment, think twice before buying a new electronic gadget when an upgrade or new device becomes available and not to buy new stuff is good for the environment and your wallet.

On the other hand, disposal of e-waste thru: selling/donating as a second-hand having 3.91 (SD=.900), recycling event with 3.84 (SD=1.021), and collectors' event gained 3.69 (SD=1.083). This is supported by a local article (Ramos, 2019) written on the website (Globe telecom, Inc), a management program for recycling event known as 'Door-to-door pick-up' in various cities in Metro Manila was delivered. The E-Waste Recycling Program makes electronic waste disposal easier by heading straight to your doorstep. Additionally, this team offers to help sell your items should you not be ready to dispose of them. Products accepted include old laptops, CPU units, Li-ion batteries, cellphones, cellphone batteries, UPS power supplies, power banks, and emergency light batteries.

Talking about practices attributed toward illicit trade of e-waste, the researcher ran Cronbach alpha for the consistency of items about this composite and gained the value of .702 as acceptable reliability. Table 8 marks the descriptions of **practices against the impact of illicit trade of e-waste** on government relating to the health and safety of citizens as to carry out on the sue of substandard electrical components and equipment being traded and sold.

Table 2
Practices against Illicit Trade of E-Waste (N=45)

Items	Mean	SD	Interpretation	Rank
1. As an officer, cooperate more closely to proper authorities and encourage the safe trading and shipment of electronic gadgets.	4.29	.869	Always	1.5
2. Report to the proper authorities the smuggling of electronic wastes.	4.29	.991	Always	1.5
3. Import refurbished electronic products with proper documentation.	3.02	1.422	Sometimes	3
4.Trade-in used electronic product to anybody as if it is just an ordinary household waste.	2.76	1.282	Sometimes	4
5. Buy and trade refurbished electronic products because they are cheaper from registered second-hand store.	2.51	1.199	Seldom	5
Overall Mean and Standard Deviation	**3.3733**	**.79040**	**Sometimes**	

As seen in the accumulated results on the composite about practices toward illicit trading of e-waste (mean=3.3733, SD=.7904), it gained **sometimes**. This means that the perceived implementation of practices is acceptable. This displays the idea that the respondents collectively believe that the personnel just occasionally practice the protocols in managing environmental protection against illicit trade of e-waste.

Specific items got the top scores with a mean score of 4.29: As an officer, cooperate more closely to proper authorities and encourage the safe trading and shipment of electronic gadgets (SD=.869) and Report to the proper authorities the smuggling of electronic wastes (SD=.991). These items indicate constant and continuous practices against illicit trade of e-waste. Literatures tell that trade products among like leading firms in digital trade (digitally enabled purchasers of goods) are well aware of traditional connectivity constraints to their businesses. While digital trade reduces fixed transaction costs (e.g., the cost of searching for and screening trading partners), the negotiation and implementation of a contract and its monitoring and execution might not reduce transport costs (OECD/World Trade Organization, 2017).

In terms of trade facilitation, aside from digitalization, poor coordination and inability to report to proper authorities can result to high-cost financial demands and high-risk management. Therefore, the idea of cooperating closely with proper authorities or inter-operability and encouraging the safe trading and shipment of electronic gadgets is to support better coordination among logistics modes and among countries' logistics services and increase coordination among public and private trade operators. This, in turn, can increase the efficiency of trade logistics and detection of any related illegal or high-risk practices against illicit trade of e-waste.

Other items like Import refurbished electronic products with proper documentation (mean=3.02, SD=1.422) and trading in used electronic products to anybody as if it is just ordinary household waste (mean=2.76, SD=1.282) both fall in the category of sometimes practiced. Lastly, Buying and trading refurbished electronic products because they are cheaper from registered second-hand store received a mean score of 2.51 (SD=1.199), leading the respondents to rate rarely practiced for the restored electronic products.

Inconsistency in the delivery of the practices against illicit trade of e-waste may be due to the inability to understand the stance of refurbished electronic products. This is supported by the study of Mugge, de Jong,

Person, & Hultink (2018), which found that refurbishment provides an exciting strategy for consumer electronics companies to contribute to a circular economy − and for designers in thinking about the sustainability of new and old products − but its success depends on consumers' acceptance of refurbished products as an alternative to purchasing new ones. Companies and designers, thus, need more knowledge on how to tailor their design, production, and marketing strategies to increase the success of their refurbishment practices. This paper contributes by investigating in two studies how information about prior use – in either a visual (signs of wear and tear) or a verbal (textual description) form – influences consumers' evaluations of refurbished electronics. The findings show that providing consumers with information about the prior use of refurbished electronics does not have a univocal effect on consumers' evaluations of the refurbished product.

Therefore, like other respondents, Filipino respondents may believe more risks for malfunctions and further electronic failure for refurbed products if visual and verbal information are provided.

2. **The challenges in the implementation of environmental protection against illicit trade and dumping of e-waste.**

Concerning the **challenges against the dumping of e-waste, the data employed internal consistency with the Cronbach alpha of .863, which marked acceptable reliability on items concerning challenges against the** dumping of e-waste. Regarding reliability, the newly generated five items under challenges were stable on the internal consistency.

Table 3
Challenges against Dumping of E-Waste

Items	Mean	SD	Interpretation	Rank
1. Lack of basic concept and awareness on e-waste disposal that these should be segregated and collected separately by the LGU collection system and brought to an EMB-registered e-waste Treatment, Storage and Disposal (TSD) facility	4.07	.986	Agree	1
2. Lack of knowledge on the risks posed to human health and the environment brought about by the improper recycling and disposal of e-wastes.	4.04	1.147	Agree	2
3. Store data online to reduce the need to purchase new storage electronic device.	3.62	1.093	Agree	3
4. Poor monitoring and evaluation of the electronic waste management programs.	3.61	1.091	Agree	4
4. Uncooperative co-workers.	3.60	1.089	Agree	5
Overall Mean and Standard Deviation	**3.788**	**.55428**	**Agree**	

Using the scores of the assessment on the composite concerning challenges against dumping e-waste obtained a mean of 3.788 (SD=.554) as **agree**. The ratings of the respondent gave an overall assessment of good in addressing the challenges against illegal dumping of e-waste. These perceived challenges in e-waste dumping gave the impression to the respondents as being aware on the challenges that people in the different sectors landed higher than average rate in the fundamental knowledge of handling e-waste and its by-products, which can affect every individual and the environment.

Explicit items which gained the following scores are Lack of basic concept and awareness on e-waste disposal that these should be segregated and collected separately by the LGU collection system and brought to an EMB-registered e-waste treatment, Storage and Disposal (TSD) facility (mean=4.07, SD=.986), Lack of knowledge on the risks posed to human health and the environment brought about by the improper recycling and disposal of e-wastes (mean=4.04, SD=.1.147), Store data online to reduce the need to purchase new storage electronic device (mean=3.62, SD=1.093), Poor monitoring and evaluation of the electronic waste management programs (mean=3.61, SD=1.091), and Uncooperative co-workers (mean=3.60, SD=1.089).

Lundgren (2012) identifies several challenges in the current situation, including insufficient capacity and capability of responsible institutions, inadequate enforcement of legal measures, limited stakeholder participation, and absence of precise definitions, legal instruments, policies, or strategies. Other literary works illustrate a range of procedures. As the initial phase of e-waste management, the garbage produced by homes and enterprises is gathered (Wath et al., 2010). Pretreatment is the second phase of waste management, which occurs prior to the transportation of waste to treatment facilities or disposal locations. Asia is the continent that produces the most amount of electronic garbage. Asia, in comparison to Europe, Oceania, and America, produces a far lower amount of waste per person, at a rate of 5.6 kg per inhabitant. Regrettably, a staggering 83% of the electronic trash produced worldwide lacks proper documentation, resulting in its disposal through open burning or illicit dumping. This poses a significant risk to both the environment and human health. Effective management of e-waste in the circular economy necessitates a collaborative effort from both national and international organizations, as well as public awareness, as emphasized by Shahabuddin et al. (2022).The data were provided in a numerical format and examined in a measurable manner using statistical techniques.
Thus, this confirms that the respondents perceived the challenges on the implementation against e-waste dumping as good and within standard. Meanwhile, about the **challenges against illicit trade of e-waste**, the researcher ran the Cronbach alpha and resulted to the computed value of .859, which confirms acceptable reliability.

Table 4
Challenges against Illicit Trade of E-Waste

Items	Mean	SD	Interpretation	Rank
1. Difficulty in managing the import and export of electronic waste products.	3.80	.661	Agree	1
2. Lack of incentives schemes to lure people engaged to adopt formal path for handling and trading e-waste.	3.76	.908	Agree	2
3. Lack of coordination between various authorities and agencies responsible for E-waste management, trade, and disposal.	3.60	1.195	Agree	3
4. Limited financial support to properly implement new environmental standards with regard to proper trading of electronic waste.	3.49	.968	Agree	4
3. Lack of specific framework in dealing environmental protection against illicit trade of electronic waste.	3.47	1.036	Agree	5
Overall Mean and Standard Deviation	**3.6222**	**.77486**	**Agree**	

Upon getting the data rated by respondents, the items dealing with the challenges against illicit e-waste garnered a mean value of 3.6222 (SD=.77486), interpreted as **agree**. The respondents acquired an overall assessment of good in addressing the challenges against illicit e-waste trading. The descriptive results gave a sense that the respondents viewed above average in responding to the challenges related to the illicit e-waste trading like managing the import and export of e-waste products.

The items prompt order, showing how much difficulty and limitations the respondents experience in their battle against the illegal trade of electronic waste. These are Difficulty in managing the import and export of electronic

waste products (mean=3.80, SD=.661), Lack of incentives schemes to lure people engaged in adopting formal path for handling and trading e-waste (mean=3.76, SD=.908), Lack of coordination between various authorities and agencies responsible for E-waste management, trade and disposal (mean=3.60, SD=1.195), Limited financial support to properly implement new environmental standards about proper trading of electronic waste (mean=3.49, SD=.968), and Lack of specific framework in dealing environmental protection against illicit trade of electronic waste (mean=3.47, SD=1.036).

One of the main stakeholders in the e-waste management value chain is informal waste pickers who contribute to waste management by collecting, sorting, and trading e-waste. At many levels, including national, regional, and worldwide, each country has implemented policies, rules, and regulations that include steps to control the spread of electronic trash (e-waste). Nevertheless, the ongoing issue exists as a result of inadequate execution, enforcement, and vulnerabilities present in the legislation. According to Awasthi et al. (2019), the Basel convention's creation is an example of a top-down management approach that does not include the involvement of the private sector. As a result, it lacks scientific data and technical capability to effectively address the problem of e-waste. Furthermore, this treaty fails to explicitly forbid the transfer of dangerous waste to economically disadvantaged nations, thereby establishing a means for the exports of electronic trash (Gosh, et.al., 2016).

With such deal and loophole that the exportation of e-waste is possible, to trade e-waste is at its edge especially to countries with loose rules and distorted guidelines.

3. **The extent of implementation of environmental protection against illicit trade and dumping of e-waste.**

For the internal consistency, the researcher employed Cronbach alpha to the newly develop items that described the **extent of implementation against dumping of electronic waste**. This attained the value of .875, which gained acceptable reliability.

Table 5
Extent of Implementation against Dumping of E-Waste

Items	Mean	SD	Interpretation	Rank
1. Inventory of waste disposal facilities or sites.	4.16	.952	Often	1.5
2. Prohibition on the act of open burning of electronic waste.	4.16	1.065	Often	1.5
3. Electronic wastes characterization for initial source reduction and recycling	4.04	.824	Often	3
4. Prohibition on the act of squatting in legally designated landfills for dumping of e-waste.	4.00	1.000	Often	4
5. Collection and transfer of electronic waste to designated safe landfills.	3.96	.952	Often	5
6. Existing markets for recyclable materials.	3.89	.804	Often	6
7. Setting up a drop-off center for e-waste. IT Dept. at the very least, to access the drop-off so that the recycling items don't pile up.	3.82	.777	Often	7
8. Looking for other companies that work with charitable organizations to provide refurbished laptops and the likes to those in need.	3.58	.839	Often	8
Overall Mean and Standard Deviation	**3.9520**	**.66231**	**Often**	

Table 5 indicates the items describing the extent of implementation against dumping of electronic waste. The respondents earned a mean score of 3.9520 (SD=.66231), which emphasizes **often implemented** as an extent of implementation. This represents that the provision or condition is moderately extensive and functioning well.

The overall magnitude of environmental protection against the dumping of e-waste seems to be given alternatives by executing the items provided below. On top of the list with a mean value of 4.16 are Inventory of waste disposal facilities or sites (SD=.952) and Prohibition on the act of open burning of electronic waste (SD=1.065), followed by the other items: Electronic wastes characterization for initial source reduction and recycling (mean=4.04, SD=.824), Prohibition on the act of squatting in legally designated landfills for dumping of e-waste (mean=4.00, SD=1.000), Collections and transfers of electronic waste to designated safe landfills (mean=3.96, sd=.952), Existing markets for recyclable materials (mean=3.89, sd=.804), Setting up a drop-off center for e-waste, IT Dept. at the very least, to access the drop-off so that the recycling items do not pile up (mean=3.82, SD=.777), and Looking for other companies that work with charitable organizations to provide refurbished laptops and the likes to those in need (mean=3.58, SD=.893).

The three electronic devices currently recognized are cell phones, personal computers, and laptops, all of which contain valuable and dangerous metals in their circuitry. In the Philippines, Alam (2016) conducted a study to assess the level of enforcement against the illegal disposal of electronic debris (e-waste). The study revealed that around 70% of the heavy metals identified in landfills originate from the improper recycling and disposal of e-waste. In addition, informal recyclers employ hazardous methods, often resorting to manual handling or rudimentary tools to dismantle and incinerate the circuits in open spaces to extract valuable metals like copper and gold. The individuals that scavenge collect rubbish, and trade in discarded items are categorized as informal recyclers. Most of these recycling efforts occur in densely populated areas and impoverished neighborhoods surrounding major urban centers. Gutierrez & Agarrado (2011) reported that electronic garbage is illegally disposed of at three locations: Smoky Mountain, Pier 18 in Manila, and Dreamland in Rosario, Cavite.

Furthermore, dumping e-waste is still the most common disposal method for 58.4% of Jordanian households. Other disposal strategies revealed that donating to others has a 16.6% share, selling has a 10.7% share, and providing waste electrical and electronic equipment (EEE) for ecologically sound recycling has a 6.8% share. (Dzah etal., 2022).
Referring to the scores taken from the respondents allowed the researcher to generate the internal consistency known as Cronbach alpha, with the computed value of .873 to arrive with an acceptable reliability on items concerning **extent of implementation of environmental protection against illegal trade of e-waste**.

Table 6
Extent of Implementation against Illicit Trade of E-Waste

Items	Mean	SD	Interpretation	Rank
1. Strict compliance on the national policies and international commitments with regard to import and export of recyclable materials	4.44	.586	Always	1
2. Stiffer fines and penalties for the person/entity who violates the prohibited acts of illicit trade of e-waste.	4.29	.944	Always	2.5
3. Abiding to company's rules and regulations as far as how and when e-waste products can be traded and what restrictions there are on.	4.29	.695	Always	2.5
4. Identifying possible enhancing factors and programs to extent the implementation of trade activities for e-waste.	4.27	.688	Always	4

5. Prohibition on the illicit trade activities of non-environmentally electronic devices.	4.18	.806	Often	5
6. Issuances of legal permit for electronic products trading coming in and out the National Capital Region.	4.11	.982	Often	6
Overall Mean and Standard Deviation	**4.2636**	**.62304**	**Always**	

Looking at the computed data in Table 14, an average score of 4.2636 (SD=.62304) with a verbal interpretation of **always** was computed. This emphasizes the comprehensive and flawless operation of the supply or condition. Equally, it explains that the respondents are firm on their position to the extent of implementation on environmental protection toward illicit trade of e-waste.

After collecting and computing the raw data, the highest item on the list is Strict compliance with the national policies and international commitments regarding the import and export of recyclable materials, with a mean score of 4.44 (SD=.586). Both Stiffer fines and penalties for the person/entity who violates the prohibited acts of illicit trade of e-waste (SD=.944) and Abiding with the company's rules and regulations as far as how and when e-waste products can be traded and what restrictions there are on (SD=.695) acquired a mean score of 4.29. This is followed by Identifying possible enhancing factors and programs to extend the implementation of trade activities for e-waste (4,27, SD=.688), Prohibition on the illicit trade activities of non-environmentally electronic devices (4.18, SD=.806), and Issuances of a legal permit for electronic products trading coming in and out the National Capital Region (4.11, SD=.982).

Currently, an unequal relationship between rich and poor countries is at the heart of the global e-waste trade. From this, it persists due to the unfair global trade systems and inadequate local capacities, usually coupled with entrenched corruption.

In the past two decades, there have been several reported high-profile cases of illegal waste trade in the Philippines (solid and e-waste), from mixed municipal waste not meant for recycling, to shredded municipal waste meant as feedstock for cement kilns that double as waste incinerators, and to toxic chemical wastes intended for dumping. However, these illegal waste shipments present only the tip of the iceberg of the entire picture of waste importation in the Philippines. Waste trade is primarily for "recycling," and under certain conditions, it is legal. Philippine law has allowed and continues to allow waste to enter the country through electronic waste (including scrap computer equipment and used appliances), used lead acid batteries, plastic materials, used oil, and fly ash from coal-fired power plants (Bueta, 2020).

On a positive note, Jutba (2022) mentioned that the project's main objective is to raise awareness of proper e-waste management (dumping and illicit trading). Every village in La Union has a temporary storage facility where residents can dispose of their e-waste. Moreover, the project was delivered to bring their household e-waste to the drop-off point in their barangay from October 3 until November 2. Further, the PGLU also designates a central collection site where the LGUs can bring their collected e-waste. Meanwhile, the UNIDO Project provides the transport of the e-waste from the Central Collection Site to the project's Treatment, Storage, and Disposal Facility in Bagong Silang, Caloocan City (Dilim, 2022).

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were derived from the findings and the results on the extent of implementation of environmental protection against dumping and illicit trade of electronic waste.

1. It is often the practice of implementing against the dumping of e-waste. Hence, disposal of e-waste through selling/donating a second hand and recycling a gadget through material recovery facilities is needed. However, it is also observed that the community always practices buying a new electronic gadget,

storing data online to reduce the need to purchase a new storage device, and avoiding the use of extra gadgets.

2. Sometimes, the illicit trade of e-waste is practiced as trading of used electronic products to anybody as if it is just ordinary household waste and importing refurbished electronic products with proper documentation. Thus, cooperation with proper authority and strict compliance with the policies and guidelines in the trading and shipment of electronic gadgets must be observed. Consumers should be provided with proper information on the use of refurbished products and their impact on their use.
3. The challenges against the implementation of dumping of e-waste and the illicit trade of e-waste confirm the impression that people are aware of the standard and proper handling of e-waste, which they often practice.

4. The extent of the implementation against the dumping of e-waste is moderately extensive and functioning well. It indicates that proper inventory of waste disposal sites and different prohibitions are being observed. While the extent of the implementation against the illicit trade of e-waste is pervasive and functioning correctly, it is noted that different activities are strictly implemented and firmly monitored.

Based on the findings and conclusions of the study, the following are recommended.

1. The Local Government Unit must continue to implement waste segregation and separation of collection of e-waste be adhered to/by the community as cooperation to the implemented programs of the LGUs.

2. Regular in-depth training sessions and seminars on proper e-waste management must be conducted for the public and private sectors to strengthen and empower environmental services in achieving e-waste management goals.

3. Regular monitoring of the e-waste management system to check its effectiveness and efficiency in carrying out the requirements in implementing environmental management must be carried out.

4. It is imperative to establish a strong collaboration with the public sector, business sector, non-governmental organizations, and the community to effectively execute progressive policies to enhance e-waste management and promote good governance.

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