



Knowledge, Attitudes and Practices of Selected Respondents in Electronic Waste (E-waste) in Naga City

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Abstract

This study assessed the knowledge, attitudes, and practices of selected respondents in electronic waste in Naga City. Specifically, it probed to the extent of awareness of respondents regarding e-waste, collection and disposal practices of their e-waste. Through a mixed method of descriptive and correlational design, the researcher sought to describe and correlate the awareness, collection and disposal practices of the selected respondents. The findings revealed that the respondents have low e-waste awareness. Further, the flow of e-waste shows that e-waste still ends up in the waste stream in all probability. Results further implied that respondents have no knowledge of handling e-waste. Since e-waste has not been part of the waste mainstream data for several years in Naga City, no proper disposal is recommended by the authorities. Massive seminars, training, fora, infomercials, and social media campaign may help to educate masses on the pressing e-waste problem in the city.

Keywords: e-waste; environmental management; waste disposal.

1. Introduction

The current advancement in technology is unstoppable worldwide. Both developed and developing countries have consumers that are hungry for the latest technology which they find either a necessity or luxury. With high demand for these technologies, which are more electronic in nature, the so-called “e-waste” or electronic waste is becoming a global concern in this decade.

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The draw to acquire electronic goods in the Philippines is becoming as insatiable as revealed in a survey [1]. Adding to possible e-wastes are cheap second-hand or *segunda mano* electronics, mostly from countries such as Japan and South Korea, that seem to be driving the increase in electronics particularly television sets among households [2]. A study on the current and future quantity of e-waste in the Philippines estimates that approximately 2.7 million units appliances became obsolete by the end of decade, with around 1.8 million units go to landfills [3]. In terms of toxicity, many studies have firmly established the toxic constituents of e-waste such as lead, cadmium, mercury, hexavalent chromium, several forms of brominated flame retardants, just to name a few [4]. The looming problem of e-waste in the country is glaring in the national scene but seemingly not given attention. Naga City, known as one of the model cities in Asia, puts premium on ecological solid waste management. But though it has promising program and plans in resolving solid waste management problems, it has no clear direction on handling e-waste [5]. Clearly, if a local government does not have a baseline data for e-waste volume, no sound action will be implemented in resolving this alarming accumulation of wastes.

2. Materials and method

This study utilized a mixed method embedded research methodology. The purpose of the embedded research design was to collect both quantitative and qualitative data simultaneously and to have one form of data plays a supportive role to the other form of data. In this case the open-ended questions were designed to illuminate respondents knowledge, collection and disposal e-waste practices matters not easily captured by the multi-choice knowledge questions.

The respondents were household, repair shops, junk shops, waste pickers and CSWMO personnel in Naga City, in which systematic and non-systematic sampling were used. Household samples were determined using systematic sampling based on the 2010 NSO Census on the number of households in the city. Purposive sampling determined the key informants interviewed which included the waste pickers and the CSWMO personnel. Stratified sampling determined the number of house hold per barangay. Using Slovin's formula, the total number of household respondents was 395. Since population was small, all of the population of the other respondents was included in the study. The population included 24 registered repairs shops, 16 registered medium to large scale junk shops, 23 waste pickers who are members of the Balatas Kadamay Scavengers Association and 7 government personnel. It should be noted that only those appeared on the government records were surveyed and interviewed. However, there are unregistered repairs shops, junk shops and waste pickers which is a scope of getting partial information about the disposal and collection practices from the sampled, owing to its meagre form against the total population. Hence, the results of the study cannot be generalized in context to a larger population, but rather be suggested.

The interview protocol and documentary analysis were the main tools used in gathering the primary data. It was supplemented by direct observation conducted at the dumpsite and households. An interview guide protocol was conceptualized in such a way that the respondents could freely express their responses towards the subject under discussion. The instrument used was made in accordance with the general concepts and principles of e-waste management. Three separate instruments were used in gathering the primary data. The first instrument

used a seven-point Likert scale. Focus group discussions question and guided interview questions were also used to answer particularly on collection of e-waste. As data analysis, the researcher used weighted mean, percentages and one-way Analysis of Variance (f).

3. Results

3.1 Knowledge on E-waste

It is interesting to note that responses in the higher means were misconceptions while two of the three of the lower mean were the right descriptions while the highest means are also misconceptions. Based on the levels of extent of awareness, the results implied that respondents were unaware of what e-waste is. This result is supported by numerous local studies [1,3,6,7] highlighting that the Philippines is not yet ready for e-waste management since it is not yet included in the vocabulary of common Filipinos, most especially among waste pickers. Furthermore, there is a need for a heightened campaign on e-waste such seminars and training regarding best practices associated with e-waste management that would help promote behavior change on this issue [8].

3.2 Disposal Practices

Based on the data generated, it can be implied that respondents disposing of e-waste is dependent on the scrap dealers, which are the waste pickers. Waste pickers, as earlier mentioned, do not have proper disposal of e-waste after they got what they need in an

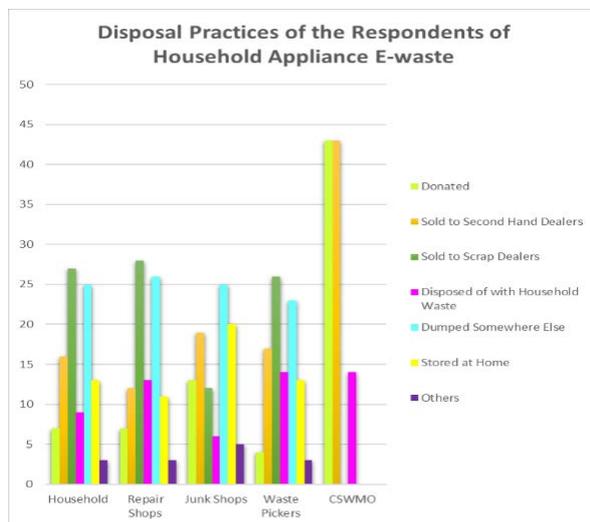


Figure 1: Disposal Practice of the Respondents of Household Appliance E-waste

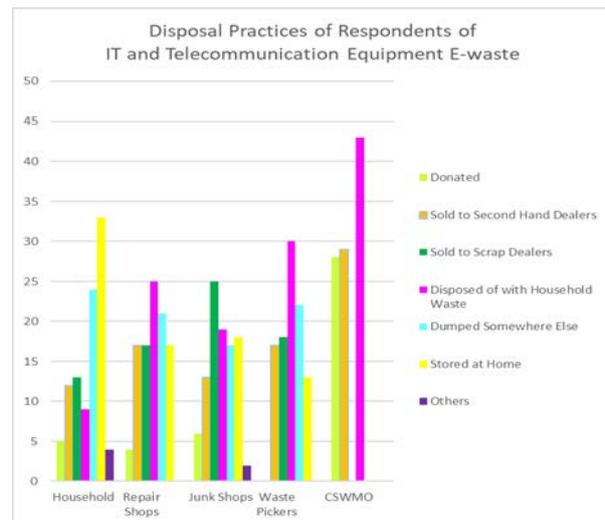


Figure 2: Disposal Practice of the Respondents of IT and Telecommunication Equipment E-waste

e-waste. Thus, the burden of disposal is heavily passed on the waste pickers. Disposal of e-waste has never been a subject for discussion in public fora and few information drives have been done about their disposal [5]. Prevention of waste creation is the main priority of waste management and moving toward waste minimization requires proper disposal of wastes [9]. Studies in further supports this analysis, which cited that waste generators adopted poor solid waste management practices in terms of waste segregation, collection and transport, waste disposal and recycling due to lack of awareness on proper and effective ways of managing wastes [10,11,12,13].

Data analysis determined the significant difference between the disposal practices. Results of computation is shown in Table 1, where the F-value was 0.22, which was lower than the critical value of 2.62 ($F= 5,24, \alpha 5\%$), interpreted as not significant. These non-difference can be attributed to the situation that the practices can be done by chance and at random. Also, there are many factors that affect the independent variable and further test is needed in order to control factors affecting the variable. Respondents have different ways of how the disposed their e-waste which make each disposal practice varied. A point to be considered is the ethics. Respondent may have different beliefs on disposing of e-waste. This may result to uninformed and uncoordinated waste disposal system [14,15]. Further, local studies revealed that the government admits that recycling of e-waste is by and large a backyard industry that is largely informal, not covered by proper environmental permits and clearances, and lacking business permits [3,7,16]. In addition, consumer awareness of recycling options in the Philippines is low [4]. Furthermore, the results implied the lack of segregation of solid wastes, including e-waste. It is interesting to note that some e-waste are dumped with common household waste or disposed of somewhere else. Segregation is vital in determining whether a waste is rubbish or recyclable [16,17]. The result of this study is supported by the several similar studies [10,18,19,20,21].

3.3 Collection Practices

As the process goes, e-waste primarily comes from a source (household, shops, among others) and has been disposed of in different ways. Some of the e-wastes are donated to junk shops, repair shops and waste pickers. Other e-wastes are sold to second hand dealers (repair shops and waste pickers) and scrap dealers (repair and junk shops). Other e-wastes are dumped either with household waste or elsewhere and some are stored at their domiciles. The repair shops, because they recycle some e-waste, return some of the e-wastes disposed to them at the source. The e-wastes, usually the unprocessed and non-refurbished parts, from the repair shops, junk shops, and waste pickers including the ones dumped with household and elsewhere and stored at domiciles are collected by the CSWMO through their garbage trucks. All of the e-wastes are carried to the controlled dumpsite at Balatas. On this point, e-wastes are processed through the MRF, extracting parts that can be sold or recycled. Other parts that cannot be used will be dumped again in the dumpsite.

The findings revealed that there was no adopted mechanism on how to dispose of such unrepairables. Even the CSWMO cited that repair shops are not covered by their jurisdiction. The interview revealed that repair shops do not have proper handling of dismantled e-waste. These pose threats to the health of these repair men, primarily because these equipment emit harmful chemicals such as PCB (polychlorinated biphenyls), rare earth metals and lead [4,11,16]. Also, most of the collectors of e-waste respondents have poor segregation and health-risk practices. Junk shops business were not practicing proper segregation, thus adding to the stockpile of waste in landfills [22]. Notably, the city should capitalize their waste pickers as part of the formal collection process of e-waste in the city. This practice is seem to be effective in some countries [11,25].

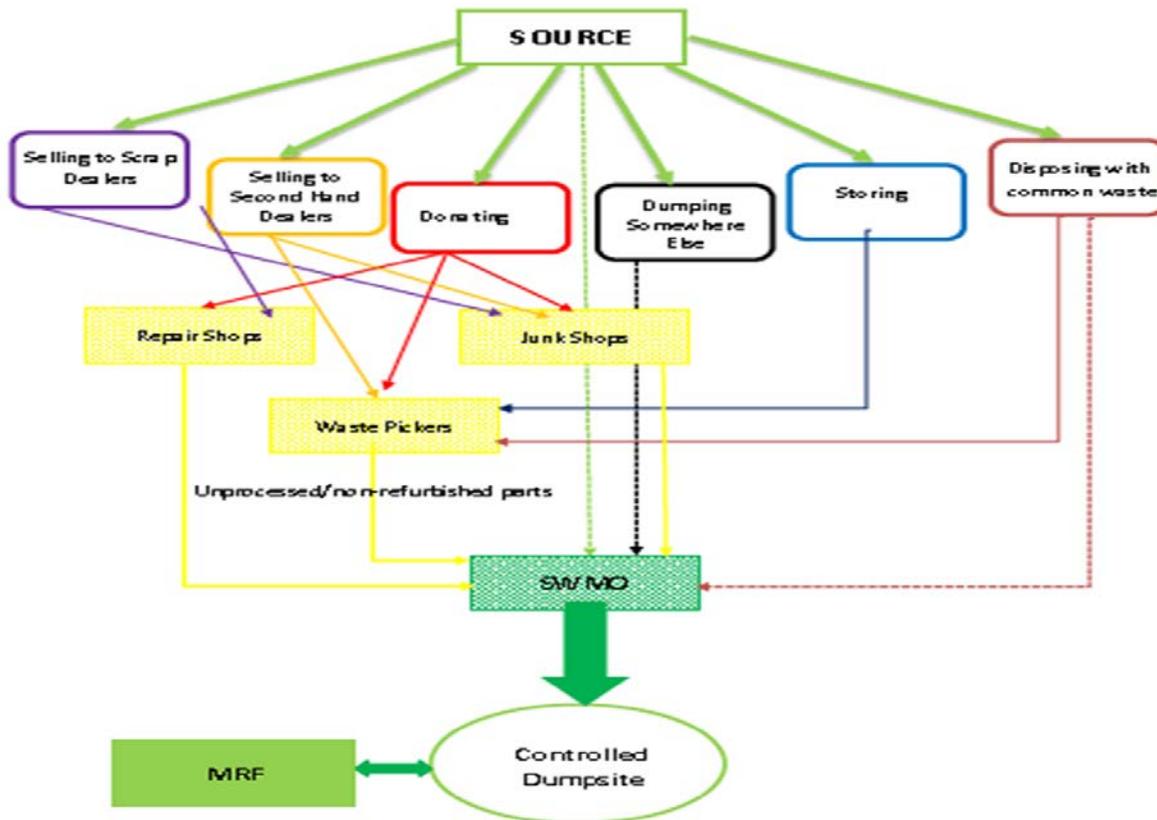


Figure 3: Flow of E-waste in Naga City

The review of data from the Solid Waste Management Plan and interview with CSWMO personnel revealed that the CSWMO does not put premium on e-waste, as it has no place in their program. It is interesting to note that as of the moment, no national framework has been crafted for e-waste. This was pointed out as a main problem in most developing countries with e-waste mismanagement in several studies. Most of the countries with poor e-waste management do not have an agency or an office monitoring the in flow, toxicity and economic benefits of e-waste [11,26,27].

4. Conclusions

The respondents have low e-waste awareness. The result is attributed to lack of available information about e-waste and non-inclusion of such waste to government solid waste management framework. Government agencies should strengthen the information campaign about e-waste definition and its effects. Collection practices on e-waste has no patterned system in Naga City. Junk shops and repair shops did not have proper handling on dismantling e-waste. The flow of e-waste showed that e-waste still end up in the waste stream. Although repair shops, junk shops and waste pickers dismantle parts which can be profitable, most of the e-waste end up in the general waste stream. It is highly suggested to form a special committee that will focus on e-waste generation and collection in the city. The role of repair shops, junk shops and waste pickers should be recognized as part of the waste recovery system. Respondents have bad habits of disposing their household appliances e-waste. Disposal of such has never been a subject for discussion in public fora and few information

drive have been done about disposal of such waste. Results further implied that respondents have no knowledge of handling such kind of e-waste. Since e-waste has not been part of the waste mainstream data for several years in Naga City, no proper disposal is recommended by the authorities.

5. Recommendations

E-waste should be reconsidered to form part of the solid waste framework of Naga City. It will be best if a clear collection of e-waste will be implemented in the city. This can be done by accrediting recycling centers and e-waste processing centers within the city to lessen the e-waste ending up in the waste stream. It is highly suggested to form a special committee that will focus on waste generation and collection in the city. The role of repair 117 shops, junk shops and waste pickers should be recognized as part of the waste recovery system. It is interesting to delve into storage and transportation of e-waste. Also, government agencies should strengthen the information campaign about e-waste definition and its effects, as mandated by RA 9512 or the Environmental Awareness Law. Seminars, trainings, fora, infomercials and social media campaign may help to educate masses on the pressing e-waste problem. It is highly recommended to include e-waste discussions on the topics on Environmental Science subjects.

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References

- [1]. Robinson, Brent. "E-waste: An assessment of global production and environmental impacts," *Science of the Total Environment*, Volume 408,(Oct 2010); 183–191.
- [2]. Guterrez, Richard. The Growing Electronic Wastes Problem. <http://www.journal.com.ph/index.php/opinion/24443-the-growing-electronic-wastes-problem>. 2012
- [3]. Peralta, Geraldine and Psyche Fontanos. "E-waste Issues and Measures in the Philippines," *Journal of Material Cycles and Waste Management*, Volume 8, Issue 1, (Sept 2010); 34-39.
- [4]. Agarrado, Gerald and Richard Gutierrez. The Vanishing e-Wastes of the Philippines. http://bantoxics.org/v2/images/downloads/ewaste_report.pdf. 2011
- [5]. Naga City Solid Waste Management Office. "Waste Analysis Computing and Sampling (WACS)," (Phils.: Naga City, Dec 2013), 1-6
- [6]. Arceo-Dumlao, Tina. "Winning the war against electronic waste," *Philippine Daily Inquirer*, 2013 February 18, E6.
- [7]. GreenPeace Southeast Asia. Greener electronics guide updated. <http://www.greenpeace.org/seasia/news/Greenelectronics-guide-updated/>.2010
- [8]. Mueller, Esther. "E-waste Misconception in India," *American Chamber of Commerce Digest*, (United Nations University, March 2013).
- [9]. Pongráez, Eva, Phillips PS and Keiski RL. "Evolving the Theory of Waste Management – Implications

- to Waste Minimization,” Oulu University Press, (Oulu, Finland, University of Oulu, p.61-67, Jun 2012).
- [10]. Ballados, Maria Theresa. “Assessing the Solid Waste Management Practices in Bacolod City, Philippines” 4th Asian Rural Sociology Association (ARSA) International Conference. <http://www.arsa1996.org/pdf/>
- [11]. Shah, Anuj. “An Assessment of Public Awareness Regarding E-Waste Hazards and Management Strategies,” *Journal of SIT World Learning – India: Sustainable Development and Social Change*, Volume 3, Issue 2, (Apr 2014); 2-21.
- [12]. United Nations Environmental Programme. *Developing Integrated Solid Waste Management Plan: Assessment of current waste management system and gaps therein*, (United Nations Press, Osaka/Shiga, Japan: 2010)
- [13]. Kalana, Junaidah Ahmad. “Electrical and Electronic Waste Management Practice by Households in Shah Alam, Selangor, Malaysia,” *International Journal of Environmental Sciences*, Volume 1, Issue 2 (Nov 2010); 10-23.
- [14]. Stern, Paul C. “Towards a coherent theory of environmentally significant behavior,” *Journal of Social Issues*, Volume 56, Issue 1, (2014); 407-424.
- [15]. Hardin, Garrett. “The Tragedy of Commons,” *Science Magazine*, Volume 162, Issue 3859, (13 December 2014); 1243-1248.
- [16]. Alegre, Alan and Patricia Gwen Borcena, *ICTs and Environment Sustainability (Philippines)*. <http://www.giswatch.org/country-report/philippines>. Global Information System Watch. 2010
- [17]. Gertsakis, J. and H. Lewis. “Sustainability and the Waste Management Hierarchy – A Discussion Paper,” *EcoRecycle Victoria*. [http://ecorecycle.vic.gov.au/resources/documents/TZW_Sustainability_and_the_Waste_Hierarchy_\(2013\).pdf](http://ecorecycle.vic.gov.au/resources/documents/TZW_Sustainability_and_the_Waste_Hierarchy_(2013).pdf).
- [18]. Ifegbesan, Ayodeji. “Exploring secondary school students’ understanding and practices of waste management in Ogun State, Nigeria,” *International Journal of Environmental and Science Education*, Volume 5, Issue 2, (April 2012); 201-215.
- [19]. Ercan, Orchan and Kadir Bilen. “A Research on Electronic Waste Awareness and Environmental Attitudes of Primary School Students,” *International Journal of Social Science*, Vol. 17, Issue 1, (Mar 2014); 13-23.
- [20]. Vivek, Raghavan et al. “Awareness, Attitude and Practice of School Students towards Household Waste Management”, *Journal of Environment*, Volume 2, Issue 6, (2013); 147-150.
- [21]. Sarker, B.C et al. “Public Awareness about Disposal of Solid Waste and its Impact: A Study in Tangail Pourashava, Tangail,” *Journal of Environmental Science & Natural Resources*, Volume 5, Issue 2, (2012); 239 – 244.
- [22]. Ryan, Arthur and Clive Spash. “Measuring ‘Awareness and Environmental Consequences of E-waste’ Two Scales and Two Interpretations,” *CSIRO Working Paper Series*, Volume 1, Issue 2, (Oct 2010); 34-56.
- [23]. Sapuay, Grace. “From Rural to Urban: The Plight of Wastepickers,” *Solid Waste Association of the Philippines Journal*, Volume 2, Issue 2, (2011); 2:21

- [24]. Gonzales, Eugenio. "From Waste to Assets: The Scavengers of Payatas," University of Massachusetts Political Economy Research Institute Center for Science and the Environment, Volume 7, Issue 1, (Dec 2010);1:25.
- [25]. Samson, Melanie. Refusing to be Cast Aside Waste Pickers.
- [26]. Finlay, Arthur. "E-Waste Challenges In Developing Countries: South Africa Case Study," Association For Progressive Communications, United Kingdom. http://www.apc.org/en/system/files/e-waste_EN.pdf.2010
- [27]. Huisman, J. and A. Stevels, "Eco-efficient implementation of electronic waste policies in practice," Electronics and the Environment Conference Record for 2013 IEEE International Symposium, 58-2, (2013); 243-248.