GSC Advanced Research and Reviews

eISSN: 2582-4597 CODEN (USA): GARRC2

Cross Ref DOI: 10.30574/gscarr

Journal homepage: https://gsconlinepress.com/journals/gscarr/

(RESEARCH ARTICLE)

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Assessment of knowledge, attitude and practice (kap) of electronic waste management among consumers in Dhaka City, Bangladesh

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GSC Advanced Research and Reviews, 2021, 08(02), 126–135

Publication history: Received on 20 July 2021; revised on 25 August 2021; accepted on 27 August 2021

Article DOI: https://doi.org/10.30574/gscarr.2021.8.2.0179

Abstract

Electronic waste is growing at an alarming rate in Dhaka City which would be harmful for the environment and the people of the city if it is not properly managed. This study aimed to explore consumers' knowledge, attitude, and practice towards electronics waste manage facility of Dhaka city. The Present study follows quantitative research methods and collects data in the way of purposive sampling technique. Every city dweller uses electronic equipment in his house or office for daily activities. Although 100% of people are involved in e-waste generation but they (actually 73.5%) have no proper knowledge about the management of electronic wastes. On the other hand, approximately 96.8% citizens believe that there is a lack of proper management of electronic waste in the city. Again, nearly 95.2% would like to be involved in setting up a responsible and safe recycling scheme in the city area to get rid of from the detrimental effects of the electronic wastes. Of them, about 79% consumers are willing to get involved their selves into proper e-waste management facility by setting up a responsible and safe recycling scheme for the betterment of future generations and minimizing present socio-eco-environmental threat.

Keywords: Electronic Waste; Dhaka City; Knowledge; Attitude; Practice; Recycling Scheme

1. Introduction

We are living in the modern era. Modern people are more or less acquainted with electronic products. The life of people is becoming easier by the use of electronic products including mobile phone, computer, printer, calculator, television, refrigerator, fan, washing machine, etc. The quantity of the electronic products is increasing day by day due to the demand of consumers. On the other hand, quick change of features and availability of improved products in the electronic devices forcing the consumers to dispose the electronic products rapidly [1]. Therefore, electronic waste is being generated quickly. It is estimated that about 53.6 million tons e-waste was produced in 2019 and about 74 million tons of e-waste would be generated by 2030. Asia, America, and Europe are generated about 24.9 million tons, about 13.1 million tons, and about12 million tons of e-waste respectively [2]. Likely, Bangladesh also produced nearly 2.81 million metric tons of e-waste annually [3] whereas ship breaking yard occupied the highest position (about 2.5 million metric tons) followed by television sets (about 0.182 million metric tons) [1].

About 59% households have knowledge on electronic waste management whereas only 2-3% households are involved in the recycling of their e-waste. However, about 52.5% of the households are willing to pay for improving e-waste management system in Kuala Lampur, Malaysia [4]. In Nigeria, there is no well-established e-waste management scheme. They do not have proper knowledge of electronic waste management. Besides, they do not have positive attitude and do not practice formal electronic waste management [5]. In case of India, approximately, 72.8% of the consumers have thrown their e-waste away and about 92.2% of them are unaware that they generated e-waste.

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Moreover, majority of the consumers of India are ignored the e-waste and its issues [6]. There are several studies have been conducted regarding the issues of knowledge, attitude, and practice of e-waste management. However, no study has been conducted in Bangladesh about this issue. Therefore, present study tries to assess the knowledge, attitude, and practice of e-waste management among consumers in Dhaka City, Bangladesh.

Bangladesh imports scrap ships which carry large amount of toxic products and electronic and electrical waste [1]. Moreover, Bangladesh also produces million metric tons of e-waste annually [3]. Consequently, like many other parts of the world, Bangladesh is also facing serious environmental problem because of generation of electronic waste. So, it is prerequisite to assess the knowledge level, attitude, and practice of electronic waste management among the consumers. Hopefully, the result of the present study would be helpful for the policy makers.

2. Study area

Dhaka, the capital city of Bangladesh, is geographically situated at 23°42′N 90°22′E (Fig. 1), on the eastern side of Buriganga river. The city covers approximately 306.38 square kilometers (118.29 square miles) [7]. Dhaka is the 9th largest and 6th most densely populated city in the world. Currently, population of Dhaka city is about 21.7 million [8]. The population is likely to be increase with the rate of 4.2% per year [9]. The more population the more consumption. Consequently, the more waste (i.e. electronic waste) is being produced by the people. Dhaka is the largest stake holder for collecting and managing of e-waste [10]. Therefore, it is the perfect ground for the study of knowledge, attitude, and practice of electronic wastes management.

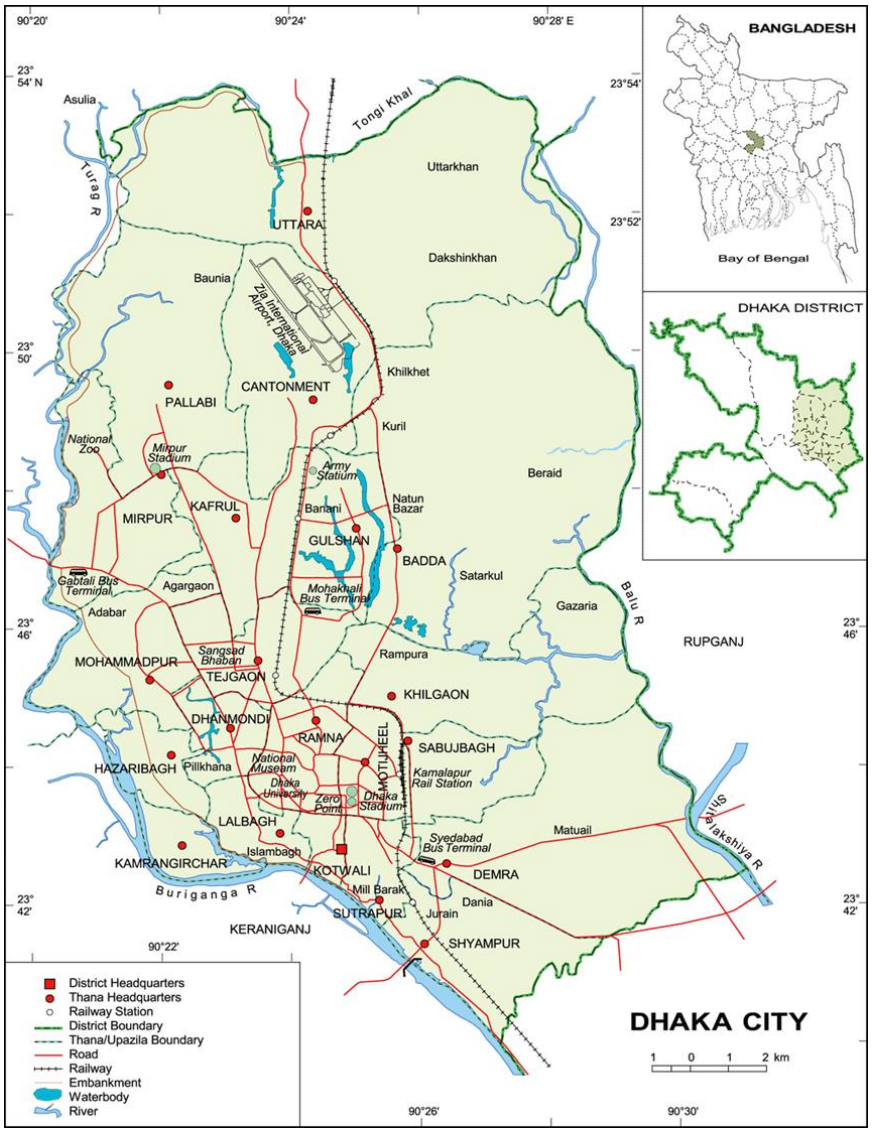

Figure 1 Study area [11]

3. Material and methods

Knowledge, Attitude and Practice (KAP) research related to environmental change is valuable in both developing and developed countries [12].

This research follows a social constructionist approach to examine subjective meanings, experiences, and behaviors of participants related to electronic waste management issues. Researcher collects information about the knowledge, attitude and practice of using electronic goods, disposal methods of e-waste by the consumers of Dhaka City. Respondents were selected based on the purposive sampling techniques. Present study follows quantitative research methods whereas primary data were collected from the field. Therefore, the semi-structured questionnaire was designed to obtain information with respect to the above-mentioned parameters.

The survey (i.e. face to face interview) was conducted among different consumers having different educational, cultural, and socioeconomic backgrounds so that respondents have differing levels of KAP. This study includes 63 respondents from different areas of Dhaka City followed by Badda, Banani, Bonosree, Framgate, Jigatola, Kawranbazar, Lalmatia, Mirpur, Mohakhali, Mohammadpur, and Motijheel. Besides, this paper also uses secondary information from different sources, for example, journal, website etc. After the completion of data collection, all data were processed and analyzed by using MS Excel and SPSS as well.

4. Results and discussion

4.1. Demographic and socioeconomic characteristic of the respondents

The age group, gender, education status, family size, occupational pattern, marital status, monthly income, of the respondents are presented in table 1.

Table 1 General characteristics of the respondents

Respondents	N	%
Age Group		
Less than or equal to 20 Years	6	9.5
21-30 Years	29	46.0
31-40 Years	14	22.2
Above 40 Years	14	22.2
Gender		
Male	26	41.3
Female	37	58.7
Education Status		
Primary	3	4.8
Secondary	5	7.9
Higher Secondary	6	9.5
Bachelor/Honors	16	25.4
Masters/MBA	24	38.1
MPhil	1	1.6
Illiterate/no formal education	8	12.7
Marital Status		
Unmarried	25	39.7

Married	36	57.1
Divorce/Widow	2	3.2
Living Status		
Living in Dhaka with family	42	66.7
Living in Dhaka without family	21	33.3

The study also depicted that 3.2% respondents have only one person, 6.3% of respondents having family members of 2, 17.5% of respondents having family members of 3, 31.7% of respondents having family members of 4, 27.0% of respondents having family members of 5 and 14.3% of respondents having family members of 6 or above. 66.7% of the respondents living Dhaka with their family members and 33.3% of the respondents living Dhaka without their family members.

4.2. Knowledge on the issue of the electronic waste management

Only 36.5% people know or hear about electronic waste before the day of survey.

Table 2 Knowledge source on electronic waste

Responses	**N**	**%**
Friends	8	34.78
Office colleague	2	8.70
Family	3	13.04
NGO campaign	1	4.35
Television programme	1	4.35
Internet	8	34.78
Newspaper article	11	47.83
Own thinking/Self awareness	2	8.70
Teacher	1	4.35

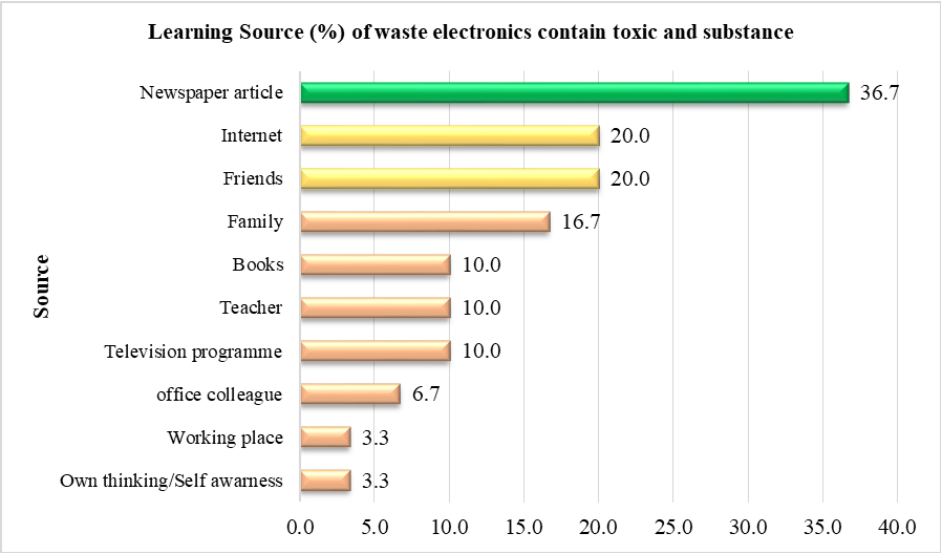

Figure 2 Knowledge source of e-waste contain toxic and substance

Among them 34.78% people knows about e-waste from friends, 8.70% people knows about e-waste from office colleague, 13.04% people knows about e-waste from family, 4.35 % people knows about e-waste from television

program, 4.35% people knows about e-waste from NGO campaign. 34.78% people knows about e-waste from internet, 47.83 % people knows about e-waste from newspaper article, 4.35 % people knows about e-waste from teachers, 8.70% people knows about e-waste from Self-awareness (Table 2).

More than 50% of the consumers have no idea that e-waste electronics contain toxic and substance. Rests of the consumers have knowledge that e-waste electronics contain toxic and substance. Among the consumers who have knowledge on that issue have gather from various source. Most of the consumers gather their knowledge from newspaper (36.7%), from fiends (20.0%), from internet (20.0%) and so on (Fig. 2). 23.3% consumer the known about lead, 23.3 % consumer the known about mercury, 16.7% consumer the known about acid as well as other toxic elements.

Only 22% consumers know about electronic waste contain some precious metal. Among them 13.6% consumers know about e-waste from friends, 4.5 % people knows about e-waste from office colleague, 13.6 % people knows about e-waste from family, 13.6% people knows about e-waste from television program, 22.7 % people knows about e-waste from internet, 45.5% people knows about e-waste from newspaper articles, 4.5% people knows about e-waste from teachers and. 4.5% people knows about e-waste from self-awareness (Table 3). 45.5% consumers known about copper, 40.9% consumers known about gold, 18.2% consumers the known about iron. As well as other precious metals are also known to consumers.

Table 3 Knowledge source of precious metals

Responses	**N**	**%**
Friends	3	13.6
Office colleague	1	4.5
Family	3	13.6
NGO Campaign	0	0.0
Television programme	3	13.6
Internet	5	22.7
Newspaper article	10	45.5
Own thinking/Self awareness	1	4.5
Teacher	1	4.5

E-waste is recycled in Bangladesh without any safety concern and only 22% people know about this fact. 3.2% of the consumers in Bangladesh get any training or information regarding the disposal of electronic equipment from the producers or sellers. 46.0% consumers know about the harmful effects of unmanaged electronic waste. Among them; 44.8% of the consumers know that unmanaged electronic waste may cause cancer, 41.4% of the consumers aware about Soil, air and water contamination because of unmanaged e-waste etc. (Table 4).

Table 4 list of environment and health impact (Multiple responses)

Responses	**N**	**%**
Cancer	13	44.8
Skin disease	9	31.0
Nerve damage	10	34.5
Reproductive disorders	1	3.4
Soil, air and water contamination	12	41.4

According to ESDO report 2010; 2.7 million metric ton e-waste are generated but none of the consumers knows about the present e-waste amount of Bangladesh. E-waste is imported from many developed countries to developing

countries. According to this study 55.6% the consumers knows about that e-waste are also imported in Bangladesh. 96.8% the consumers do not know about any present policy, rules or law about that e-waste.

4.3. Consumer's attitude towards electronic waste management

96.8% of the respondent thinks it is a problem in Bangladesh of the proper management of the electronic waste. As well as 95.2% of the respondent think it the proper time for concerning about proper management of e-waste. 95.2% of the respondent like to be involved in setting up a responsible and safe recycling scheme in our country. Most of the consumers give multiple opinion on the management of e-waste. 66.7% of the consumers think government, 4.8% consumers think manufacturer, 15.9% consumers think consumers, 14.3% NGOs, 7.9% private company should take responsibilities of the management of e-electronics. As well as 50.8% consumers opinion to manage e-waste in common responsibilities/participatory approach (Fig. 3).

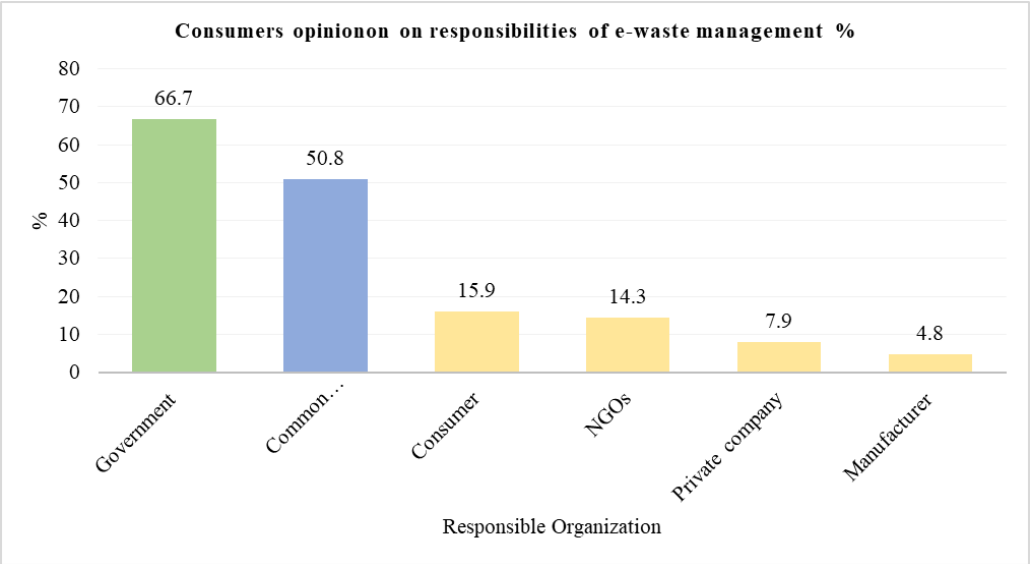

Figure 3 Consumers opinion on responsibilities of e-waste management

Formal recycling facility already had been established in many developed as well as many developing countries and then have organized e-waste collection process. Bangladesh needs to set up an organized e-waste collection process in near future for a responsible formal recycling facility. 55.6% of the consumers may comfortable with Door to door collection process (with a time interval), 38.1% of the consumers may comfortable with Damp their E-waste in any Mentioned place fixed by City Corporation, 27.0% of the consumers may comfortable to informing the recycler as recycler will collect it from their home, 3.2% consumers comfortable with take back system on way of proper management of e-waste in near future (Table 5).

Table 5 Types of electronic-waste collection process seems convenient for consumers

Responses	N	%
Door to door collection process (with a time interval)	35	55.6
Damp their E-waste in any Mentioned place fixed by city corporation	24	38.1
After informing to the recycler, they will collect it from your home	17	27.0
Take back system	2	3.2

79.4% of the respondent like to pay a recycling fee if GOVT take initiative for the e-waste recycling considering the betterment of ours and our future generations. 35.3% of the consumers willing to pay less than 1% recycling fee, 33.3% of the consumers willing to pay 1-3% recycling fee, 17.6% of the consumers willing to pay 4-6% recycling fee, 9.8% of the consumers willing to pay 10-12% recycling fee, 2.0% of the consumers willing to pay 13-15% recycling fee, 2.0% of the consumers willing to pay more than 15% recycling fee.

4.4. Practice of the electronic waste management

The study shows 100.0 % of people use electronic equipment in their house or office and 79.4% of consumers have waste electronics in their house or office. Although 100.0 % of people have been involved in e-waste generation from years but only 31.7% people are concerns about e-waste generations.

Table 6 Ratio of the respondents use electronics equipment (All the % have been calculated by N=63)

Name of electronics	Percentage of the respondents use electronics					
	Male		Female		Total	
	N	%	N	%	N	%
Compact Fluorescent Lamp (CFL)/ other lights	25	39.7	38	60.3	63	100.0
Refrigerator	13	20.6	15	23.8	28	44.4
Microwave oven	6	9.5	9	14.3	15	23.8
Other electrical/electronic appliance used for cooking and processing of food	0	0.0	3	4.8	3	4.8
Washing machine	1	1.6	2	3.2	3	4.8
Dish washer		0.0	2	3.2	2	3.2
Iron and similar other appliance	12	19.0	12	19.0	24	38.1
Hair dryer/Stainer		0.0	10	15.9	10	15.9
Table fan	6	9.5	12	19.0	18	28.6
Fan	19	30.2	30	47.6	49	77.8
Air condition	4	6.3	6	9.5	10	15.9
Toaster	0	0.0	3	4.8	3	4.8
Blender/Grinder machine	6	9.5	8	12.7	14	22.2
Fryer	0	0.0	3	4.8	3	4.8
Television (CRT, LCD, LED etc)	13	20.6	19	30.2	32	50.8
Electric running machine/other exercise equipment	1	1.6	1	1.6	2	3.2
DVD Player/VCR/VCP		0.0	3	4.8	3	4.8
Video camera/Video recorder	1	1.6	1	1.6	2	3.2
Digital camera/ or other camera	3	4.8	7	11.1	10	15.9
Electronic musical instrument	0	0.0	1	1.6	1	1.6
Electric switch / Calling bell	13	20.6	10	15.9	23	36.5
Data centralization system (Main frame computer, minicomputer)	12	19.0	8	12.7	20	31.7
Computer Monitor	11	17.5	9	14.3	20	31.7
Laptop	10	15.9	12	19.0	22	34.9
i-pad/note book/tab	5	7.9	3	4.8	8	12.7
Printer/Ploter	3	4.8	0	0.0	3	4.8
Scanner	3	4.8	0	0.0	3	4.8
Calculator	8	12.7	16	25.4	24	38.1
Cellular telephone/mobile phone)	25	39.7	35	55.6	60	95.2
Mobile Phone Accessories	25	39.7	27	42.9	52	82.5
land phone /Cordless phone	1	1.6	4	6.3	5	7.9
Blood pressure machine	1	1.6	2	3.2	3	4.8
Diabetic machine	1	1.6	2	3.2	3	4.8

11.1% of the consumers involved in e-waste generation from 2-5 years, 7.9% of the consumers involved in e-waste generation from 6-10 years, 7.9% of the consumers involved in e-waste generation from 11-15 years, 19.0% of the consumers involved in e-waste generation from 16-20 years, 54.0% of the consumers involved in e-waste generation above 20 years.

People replacing electronics for multiple reasons. Besides other causes, most of the consumers like to replace electronics for damage (77.8%) and only few people (11.1%) choose to replace their electronics for the cheap price of the new electronics (Table 7).

Table 7 Reason for replacing electronic equipment (Multiple responses)

Responses	No. of Consumers	%
Outdated style	30	47.6
Outdated functions	24	38.1
Damage	49	77.8
New products are cheap	7	11.1
high repair cost	10	15.9
malfunction during use	13	20.6
lifespan elapsed	14	22.2

Consumers discard or disposed their electronics are in different methods. Generally, consumers are used to dispose their electronics more than one ways. Most popular ways to disposed the waste electronics that to throw away with solid waste/ domestic garbage. Nearly 70% consumers use to dump their waste electronic with solid waste/ domestic garbage (Table 8). Only 25.4 % people used second hand electronics life time and 74.6% never used any second hand electronics.

Table 8 Method of disposal (Multiple response)

Responses	No. of Consumers	%
Repair	33	52.4
Thrown away with solid waste/domestic garbage	44	69.8
Sold it to huckster(Vangari wala)/second hand market/ give to scrap collector	21	33.3
Keep it in home	25	39.7
Exchange for a new equipment	1	1.6
Dump in designated place or refuse dump	1	1.6
Dump in any place	1	1.6
Dump in canal, river, sea	4	6.3
Burning or incineration	0	0.0
Sell to recycler	4	6.3
Repair, Recycle, Sell to Recycler	1	1.6
Give to Bua, Gatekeeper	2	3.2

5. Conclusion

Electronic products have become an essential part of our daily life. It is very difficult to do some tasks without electronic products. Currently, almost every person in Dhaka city is using electronic products including mobile phone, computer, refrigerator, television, and so on for the convenient of their daily activities. Consequently, voluminous electronic wastes are being created by the citizens. However, they are not much aware about the management of electronic wastes. According to this study, around two-third of the people of Dhaka City don't have any idea about the generation of electronic waste. On the other hand, more than fifty percent of the consumers have no idea that e-waste contains toxic substances (i.e. lead, mercury, antimony) which could have negative impacts followed by cancer, skin disease, nerve damage, reproductive disorder, soil, air, and water contamination as well.

However, consumer thinks that there is a lack of proper management of electronic waste in the city. They believe that it is high time to take proper initiatives to manage the electronic wastes. Besides, they would like to be involved in setting up a responsible and safe recycling scheme in our country especially in the city area to get rid of from the harmful effects of the electronic wastes. As most of the consumers would like to pay a recycling fee if government take any step regarding e-waste recycling process. Therefore, government of Bangladesh should properly implement the adopted electrical and electronic management and handling rules, 2011 and take initiatives on establishment of proper e-waste management system.

Compliance with ethical standards

Acknowledgments

Authors thank to Mahbub Alam, Department of Environmental Science, Jahangirnagar University for his assistance.

Disclosure of conflict of interest

There is no conflict of interest among the authors.

Statement of ethical approval

The Study follows proper ethical procedures.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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