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A STUDY ON E- WASTE MANAGEMENT IN MIRPUR AREA

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ABSTRACT

It is not improbable that significant technological advancements might also result in pollution. E-waste collection, disposal, recycling should be a matter of proper management for a developing country like Bangladesh. This paper discusses E-waste generation in Mirpur area. (Mirpur 1, 13, 14). A survey was performed to find out the location of the shops. Later local shops, waste pickers and feriwalas were interviewed. From the local shops it has been found that daily these shops handle 20.8 kg TV and computer parts, 3 kg circuit, 4.8 kg mobile phones, 1 kg electric stoves, 5.8 kg electric bulbs, 7.1 kg fan, 0.6 kg printer, 1.7 kg Iron and 23.85 kg of mixed E-wastes. Mirpur-14 site has found the most E-wastes. Waste pickers and waste collectors can often harm their health by collecting hazardous elements by not maintaining proper rules. Government should impose more rules for proper E-waste recycling.

Keywords*: Electrical and Electronic Equipment (EEE), E-waste, waste-pickers, recycling, toxic elements.*

INTRODUCTION

Different electrical equipment or appliance is required in every aspect of life, from getting out of bed to going to sleep. After Covid-19, utilization of these equipment has increased more. Each piece of equipment has a set life expectancy and then problems arise in terms of discarding these electrical and electronic wastes. Electronic rubbish, or "E-waste," is any electrical or electronic equipment (EEE) that has reached or is about to reach the end of its useful life. People frequently change their mobile devices, tablets, and computers due to upgrades or updates. Usage life span of these products can be from 1 year to 5 years for people who are technology savvy. Questions can arise related to where the products go when they are out of use. Some are given away to those who need them, while others become e-waste and are dumped in landfills in part. Not only do people throw away these things carelessly, but they also throw away batteries without thinking. People frequently sell their old, used televisions, freezers, and ovens to feriwalas in order to purchase new ones. However, the general public is unaware of what happens to these tools after that.

Electronic equipment refers to objects that run on a variety of tiny electrical components, including but not limited to microchips, transistors, and circuits. Anything that is charged or powered by electricity is referred to as electrical appliances. And when these electrical and electronic equipment are discarded, they contribute to a waste stream. These include mobile phones, computers/ laptops, televisions, analogue phone sets, cooking appliances, electric ovens, air-coolers, electric bulbs, keyboards etc. All of this equipment contains various toxic and hazardous elements which can cause harm to environment. The E-waste generation rate is increasing every year by about 10%. (Masud et al. 2019) Global e-waste generation increased to 53.6 Mt (million metric tons) in 2019 from 44.75 Mt in 2016, according "Global E-waste Monitor" study. (Rautela et al., 2021) Since 2014, the production of e-waste has increased by 9.2 Mt, and by 2030, it is expected to reach 74.7 Mt. (Forti et al. 2020) Volume of e-waste produced annually is rising at a startling rate. More than 50 million tons (Mt) of e-waste were produced worldwide alone in 2019. 24.9 million tons of this total amount of e-waste were produced in the Asia Pacific area. (Andeobu, Wibowo, and Grandhi 2021) Only a small number of nations are aware of how to properly recycle this e-waste so as not to harm the environment.

E-WASTE SITUATION IN BANGLADESH

According to a National Board of Revenue (NBR) Bangladesh survey, since 2012, some 63,003,818 phones have been launched into the Bangladeshi market. If one mobile phone has a life span of 2.5 years, the amount of E-waste that will be generated that will be increasing in an exponential

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rate. (Masud et al., 2019) Cell phones and TVs are the two E-waste sources that contribute the most to the overall generation. In the past 21 years, Bangladesh has produced 10,504 metric tons of harmful E-waste from cell phone sets, 0.17 million metric tons of E-waste from televisions, 2.5 million metric tons of toxics e-waste from ship breaking yards, 2428.22 metric tons E-waste from CFL (compact fluorescent light) and Mercury bulbs. In every year Bangladesh generates roughly 2.8 million metric tons of e-waste. (Islam, 2016) Due to factors including improving living standards, urbanization, exposure to new and improved technology, shifting consumer preferences, etc., the generation of e-waste in Bangladesh is significantly rising. Bangladesh has a greater rate of e-waste generation than many other nations worldwide. (Hossain et al., 2011) A law titled "E-waste management regulation" was drafted by Bangladesh in 2019 which outlines the requirements for manufacturers to reuse and recycle E-waste, to properly register and collect, to segregate the wastes while collecting and storing in accordance with Environmental Conservation Rules (1997). Customers are required to give their E-waste to specialized collectors or dispose of it at locations provided by local government organizations. Lack of awareness is a major issue for neglecting the E-waste management. (Ananno et al., 2021) When compared to first-world nations in terms of handling, Bangladesh is still in the early stages. To extract metals like copper from wires, transformers, and capacitors from circuits, among others, informal recyclers frequently use incineration, disposal of e-waste in landfills, and hand desoldering of circuit boards. There is no such thing as a formal sector of e-waste collectors and that the majority ends up in informal sectors like vangari shops and second-hand electronic marketplaces in Bangladesh. (Karim, Bari, and Amin 2014)

The paper will discuss about existing scenario of E-waste management in specific places of Mirpur area in Dhaka with the types of E-wastes generating in there. Bangladesh needs an extensive research on how E-waste management can be improved in each localities. The paper is a small initiative in order to create awareness about consequences of E-wastes.

STUDY AREA

Mirpur area is a busy area in the city of Dhaka. It is famous for being a heavily populated area. After performing a reconnaissance survey, three areas were found to be further assessed for e-waste management study. The selected areas are given below and their respective maps are given below:

1) Kafrul Thana – Mirpur 13 & 14
2)Shah Ali Thana- Mirpur 1 (North)
3)Darus Salam Thana- Mirpur-1 (West)

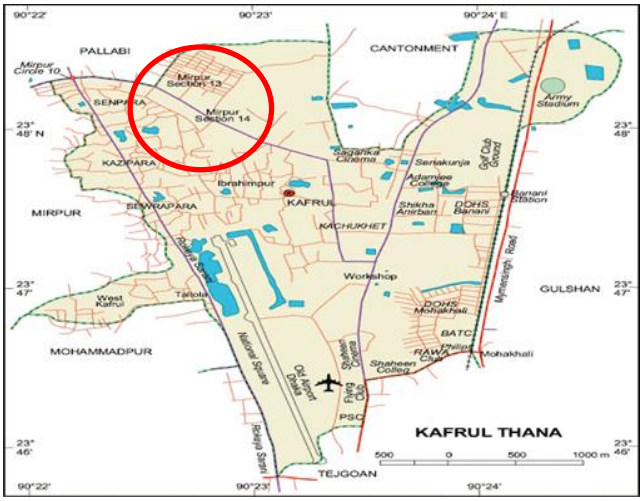

Figure 1 Map of Mirpur 13 & 14 area

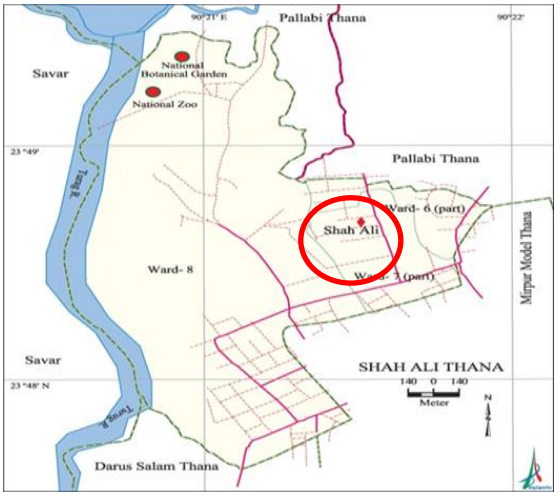

Figure 2 Map of Shah Ali Thana

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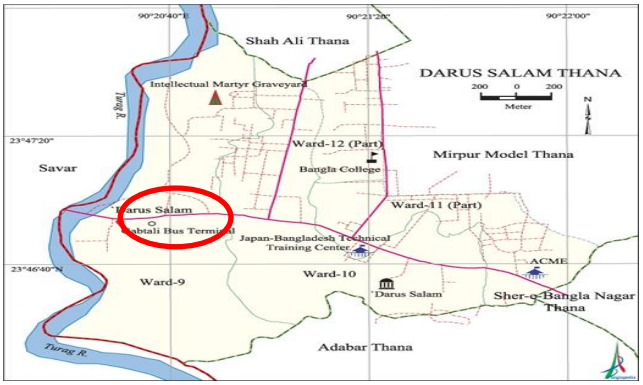

Figure 3 Map of Darus Salam Thana

METHODOLOGY

A reconnaissance assessment was conducted in the Mirpur area to determine the state of electronic waste management at the time (Mirpur-1, 13, 14). This poll was carried out among those involved in the e-waste recycling process. A survey had been conducted among primary e-waste collectors (such as feriwala, rubbish pickers), as well as at e-waste recycling businesses. There are two stages to the entire survey. Data were collected at the time of January 2022 to March 2022 in Dhaka.

The people that collect primary e-waste from homes, dustbins, and other disposal sites and sell it to recycling businesses are known as primary e-waste collectors. Two related persons were found in the process -Feriwalas and Waste Pickers. Feriwala are the people who collect wastes from house to house. Waste pickers collect wastes from dustbins or dumping places. It is very difficult to determine the working locations of primary E-waste collectors. That is why information is gathered from the garbage business owners and from conversations with them at their homes.

The next survey was done to find out the recycling shops. The e-waste recycling businesses are dispersed throughout the research region in clustered formation. It is challenging to determine the precise number of stores because some stores might not be counted. 29 shops were found in the process. These shops are categorized according to their e-waste handled per month. The amount of e-waste handled less than 5 kg per day is categorized as small shops. Between 5.5- 7 kg e-waste per day is categorized as medium shops and more than 7 kg of e-waste is categorized as large shops.

A questionnaire form is used to gather specific information about various shops after categorizing them. These details include the amount and type of electronic trash generated, as well as information on how it is collected or recycled. Different pictures during field surveys are given below-

Figure 4 Speaker Wastes

Figure 5 Collection of E-wastes

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Figure 6 Discarded Television sets

Figure 7 Discarded Freezes in Vangari Shops

RESULT AND ANALYSIS

A questionnaires survey was performed in Mirpur area of Dhaka north city to select suitable places for collecting data and information. The selected area and collected information's are listed in the following table:

Table 1 Information of study area

Area	Related Information
1)Kafrul Thana, Darussalam Thana, Shah Ali Thana (DNCC)	Information on household owning of electronic and their life span
2) Mirpur-1	Sales center of electronic products (both new and old)
3) Mirpur-13	Secondary market of e-waste
4) Mirpur-14 (Vhasantek)	Source of cable

The entire field survey was conducted across several phases that can be divided into two groups. The number of waste collectors, daily waste collection volume, and mass balance of all e-waste in the study area are detailed below under these categories.

PRIMARY E-WASTE COLLCETORS

People of various ages are seen working in this line of employment because there are no costs associated with it, and the money they make from selling the e-waste is their sole source of income. It is often seen that small children generally work as waste pickers. Their age designates between 7 to 60 years. The information collected from primary e-waste collectors are given in table 2.

Table 2 Average daily collection of e-waste by weight from various categories of collectors

Type of e- waste collectors and their age	Male/ Female	Average amount of e-waste collected (kg/day)						Total (kg/ day)
		TV and computer box	Circuit	Mobile phones	Electric Stove	Electric bulb	Mixed e-waste	
Waste picker (7-18)	Children	0.9	0.4	0.0	0.0	0.4	0.5	1.8
Waste Picker (19-40)	Male	1.9	0.7	0.4	0.0	0.7	0.7	3.7
Waste picker (41-60)	Male and Female	1.4	0.3	0.3	0.0	0.8	0.6	2.6
Feriwala	Male	4.7	1.4	0.5	0.9	1.7	5.2	12.7

ISBN: 978-984-35-4034-8

The selling price of different e-waste material is shown in Table 3.

Table 3 Selling price of different e-waste material

Type	Selling price to recycling shop (Tk/kg)
TV and computer parts	25-30
Circuit	40-45
Mobile phones	10-15
Electric Stove	35-40
Electric Bulb	15-20
Mixed e-waste	20-25

From the table 3 we can make a calculation about the average amount of e-waste they collect daily and their average daily income which is shown in table 4

Table 4 Estimate of amount of e-waste collected by primary waste pickers and their income

Waste picker				Feriwala			
Material	Average amount of e- waste collected (kg/day)	Selling price (Tk/kg)	Income (Tk)	Material	Average amount of e- waste collected (kg/day)	Selling price (Tk/ kg)	Income (Tk)
TV and Computer parts	1.4	25-30	38.5	TV and computer parts	4.7	25-30	129.25
Circuit	0.4	40-45	17	Circuit	1.4	40-45	59.5
Mobile phones	0.3	10-15	3.75	Mobile phones	0.5	10-15	6.25
Electric Bulb	0.6	15-20	10.5	Electric Bulb	1.7	15-20	29.75
Electric Stove	0.0	35-40	0	Electric Stove	0.9	35-40	33.75
Mixed e-waste	0.6	20-25	13.5	Mixed e-waste	5.2	20-25	117
Total	3.3		83.25	Total	14.4		375.5

RECYCLING SHOPS

In terms of E-waste management recycling process is important. But developing countries like Bangladesh, mostly lack in the process of recycling. Mainly for these processes, as a secondary market ‘Chankarpul’ only deals with used electrical equipment. Electronics' plastic is removed by shops in Chankarpul and sold to Islamabagh, where it is recycled.

RECYCLING SHOPS IN MIRPUR 13

It has been found that there are only 3 small shops. After collection of the e-waste some portions are reused, some are sold to mechanics and remaining parts are dumped.

Table 5 Detail information of the e-waste recycling shops at Mirpur-13

Shop	Type of e- waste collected	Shop Size	Way of collection	Activity after collection	Income per month (Tk)
01	Fan (table), TV	Small	Feriwala, User	Parts reuse	4000
02	Fan(ceiling) TV, Computer parts, Iron	Small	Feriwala, User	Repairing then sell	7000
03	TV	Small	User	Repairing then sell	3000
Total					14000

ISBN: 978-984-35-4034-8

The following table 6 shows the approximate percentage of different types of e-waste that are handled in Mirpur-13.

Table 6 Approximate percentage of different types of e-waste handled in Mirpur-13

Type of e-waste	Amount collected (kg/day)	Percentage (%)
Fan (table, ceiling)	1.1	22
TV	2	40
Computer parts (CPU, monitor)	1.5	30
Iron	0.4	8
Total	5	100

RECYCLING SHOPS IN MIRPUR-14 (VHASHANTEK)

In this neighborhood, there are 15 stores. However, the majority of the stores no longer deal with recycling e-waste. There are just 7 stores involved in e-waste recycling. One store is in the large category, two are in the medium category, and the remaining stores are in the small category.

Table 7 Detailed information of the e-waste recycling shops at Mirpur-14 (Vhasantek)

Shop	Type of e- waste collected	Shop Size	Way of collection	Activity after collection	Income per month (Tk)
1	Fan (table & ceiling), Refrigerator, Electric Stove, Computer & TV parts, Electric Heater, Printer, AC, Mixed e- waste	large	Feriwala, Waste Picker	Parts reuse, Sent to Chankharpull	48000
2	Refrigerator, Computer & TV parts, AC, Mixed e-waste	Medium	Feriwala, User	Parts reuse	16000
3	Computer & TV parts, Mobile, AC, Mixed e- waste	Medium	Feriwala, User	Parts reuse, Sent to Mohammadpur	18000
4	Electric bulb, Electric heater, mobile, remote, multiplug, watch, iron	Small	Feriwala, User, Waste picker	Parts reuse	10500
5	Electric bulb, Electric heater, mobile, remote, multiplug, watch, iron, Calculator	Small	Feriwala, User, Waste picker	Parts reuse	7000
6	Mixed e-waste	Small	Feriwala, Waste picker	Parts reuse	9000
7	Mixed e-waste	Small	Waste Picker, User	Parts reuse	8000
Total					116500

ISBN: 978-984-35-4034-8

Table 8 Approximate percentage of different types of e-waste handled in Mirpur-14 (Vhasantek)

Type of e-waste	Amount collected (kg/day)	Percentage (%)
TV and computer parts	7	22.76
Fan (table, celling)	3.5	11.38
Mobile phones	2.6	8.46
Electric Stove	1	3.25
Electric bulb	2.4	7.8
Mixed e-waste	14.25	46.35
Total	30.75	100

RECYCLING SHOPS AT MIRPUR-1

There are 5 shops located in this area. Here 1 shop is in medium category and 4 shops are in the small category. Table 9 shows the details of shops which is given below-

Table 9 Detailed information of the e-waste recycling shops at Mirpur-1

Shop	Type of e- waste collected	Size	Way of collection	Activity after collection	Income per month (Tk)
01	TV, computer parts, Fan	Small	Feriwala, Waste picker	Parts reuse	5000
02	Circuit, Mobile phones	Small	Feriwala, Waste picker	Sent to Chankarpul	6000
03	Electric bulb, Iron, Mixed e-waste	Small	Feriwala, Waste picker	Parts reuse	6500
04	Mixed e-waste	Small	Feriwala	Sent to Chankarpul	7000
05	TV, mobile, computer parts, Mixed e-waste	Medium	Feriwala, Waste picker	Parts reuse, Sent to Chankarpul	10000
Total					34500

The following table 10 shows the approximate percentage of different types of e-waste that are handled in Mirpur-1.

Table 10 Approximate percentage of different types of e-waste handled in Mirpur-1

Type of e-waste	Amount collected (kg/day)	Percentage (%)
TV and computer parts	2.1	24.14
Circuit	0.9	10.34
Mobile phones	1.2	13.8
Iron	0.4	4.6
Electric bulb	0.8	9.19
Mixed e-waste	3.3	37.93
Total	8.7	100

RECYCLING SHOPS AT DARUS SALAM

There are only 9 shops located in this area. Here all the three category shops are found. They are 5 small, 3 medium and 1 large shops. The next table discusses about details of different E-wastes in different shops in Darus Salam.

ISBN: 978-984-35-4034-8

Table 11 Detailed information of the e-waste recycling shops at Darus Salam

Shop	Type of e- waste collected	Shop Size	Way of collection	Activity after collection	Income per month(Tk)
01	Fan (table), TV, mixed e-waste	Small	Feriwala	Parts reuse, sent to Chankarpul	4000
02	Fan(ceiling), TV, Computer parts (CPU, Monitor)	Small	Feriwala, waste picker	Sold to local mechanics	3200
03	TV, electric bulb, circuit	Small	Waste picker	Sent to Chankarpul	3000
04	Fan (table), mobile, TV, circuit	Small	Waste picker	Parts reuse	1200
05	Electric bulb, circuit, mobile, mixed e- waste	Small	Feriwala, waste picker	Parts reuse, sent to Chankarpul	5000
06	Fan(table), TV, mobile, mixed e-waste	Medium	Feriwala, waste picker	Parts reuse, Sent to Chankarpul	7500
07	Fan(table), TV, Computer parts, mixed e-waste	Medium	Feriwala, waste picker	Parts reuse, Sent to Chankarpul	8000
08	Fan(table), TV, Computer parts, mixed e-waste	Medium	Feriwala, waste picker	Parts reuse, Sent to Chankarpul	8500
09	Fan (table & ceiling), Refrigerator, Electric Stove, Computer & TV parts, Electric Heater, Printer, AC, Mixed e- waste	Large	Feriwala, waste picker	Parts reuse, Sent to Chankarpul	38000
Total					78400

Following are the respective percentages of different kinds of E-wastes found in Darus Salam.

Table 12 Approximate percentage of different types of e-waste handled in Darus-Salam

Type of e-waste	Amount collected (kg/day)	Percentage (%)
Fan (table, ceiling)	2.5	10.33
TV	4.8	19.83
Computer parts, (CPU, monitor)	3.4	14.05
Circuit	2.1	8.67
Mobile phones	1	4.13
Printer	0.6	2.48
Iron	0.9	3.72
Electric bulb	2.6	10.74
Mixed e-waste	6.3	26.03
Total	24.2	100

TOTAL ESTIMATION OF RECYCLE PROCESS

If we summarize the whole E-waste generation in the four places the following figure presents the total percentages of e-waste generated according to different E-waste materials.

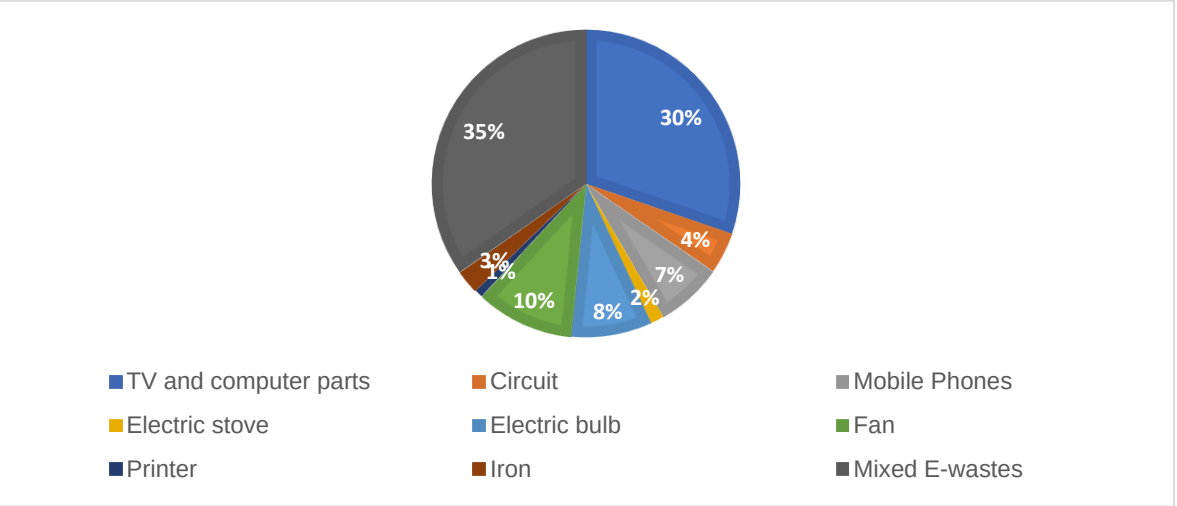

Figure 8 Approximate percentage of e-waste handled in Study Area

Table 13 Quantity of e-waste collection on the basis of location and categories of shops

Location	No. of shop with type			Amount of e-waste (kg/day)			Total e-waste (kg/day)
	Large	Medium	Small	Large	Medium	Small	
Mirpur-13	0	0	3	0	0	5	5
Mirpur-14 (Vhasantek)	1	2	4	20	6.5	4.25	30.75
Mirpur-1	0	1	4	0	6	2.7	8.7
Darussalam	1	3	5	17	5.9	1.3	24.2
Total	2	6	16	35	18.4	13.25	68.65

Table 13 represents that all shops being located in the area collects 68.65 kg of E-wastes daily. Waste pickers and feriwalas also collect E-wastes which is very low in quantity. But in terms of recycling there is no specific quantity available. During field survey very few recycling shops were found because maximum shops send the separated fragments, parts in Chankharpul. This scenario shows that the Mirpur area lacks in the recycling process. Legislation should be followed in terms of E-waste handling, which was missing, as seen during field survey. No safety measurements during handling E-wastes are followed. These circumstances may often lead to horrible pollution of environments. Other than that, toxic elements form wastes can harmfully affect health of waste pickers and feriwalas.

CONCLUSION

Waste pickers on average collects 17.7 kg E-wastes daily. Investigating the different shops, it has been found that 68.5 kg E-wastes are handled in the shops in the study area of Mirpur. Mixed E-wastes like cables, separated parts of different items, batteries are the most found E-waste in the area with the percentage of 34.74%. Television other computer parts like discarded keyboards, chip processors are next in abundantly found E-waste in the area with 30.30 %. Young children work as waste pickers which shows the unemployment situation of a developing country like Bangladesh. In current period of rising prices, it is hard to live on 83.25 Tk each day. Small shops make between 3000 to 10500 Tk every month, which can also be used to measure how little E-waste is being gathered and recycled. E-wastes are generally recycled in Chankharpul. In the process toxic and heavy metals should be separated properly to not pose any risk in environment and people's lives. General public should be made concerned about all the regulations about E-waste handling and its consequences. Recycling process should be investigated in the area for proper E-waste management.

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