



Consumers' Behaviour And Their
Perception of Circularity In the
Nigerian Electrical and Electronic
Equipment Sector



ACKNOWLEDGEMENTS

John D. Rockefeller once said: "Think of giving not as a duty but as a privilege." IHS Nigeria Limited has raised the bar in demonstrating what this statement truly means. The Organization's unwavering commitment to transitioning Nigeria to a country where electronic waste will be channeled through a formal well-documented system, and guaranteed environmentally sound management (ESM), dates back to the inception of the extended producer responsibility (EPR) system in the electrical and electronic equipment (EEE).

This support has metamorphosed from joining EPRON, becoming one of the foremost Board members, and has graduated into providing support to institutionalise the EPR system across Nigeria. The Organization's enduring partnership as well as its financial and moral support has made this study a reality and is highly appreciated. The Organization has also provided support to develop a national training manual that will be used to develop the capacity of operators of e-waste collection on ESM of e-waste. We also recognize the hard work and contribution of the following individuals:

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The views expressed in this publication are those of the authors and do not necessarily represent those of IHS Nigeria Limited, nor does citing of trade names, companies, schemes, or commercial processes constitute endorsement of any organization. We regret any errors or omissions that may have unwittingly been made.

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FOREWORD

The theme of year 2021 International E-waste Day celebration was: Consumer is key to a Circular Economy. That Statement is indeed profound and accurate because Consumers are a critical determinant of circularity in any e-waste management system. As the owners and custodians of EEE, they determine when it is obsolete and needs to be upgraded. The decision to fix, give up for recycling, or throw dysfunctional e-waste items into the trash can is made by the consumers. Also important is the fact that the population using EEE and generating e-waste is very wide. From toddlers to the older generation, there is at least one EEE for everyone, serving an endless list of purposes: toys, medical equipment, communication devices, working tools, and in some cases, lighting equipment. It is this realisation that informed the decision to explore consumers' behaviour towards EEE across its entire life cycle across the six geopolitical zones of Nigeria.

I invite you to journey with us into this report which is expository of individuals and corporate consumer behaviour concerning EEE. It reveals their perception of circular economy (CE) and its practices, it provides an insight into the decisions that consumers make when purchasing EEE, what they do to it at the end of life (EoL), and more importantly, the factors that come into play when making those decisions. It also makes some recommendations for key Stakeholders associated with EEE.

It is quite pertinent for consumers to be appropriately oriented to understand the need to transition to a CE and make sound decisions at the EoL of their EEE and also for e-waste management initiatives and infrastructure to align with their preferences. We, therefore, hope that policy makers, regulatory agencies championing a CE in Nigeria, potential investors in the e-waste value chain, and funders at large, will find this report beneficial and it will stimulate visible responses.

Do have a pleasurable reading experience!

Ibukun Faluyi

Executive Secretary

E-waste Producers Responsibility of Nigeria (EPRON)

EXECUTIVE SUMMARY

Electronic waste (e-waste) is a topical issue of concern in Nigeria and globally due to its high rate of generation, trans-boundary shipments to developing countries and the absence of basic e-waste collection storage and recycling infrastructure in those developing countries, including Nigeria. The adoption of inappropriate management practices of e-waste, especially by the informal sector, results in environmental pollution and human exposure to hazardous chemical. The Nigerian Government has taken a lead role to combat the challenge by developing a legislative framework to ensure environmentally sound management (ESM) of e-waste. This brought about the need for producers of electrical and electronic equipment (EEE) to set up a Producer Responsibility Organization - the E-waste Producer Responsibility Organization of Nigeria (EPRON) to fulfil their obligations and ensure ESM of e-waste in Nigeria.

To ensure that an appropriate foundation for collection and ESM of e-waste is laid in the country, EPRON saw the need to conduct a study to determine consumers' behaviour in relation to EEE. This study, therefore, aimed to gain a better understanding of consumers' (households and corporate organizations) behaviour towards the circular economy in the EEE sector (purchase, repair, e-obsolescence, and disposal); the level of organization of the negative impacts of e-waste; and the knowledge of existing regulations governing the EEE sector in Nigeria. The study also investigated e-waste generation patterns, existing management practices; motivations and barriers to proper e-waste disposal, and collection approaches that consumers prefer. The study was carried out in six states (Lagos, Kano, Abia, Rivers, Ogun, and Adamawa) and the Federal Capital Territory (Abuja). Three LGAs were selected from each of the states and within each of the selected LGAs/municipal areas four communities were selected.

The data collection exercise was conducted over a period of eight days. Electronic data collection techniques were utilized, namely KoboCollect and Microsoft Office Form. The developed questionnaires were appropriately programmed into KoboCollect to collect data from consumers and collectors. Various stakeholders' opinions, including those of producers, consumers, and regulatory bodies and government agencies were accessed with in-depth interview (IDI) questions programmed on Microsoft Office Form.

The study revealed that more than 90% of the surveyed consumers were unaware of a government-driven Extended Producer Responsibility (EPR) Programme in the EEE sector in Nigeria while 74% were not cognizant of the national regulation governing e-waste management. This was also the case among collectors and corporate Organizations. About 61.6% of the collectors were unaware; in a similar vein, only 39% of the corporate Organizations were aware, thus, indicating that 61% were unaware. With this low level of awareness of the EPR programme by individuals and corporates, it is unsurprising to see that most of the respondents were also unaware that EPRON exists and fulfils producer obligations for the EEE sector. The level of awareness of the term circular economy (CE), was rather low among individual consumers (27.6%) and their corporate (44%) counterparts. CE practices were inadvertently prolific among the consumers as reflected in their preference for more durable but more expensive devices; about 82.3% of the respondents currently repaired their malfunctioning EEE. Consumers also reported that they gave up e-waste for reuse by others, replaced their products only when they were no longer functional. These are CE approaches that these consumers had organically imbibed most probably due to socio-cultural factors; however, they were unable to relate them to the term because they were unaware of the term Circular Economy. The consumers also pointed out that the high cost of repair, lack of trust in the technicians, and inadequate skilled technicians discouraged the repair and reuse of EEE.

Only 32% of the respondents were motivated to recycle e-waste because they care about the environment. Until all consumers are motivated to recycle e-waste because they care about the environment, more e-waste will continue to be handled by the informal sector, the vast majority (76%) of which had no health and safety training, neither did they use personal protective equipment (PPE), and were mostly unaware of the risks in dealing with hazardous materials.

In examining the e-waste generation patterns, it was discovered that the e-waste types most frequently generated by the consumers were mobile phones (33.5%), television (12.3%), pressing irons (9.8%), radios and freezers (5.2%), all of which are mostly household items. These e-waste were generated mostly because the products no longer functioned, since the study revealed that majority of the consumers did not stop using their EEE until they became malfunctional. Such malfunctional devices are usually repaired and reused. In spite of this long lease of life that products are given, each of the respondents had generated an average of two e-waste items in the past five years, thus indicating the level of local e-waste generation in the country.

It is also noteworthy to mention that huge amounts of non-functional EEE are in storage especially the portable devices (e.g. mobile phones), so there is indeed a lot to be harvested.

As regards the fate of these e-waste generated, the study revealed that an average of 13.4% of faulty EEE were given out by consumers to family and friends, 12.4% are sold and 22.5% were stored. Most of the respondents (48.0%) indicated that they sold their e-waste to door-to-door collectors, 19.1% disposed theirs with household trash, while 17.2% gave such gadgets to family and friends. Only 1.2% of consumers used approved e-waste disposal facilities (e-waste collection centres).

The 48.0% of respondents who used the informal collectors did so for the financial incentive without formal knowledge of the health implications of unsound management of e-waste. Many consumers revealed that if incentivised, they were willing to dispose e-waste formally through the right channels to ensure its ESM. They also highlighted that the collection centres were grossly inadequate as majority did not know of the existence of any collection centres in their locality. For the EPR to survive, two major challenges to formal e-waste collection in Nigeria must be addressed: namely, the absence of collection infrastructure and consumers' preference for cash incentives in exchange for their e-waste. The latter makes the option of dealing with the informal recyclers more attractive.

In view of the foregoing, massive awareness and advocacy programmes are required to educate consumers on CE and its application; on the adverse effects associated with indiscriminate e-waste management practices and also on the value of ESM. This will increase the consumers' desire to channel their e-waste through formal documented channels for ESM and reduce indiscriminate recycling and polluting activities. Complimentary efforts in areas of awareness and advocacy to enlighten the informal collectors on the illegality of their polluting practices and efforts to channel them to formal collection practices is required on the part of regulatory agencies and EPRON. The inadequacy of collection centres needs to be addressed; more collection centres need to be made available and accessible to consumers. In response to consumers' preference to give back their e-waste at the household level in exchange for cash incentives, e-waste collection models actively integrating door-to-door collection through informal collectors need to be developed and adopted to facilitate improved take-back. Even though consumers prefer to give up to collectors, a realistic incentive commensurate with the parallel informal market is required.

To fill the gap for collection infrastructure in these States and subsequently across the country, investment in collection infrastructure is required. Investors are encouraged to come along, prioritizing solutions according to the identified generation patterns. While further studies are still required for the quantification of e-waste generation rates in households to strengthen investors' conviction on the return on their investments, it is clear that large quantities of e-waste are actively being generated and many are still in storage. So clearly the availability is certain and the fact that about 61% of respondents expressed willingness to pay to encourage effective recycling of e-waste in order to safeguard the environment, implies that with adequate awareness, behavioural patterns will change and returns on investments will be guaranteed.

Conscious and deliberate effort to train and certify technicians across the country who will provide expert and trusted repair services is also required on the part of Original Equipment Manufacturers (OEMs) and Producers. This will engender trust and enable consumers give their faulty EEE for a new lease of life. While there may be concerns that product sales would reduce when repair is guaranteed, it should be noted that it provides guaranteed part sales and will enhance Producers' ability to attain product circularity which is an imperative for any sustainable electronics manufacturing in this 21st century. Organizations with the responsibility for providing Technical, Vocational Education and Training (TVET) should also unlock these opportunities in partnership with EPRON. Strategies to drive investment in that sector needs to be taken on board without further delay.

To achieve the above and other important strides, the EPR system must move beyond mere existence; it needs to thrive. Collectors and Recyclers need the assurance that their EPR-based business models will endure. This will provide the requisite motivation to invest in requisite infrastructure to conduct ESM collection and recycling. All Producers must commit to fulfilling their EPR obligations as necessitated by the National Environmental Electrical/Electronic Regulation 2022 S.I. No 79, 2022. Formal registration of their Organizations and funding the collection and recycling according to their market share should be stressed. Lopsided funding, whereby some organizations participate while others are free-riding will not bode well for the EPR system. Ultimately, regulatory participation is required to enforce Producers' compliance, the compliance of the downstream industry standard at the National and State levels, and also to raise awareness among Producers.

Abbreviation and acronyms

CE	Circular Economy
CKD	Completely Knocked Down
CRT	Cathode Ray Tube
CI	Confidence Interval
EEE	Electrical and Electronic Equipment
EPR	Extended Producer Responsibility
EoL	End-of-Life
EPRON	E-waste Producer Responsibility Organization of Nigeria
ESM	Environmentally Sound Management
E-waste	Electronic Waste, synonym of Waste Electrical and Electronic Equipment (WEEE). “E-Waste is a term used to cover items of all types of EEE and its parts that have been discarded by the owner as waste without the intention of re-use.”
IDI	In-depth Interviews
ITU	International Telecommunication Union
LASEPA	Lagos State Environmental Protection Agency
LAWMA	Lagos Waste Management Authority
LGA	Local Government Area
NESREA	National Environmental Standards and Regulations Enforcement Agency
OEM	Original Equipment Manufacturer
OR	Odds ratio
PPE	Personal Protective Equipment
NGO	Non-Governmental Organization
TV	Television

Abbreviation and acronyms

TVET	Technical, Vocational Education and Training
STATA	Statistical Software
UEEE	EEE which was used but is still workable and keeps its original form, or can be repaired, modified, reconditioned in order to be used for the same as the original purposes.
UNITAR	United Nations Institute for Training and Research
WEEE	Waste Electrical and Electronic Equipment



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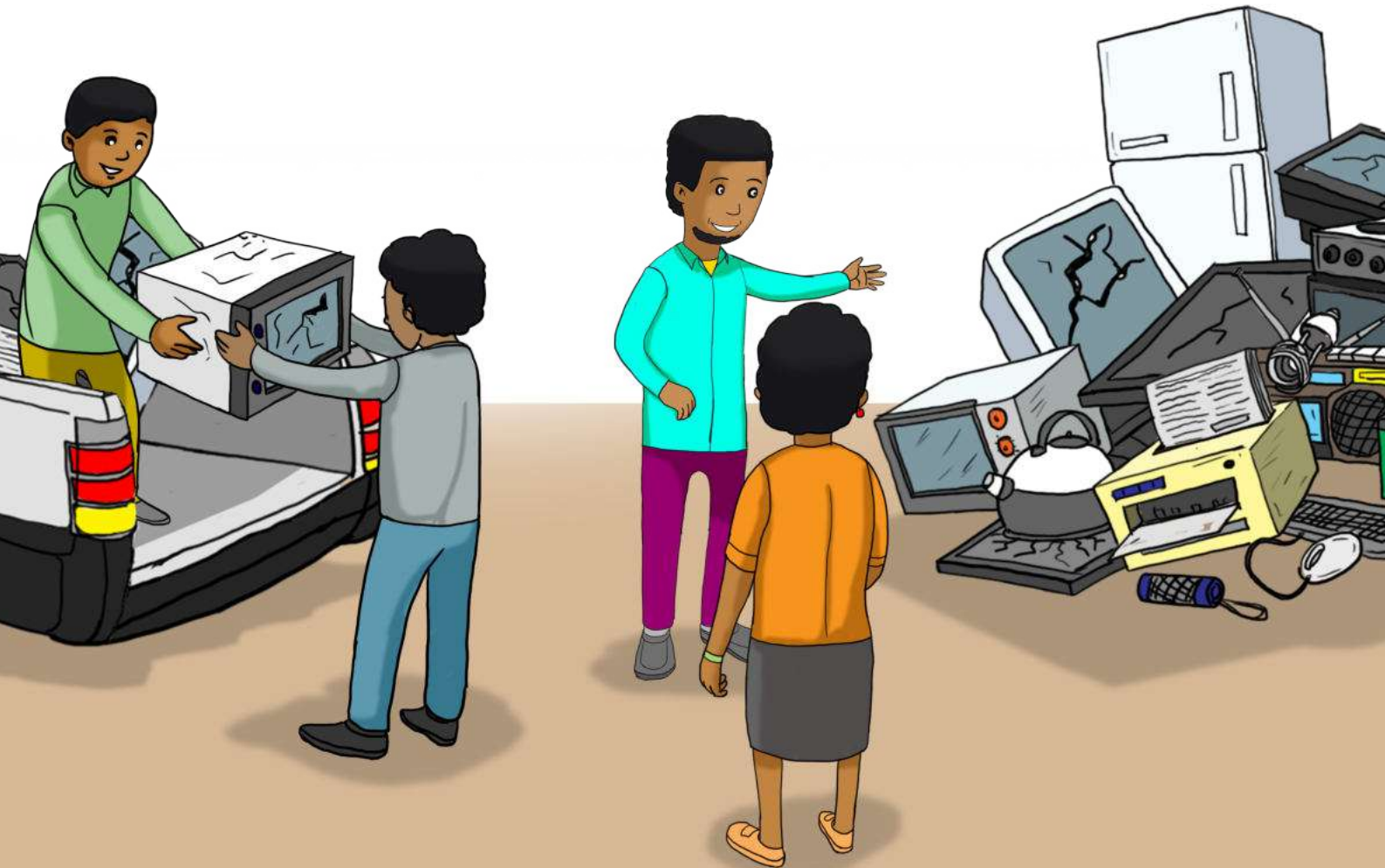
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SECTION 1:

INTRODUCTION AND PROJECT OBJECTIVES



SECTION 1:

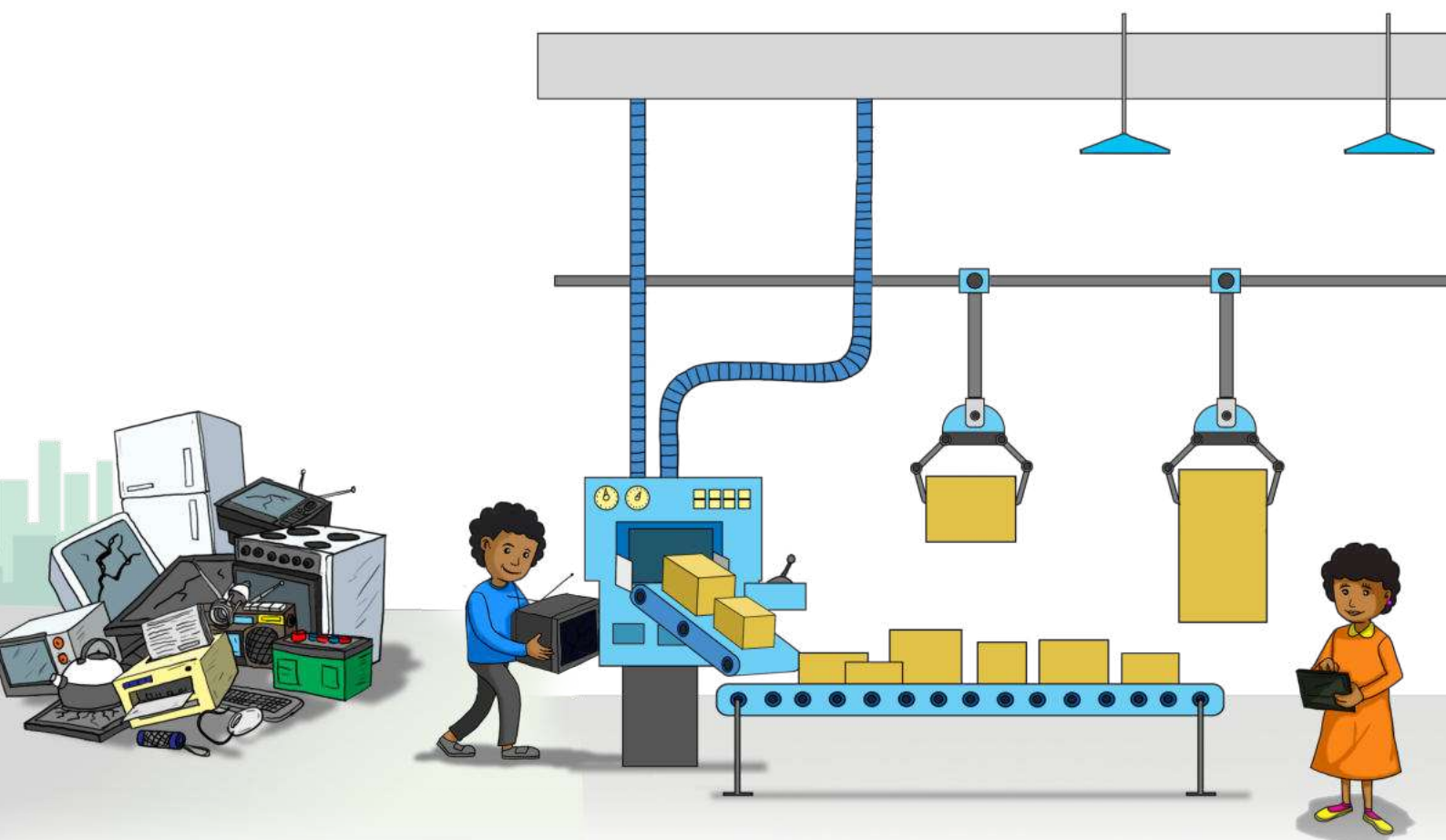
INTRODUCTION AND PROJECT OBJECTIVES

1.1 BACKGROUND

Electrical and electronic equipment (EEE) covers a broad spectrum of products used by businesses and individuals. As defined in the WEEE directive of the European Union (2002/96/EC), EEE includes equipment that is dependent on electric current or electromagnetic field in order to work properly; and includes equipment for generation, transfer, and measurement of such currents and fields. It applies to products that are designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current. The term electronic waste (e-waste) or waste electrical and electronic equipment (WEEE) refers to unwanted EEE items that are obsolete, at the end of their lives or that have been discarded by their original users.

E-waste is a topical issue of global concern due to its high rate of generation; trans-boundary shipments to low-income countries, majority of which lack basic infrastructure for collection, storage, and recycling; and whose inappropriate management practices lead to contamination. Such crude e-waste recycling processes might expose people to a complex mixture of chemicals some of whose proven toxicity and environmental effects are not thoroughly investigated yet; they could also lead to the loss of valuable raw materials (e.g. gold).

While countries are still striving to identify and implement the most effective and efficient solutions to managing the e-waste generated by their businesses and households, the generation rate is increasing. E-waste is described as one of the constantly expanding streams of solid waste. Unfortunately, many nations, including Nigeria, lack the infrastructure for collection and environmentally sound management (ESM).



In a recent study, the Global E-waste Monitor for 2020, the United Nations University reported that only 17% of the 53.6 million metric tons (Mt) of e-waste produced in 2019 was formally collected and recycled using ESM (Forti et al., 2020).

In a recent study, the Global E-waste Monitor for 2020, the United Nations University reported that only 17% of the 53.6 million metric tons (Mt) of e-waste produced in 2019 was formally collected and recycled using ESM (Forti et al., 2020). In most cases, when e-waste is not recycled or disposed in an ESM, it usually ends up in landfills or find its way into the hands of the informal recyclers who employ highly polluting techniques which pose high risks to human health and the environment.

Concerted effort is required to address the growing e-waste challenge in Nigeria, where the e-waste generation rate is on the rise and adequate collection and recycling infrastructure is lacking (Nnorom and Odeyingbo, 2020). The Global e-waste Monitor for 2020 ranked Nigeria as one of the top three African countries with the highest e-waste generation rate of 0.22 Mt/year (and recycling rate of 0.4 %) (Forti et al., 2020). The "Person in Port" project confirmed that large quantities of UEE are imported into Nigeria annually, estimated at 60,000 tons (Odeyingbo et al., 2017).

The low recycling rate recorded is obviously due to the fact that much of the e-waste is channeled through crude undocumented routes. There is, therefore, a compelling reason to consciously transition e-waste management practices in Nigeria through a documented, formal, less polluting, and resource-recovery optimizing approach.

The Nigerian Government has primed itself to combat the challenge by developing a legislative framework to address the entire life cycle of EEE. This includes the development of the National Environmental (Electrical/Electronics) Regulation S.I. No 79, (of 2022) and the Guidance Document for the Electrical and Electronics sector in line with Circular Economy (CE) Approaches. These legislative tools highlight acceptable practices in the production, assembly, and end-of-life management of EEE. They present the Extended Producer Responsibility (EPR) programme as the self-sustaining financial instrument to achieve ESM of e-waste in the country. They also define the responsibility of each of the stakeholders in the value chain. The Guidance document especially highlights the roadmap for the implementation of the programme, defining priority e-waste categories, areas to be covered, and targets to be taken back within a defined period.

E-waste Producer Responsibility Organization of Nigeria (EPRON) in fulfilling her mission of ensuring environmentally sound management of e-waste through CE approaches; and is striving to meet set EPR obligations. EPRON sought to understand consumer behaviour patterns across the country through this study, which was necessitated by the belief that consumers are critical actors who can greatly influence the outcome of any CE programme. It therefore peered into consumers' EEE interactions across its entire life cycle; namely, purchase, use, and management at end-of-life (EoL). This is to enable the development of appropriate interventions that will facilitate quick transition to formal e-waste management in Nigeria.

This study is the first element of the EPRON-IHS WEEE TRANSFORM project, an initiative developed to institutionalise formal e-waste management practices across the country starting with selected States, representative of the six geopolitical zones of Nigeria (Lagos, Kano, Abia, Rivers, Ogun, Adamawa, and the FCT, Abuja). It consists of this study; the development of a national training manual for operators of e-waste collection centres, the training of the operators of the collection centres and presentation of collection receptacles for e-waste storage within the collection centres.

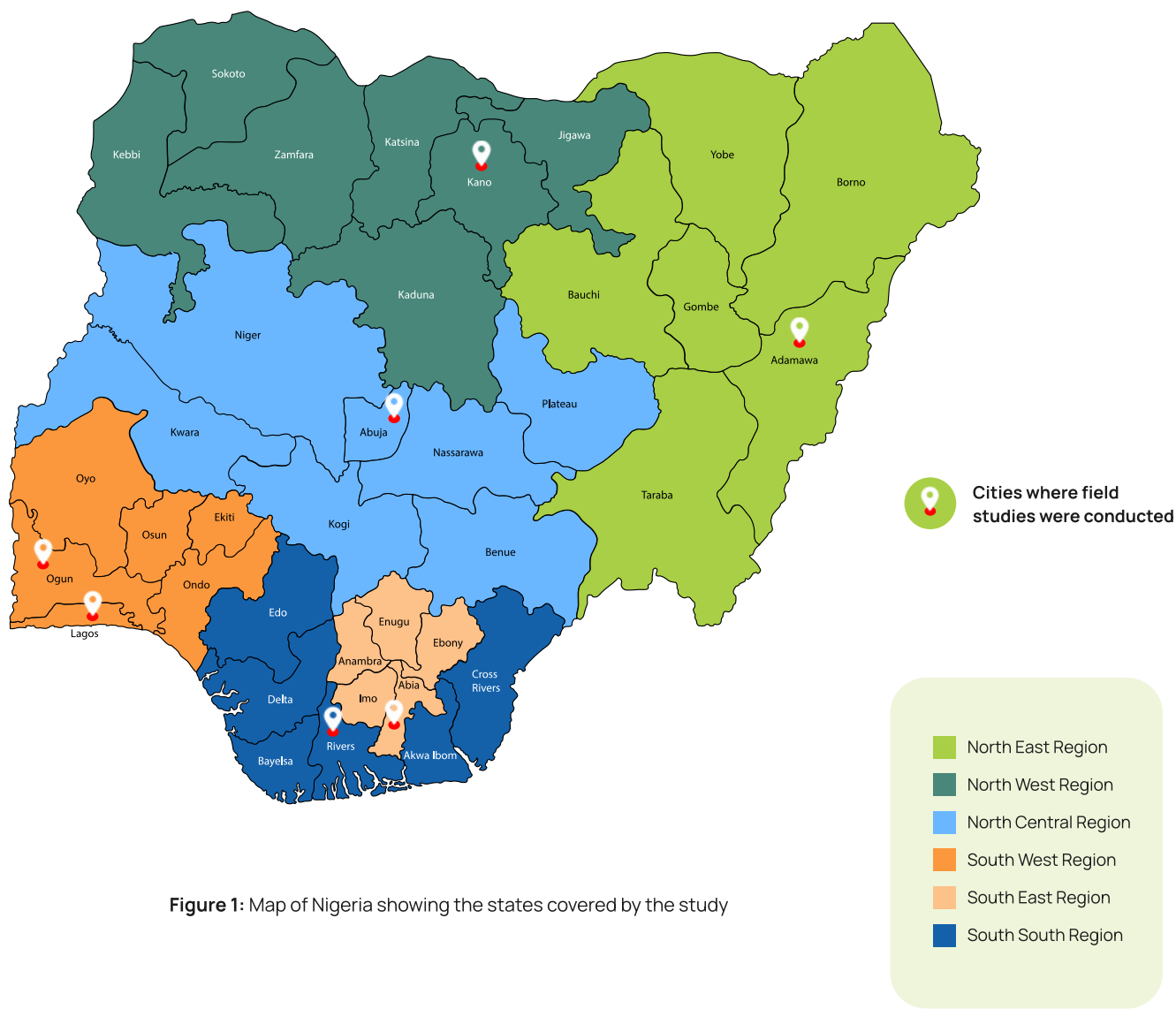


Figure 1: Map of Nigeria showing the states covered by the study

1.2 STUDY OBJECTIVES

The overarching purpose of this study was to gain a better understanding of consumers' behaviour towards the CE in the EEE sector. It sought to determine baseline consumer practices when EEE are faulty as well as when they are completely dysfunctional (giving it to registered e-waste recyclers, burning, selling to scavengers, throwing in the dump, keeping it in storage, etc.) and why they practise what they do: namely for burden of responsibility, fear of sanctions, ease of disposal, fear of data theft, etc. The main objectives of the study were:

1. to measure the level of Organization of CE approaches (e.g. sharing, repair and re-use of EEE and the attendant barriers) amongst consumers and how this influenced consumer EEE purchasing decisions and e-waste disposal attitude;
2. to survey consumer behaviour in relation to EEE purchase, use, stocks and disposal at end of life and the level of consumer Organization of the negative impacts of e-waste (potential hazards to health and environment) and regulations governing them;
3. to identify e-waste generation patterns for different e-waste types/categories and the current e-waste disposal methods and management practices that the Consumers were familiar with and practice;
4. to understand current practices regarding e-waste disposal at the different life stages across different stakeholders as well as to understand the motivation and barriers to proper e-waste disposal;
5. to identify convenient and viable methods of e-waste collection approaches preferred by the consumers and the willingness of consumers to adopt various formal e-waste take-back options; and
6. to develop predictive models to explain observations of this study.

1.3 STUDY SCOPE

Study Boundary

Randomly selected States representing each of the six geopolitical zones of the Nigeria were selected. Lagos State being the major e-waste hub in the country was also included in the study. (Table 1). The study directly targeted consumers and other critical stakeholders in the e-waste value chain.

Table 1: Six geopolitical zones of Nigeria and the participating states

S/N	Zone	Constituent States
1	North West	Jigawa, Kaduna, Kano , Katsina, Kebbi, Sokoto, Zamfara
2	North East	Adamawa , Bauchi, Borno, Gombe, Taraba, Yobe
3	North Central	Benue, Kogi, Kwara, Nassarawa, Niger, Plateau, [FCT]
4	South West	Ekiti, Lagos , Ogun , Ondo, Osun, Oyo
5	South East	Abia , Anambra, Ebonyi, Enugu, Imo
6	South-South	Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo, Rivers
7	Federal Capital Territory	Abuja.

The targeted stakeholders included:

- Consumers (individual and corporate consumers/businesses with varying income levels;
- Producers (representatives of producers, importers, and companies engaged in the assembling of imported completely knocked down (CKD) parts);
- Collectors (formal and informal) including those engaged in pre-processing; and
- Recyclers.

■ 1.4 PRODUCT SCOPE

The emphasis of the study was on all imported EEE (new and used EEE) sold and bought in the country by all sectors of the population. Emphasis was not placed on any particular category or type of e-waste. However, some EEE types were used to cite examples in the study tools as all EEE products could not be listed in the questionnaires.

SECTION 2:

METHODOLOGY AND APPROACH TO THE STUDY



SECTION 2:

METHODOLOGY AND APPROACH TO THE STUDY

The research was interested in computing statistical significance of inferences and convincing interpretations of the concept of CE in relation to EEE in Nigeria. In that regard, qualitative and quantitative study approaches were adopted to conduct the study. The data sources were: primary data from surveys and secondary data from literature review. The result acts as a foundational research (a baseline study) upon which further communication driving knowledge and behavioural change can be built and measured. It will also spur different stakeholders to action.

2.1 STUDY APPROACH

The study adopted the following approaches to obtain information:

- A desk study was carried out to review related topics in literature to address the objectives indicated in the study. The literature enabled the design of the survey tools (questionnaire) and preparation of the in-depth interview (IDI) guides for major stakeholders, including the e-waste generators (corporate organizations) and regulators/enforcement agency staff members.
- Consultations were made with key officials of the regulatory bodies with responsibility for environmental issues, waste management, the National Environmental Standard and Regulations Enforcement Agency (NESREA), Abia State Ministry of Environment, Lagos State Environmental Protection Agency (LASEPA), Lagos State Waste Management Authority (LAWMA), Kano State Ministry of Environment, Adamawa State Ministry of Environment, and Rivers State Ministry of Environment.
- Stakeholders for the study were also identified and invited to participate in the project.

2.2 STUDY TOOLS/QUESTIONNAIRES

Choosing the right survey tools is very critical to the outcome of any study. It simplifies and optimizes the data collection process. This section of the report, therefore, highlights the type of tools that were used for data gathering from the respondents.

Programmed Questionnaires

To facilitate data collection and management, this study utilized online programming tools. The questionnaires and IDI guides created for this study were administered using KoboCollect and Microsoft Office Form, respectively. KoboCollect was used to administer the two separate surveys that were developed for the consumers and the collectors (Appendix 1 and 2). The IDI guide (Appendix 3) was integrated into Microsoft Office Form and used to elicit the opinion of various stakeholders, namely: producers of new and used EEE, corporate consumers, and environmental regulatory agencies.

The KoboCollect was preferred because it was easy to administer using a smart device and, therefore, saved the huge printing costs that would have been incurred across the States given the length of the questionnaires. It also allowed for some level of remote monitoring of the data collection process to enable prompt feedback, thus improving the quality of the data collected. It allowed for data to be stored off-line until participants would have access to data.

Structured questions for Stakeholders

The questionnaire developed and used by ITU¹ to assess e-waste management practices in different countries, which focuses on policy, legislation, initiatives, and stakeholders' involvement ('[Questionnaire of the Supplement on Best Practices on E-waste Management](#)') was consulted to develop the IDI used in this study, and some questions were adapted.

¹Questionnaire of the Supplement on Best Practices on E-waste management (itu.int)

The IDI guide was integrated into Microsoft Office Form and used to elicit the opinion of various stakeholders, namely: producers of new and used EEE, corporate consumers, and environmental regulatory agencies (see Appendix 3).

2.3 FIELD STUDIES

To ensure an effective data gathering process, one supervisor was assigned to each of the participating States. Working with each of these supervisors were ten enumerators who administered the survey tools in the respective States. The supervisors were collectively trained to get a very good understanding of the KoboCollect toolbox, and the research questions. Subsequently, each of the supervisors trained the enumerators in their respective States before the field work commenced. The supervisors helped each of the participants to download the app and familiarize themselves with all the questions before the administration of the tools commenced. The study was conducted through physical visits to the consumers for the administration of the electronic questionnaires and interviews. The States studied and the LGAs/municipalities that were covered are presented in Table 2. Three LGAs were selected from each of the three senatorial zones across the States. For the Federal Capital Territory (Abuja), three area councils were selected for the study. Four communities each were selected in each of the selected LGAs/municipal areas. The data collection exercise was conducted over a period of eight days across the States.

Most of the individual respondents were interested and keen to be part of the study. The survey administration also provided an opportunity to create awareness on e-waste issues and CE among the respondents. A good number of the respondents expressed lack of trust in relevant authorities and accepted to participate, only after they were informed that the project was a private initiative. The organizational respondents, on the other hand, were more reticent. Many refused to respond, rescheduling appointments over and over again and eventually refusing to take the interview. Subsequently, the data generated were analysed using statistical software (STATA). From the baseline information obtained from the field studies, a practical frame work in relation to e-waste management across the country was prepared. This was subsequently used to develop predictive models to explain the observations of the study.

Table 2: LGAs and communities Selected for the Study

State	Abia	Rivers	Ogun	FCT	Adamawa	Kano	Lagos
LGA 1	UMUAHIA NORTH 1. Umuahia 2. Umuagu 3. Ohuhu 4. Umuda - Isingwu	ELEME LGA 1. Alesa 2. Aleto 3. Akpajo 4. Onne	ABEOKUTA SOUTH 1. Ibara Omida 2. Oke Efon 3. Olo Nusogo 4. Oluwo Ifa	AMAC 1. Kabusa 2. Gwarinpa 3. Gudu 4. Garki	NUMAN LGA 1. Wodi Pare, 2. Bamtato, 3. Makera, 4. Sabon Paghi	FAGGE LGA 1. Fagge 2. Kurna 3. Jaba 4. Sabon Gari	LAGOS ISLAND LGA 1. Obalende 2. Ajah 3. Marina, Broad Street 4. CMS
LGA 2	ABA NORTH 1. Ogbor 2. Umuola 3. Eziana 4. Osusu	OBIO/AKPOR LGA 1. Choba 2. Woji 3. Ogbogoro 4. Rumuokwurushi	IJEBU ODE 1. Ogbogbo 2. Ilese 3. Erunwon 4. Odopotu	GWAGWALADA 1. Gwagwalada town 2. Dagiri 3. Gwako 4. Giri	MUBI SOUTH 1. Araham Kunu 2. Tsimiya 3. Lokuwa 4. Yelwa	BICHI LGA 1. Chiromawa 2. Badumei 3. Bagwai 4. Bichi Town	IKORODU LGA 1. Agric 2. Odongunyan 3. Itamaja Jede 4. Igbogbo Bayeku
LGA 3	ISIUKWUATO LGA 1. Uturu 2. Eluama 3. Ovim 4. Akara	AHOADA EAST LGA 1. Ahoadia 2. Ala-Ahoadia 3. Akinima 4. Ekpene	ADODO OTA 1. Sango-Ota 2. Iju-Ota 3. Itele 4. Owode	BWARI 1. Dutse Alhaji 2. Ushafa 3. Zuma 4. Kuchiko Bwari	YOLA NORTH 1. Bekaji 2. Malamere 3. Luggere 4. Nasarawo	WUDIL LGA 1. Dangunawa 2. Juma Danfada 3. Daki 4. Indabo	IKEJA LGA 1. Allen/Opebi 2. Ikeja Underbridge/Computer Village 3. Mangoro/Airport Road 4. Ogba

2.4 STUDY LIMITATIONS AND CONSTRAINTS

As it is the case with similar studies, the study is fraught with its own limitations, one of which was the unwillingness of some consumers, especially the corporate organizations, to provide the required information. Secondly, some respondents had the questions translated into their native language – such a non-standardised translation process across board has the potential to taint the survey with some personal bias. The selection of about 20% of States in the country and 3 LGAs in each of the participating States may not be representative enough of Nigeria. Some respondents demanded incentives before participation; the absence of such incentives may have affected the responses given by some respondents. Also important is the fact that most of the consumers who responded are of the low-income cadre, possibly because they were more accessible. So, findings from the study may not be so representative of the upper income class and may thus necessitate more targeted study for the middle and upper class of people.

2.5 DEMOGRAPHY OF STUDY PARTICIPANTS

The demography of the study respondents are presented in this section of the report. It includes the information on the number of respondents across the different categories as well as basic socio-economic information collected from them.

2.5.1 Demography of Consumers

Figure 2 depicts the distribution of individual consumers' participation in the survey from each of the regions. A total of 3715 consumers took part in the survey. Lagos had the most respondents (708 respondents; 19.1%) followed by Kano (17.6%). Closely following Kano was Abia State (16.3%), and Rivers State next with 14.6% of the respondents. Abuja followed with 12.6%, Ogun, 10.1%, while Adamawa had the least respondents (9.7%).

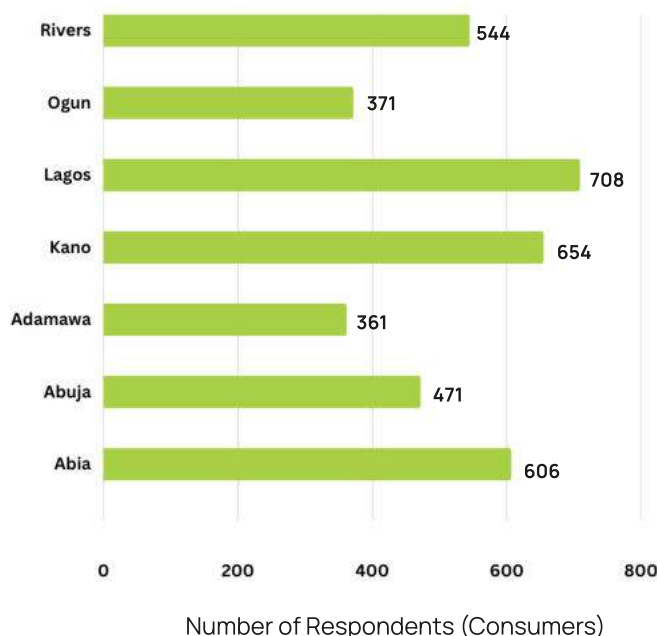


Figure 2: Distribution of respondents (consumers) according to participating states

In terms of the LGAs surveyed, Ikeja LGA in Lagos had the most (302 respondents; 8.1%), followed by Fagge in Kano State (6.7%). Abeokuta South (2.5 %) and Yola North (2.4%) which had less than 100 respondents (Figure 3).

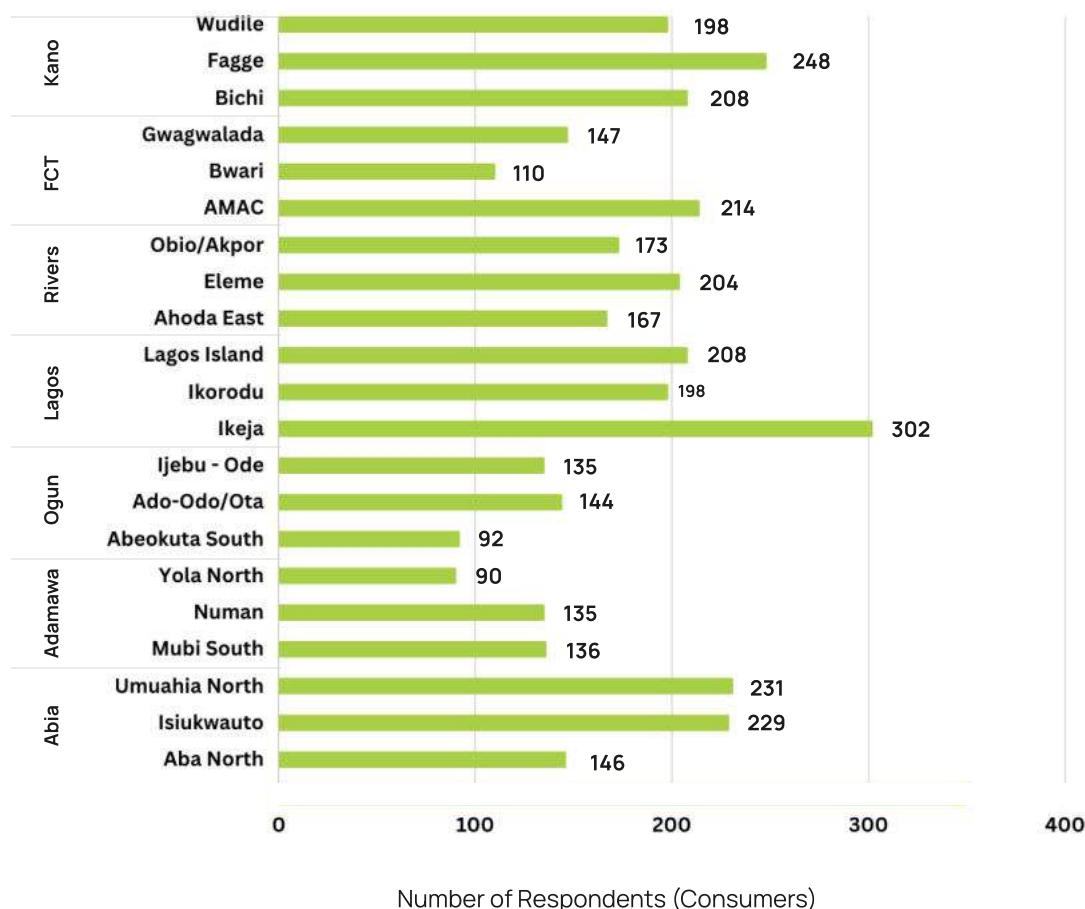


Figure 3: Distribution of respondents (consumers) according to participating LGAs in the States

Most of the consumers who participated in the survey were self-employed (70.7%); the next highest were employees working in the private sector (17.1%). Government employees were the next making up about 10.4% of the consumer respondents; 1.2% of the respondents worked with non-profit/non-governmental organizations while 0.54% worked with international agencies. The study took cognizance of the country's high unemployment rate in the survey tool developed.

The gender representation of the respondents was 56.6% male and 43.2 % female while 7 respondents (0.2%) preferred not to disclose their gender. The mean age of the study was 37.3 ± 11.0 (mean±standard deviation; also, elsewhere in this report). The age bracket of most of the respondents (85%) ranged from 18 to 49 years, followed by 30-39 years (37.3 %), 18-29 years (25 %), 40-49 years (22.9 %), and 50 -59 years (10.4 %). Respondents older than 60 years were the least, only 4.5 % of the study population. Most of the respondents were married (65%) followed by those single (30 %). Few were divorced (1 %) or widowed (3 %) while about 1 %) preferred not to disclose their marital status. The mean family size across the study population was 5.5 ± 3.7 . The family size varied widely, but most were between 1 – 5 (62 %). The study also encountered some large households. Families with 6-10 members made up 32% of the consumers surveyed while those above 11 members constituted 6%.

Approximately 44% of the consumers earned less than N30,000 per month², which is less than the national minimum wage. This could indicate that this huge population was most likely unemployed. Approximately 33% of the respondents earned between N30,000 and N60,000 monthly, 10% between N60,000 and N90,000 monthly, and 5.7% between N90,000 and N120,000 monthly. Only about 8.2% earned more than N120, 000 per month.

²Exchange rate: 1\$= N758.78 (as at 27 June, 2023) Central Bank of Nigeria | Exchange Rate (cbn.gov.ng)

2.5.2 Demography of Collectors

The collector questionnaire was administered to 495 respondents. Lagos had the highest number of respondents (21.6%) while Adamawa State had the least (8.5%) (Figure 4).

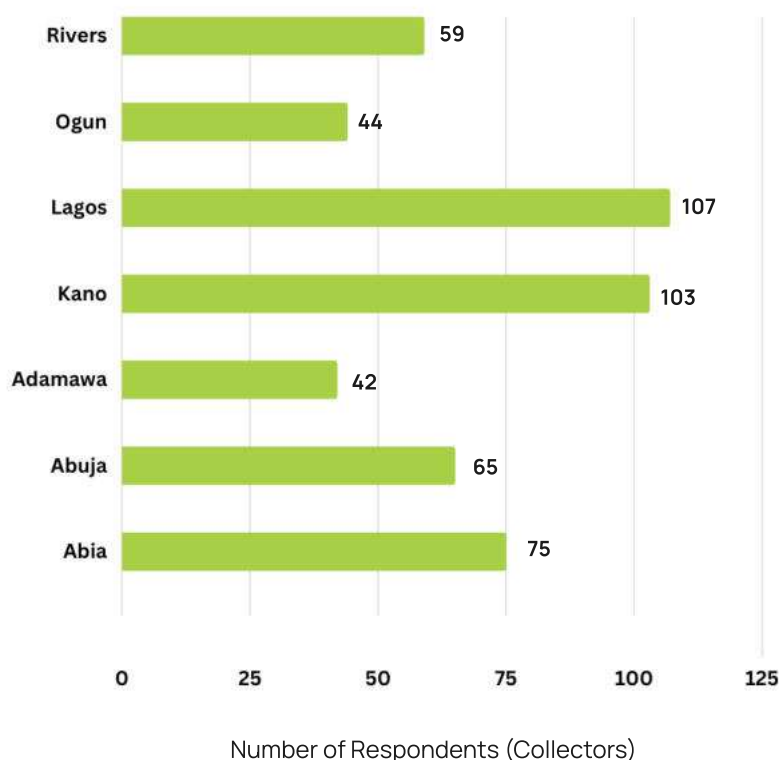


Figure 4: Representation of Collectors across the Participating States

The respondents were mostly self-employed (78.0%) while 15.4% worked for a collection centre and 4.9% served as agents to recycling facilities. The respondents were mostly male (96.8%); only 3.2% were female. The e-waste collection is male-dominated compared to the demography of the consumers surveyed. The mean age of the respondents was 33.2±9.2 (mean ± standard deviation). Out of the 495 collectors who participated, 38.6% were within the ages of 18 and 29 years; 37.4% were between 30-39 years; 17.8% were between 40-49 years; 5.3% between 50-59 years whereas only 1.0% were found to be 60 years and above.

Most of the collectors were married (59.4%) while 39.4% were single; 0.4% divorced, 0.2% widowed while 0.6% preferred not to disclose their marital status. This study shows that there is a wide variation in the family sizes of the collectors. Most collectors had between 1 – 5 family members (56.4%) while 37.2% had between 6 – 10 family members. About 6.5% of the collectors had large households of 11 and above. Two collectors in Ogun State, 20 in Kano, four in Adamawa, one in Abuja, and five in Abia reported having 11 family members and above. The average family size of the collectors was 5.6±3.8 (Table 3). The e-waste/scrap metal collection business across the country is significantly dominated by migrant workers from the Northern States of Nigeria.

Table 3: Summary of family size and monthly income of collectors according to State of operation

State	Variable	Observation	Mean	Std.Dev	Min	Max
Abia	Family Size	75	6.3	5.4	1	40
	Monthly Income	75	63747	69766	4000	500000
Abuja	Family Size	65	5.4	2.5	1	14
	Monthly Income	65	63169	127340	0	1000000
Adamawa	Family Size	42	6.1	2.6	1	13
	Monthly Income	42	40286	24782	10000	100000
Kano	Family Size	103	7.9	4.9	2	25
	Monthly Income	103	36413	48449	5000	400000
Lagos	Family Size	107	4	2.0	1	10
	Monthly Income	107	72140	77721	8000	700000
Ogun	Family Size	44	4.2	2.6	1	12
	Monthly Income	44	53466	50029	5000	200000
Rivers	Family Size	59	4.5	2.0	1	10
	Monthly Income	59	46610	30191	7000	200000

The study observed that 44.2% of the collectors earned below the monthly national minimum wage, that is, less than N30,000 while 31.3% earned between N30,000 and N60,000 monthly (Table 3). About 10.7% of the collectors earned between N60,000 and N90,000 while 7.7% earned between N90,000 and N120,000. About 6.1% indicated that they earned above N120,000 (Figure 5). In summary, the collectors had an average monthly income of N54,851±71900. In all the participating States, the order of income is as presented in Figure 5 (with most collectors earning ≤N30,000 and decreasing in that order) except in Lagos State. In Lagos State, 38.3% of the collectors reported earning between N30,001 – N60,000 while 24.3% reported earning ≤N30,000. Collectors in Lagos earned more than collectors in the other participating States. In Rivers State, 40.7% of the collectors reported earning ≤N30,000 while 39% earned between N30,001 – N60,000.

A few of the collectors, however, stood out with monthly earnings exceeding N100,000 which is much more than the usual ranges in their respective States. A collector in Kano State reported earning N400,000, one in Abia State reported earning N500,000; an earning of about N700,000 was reported in Lagos State. In Abuja, two of the respondents fell within this category, with one reporting a monthly income of N300,000, and the other reported a monthly income of N100,000. Given that about 44% of the consumers reported earning less than N30,000 per month, it is evident that e-waste scrap collectors make more, considering their average monthly income of N54,850.

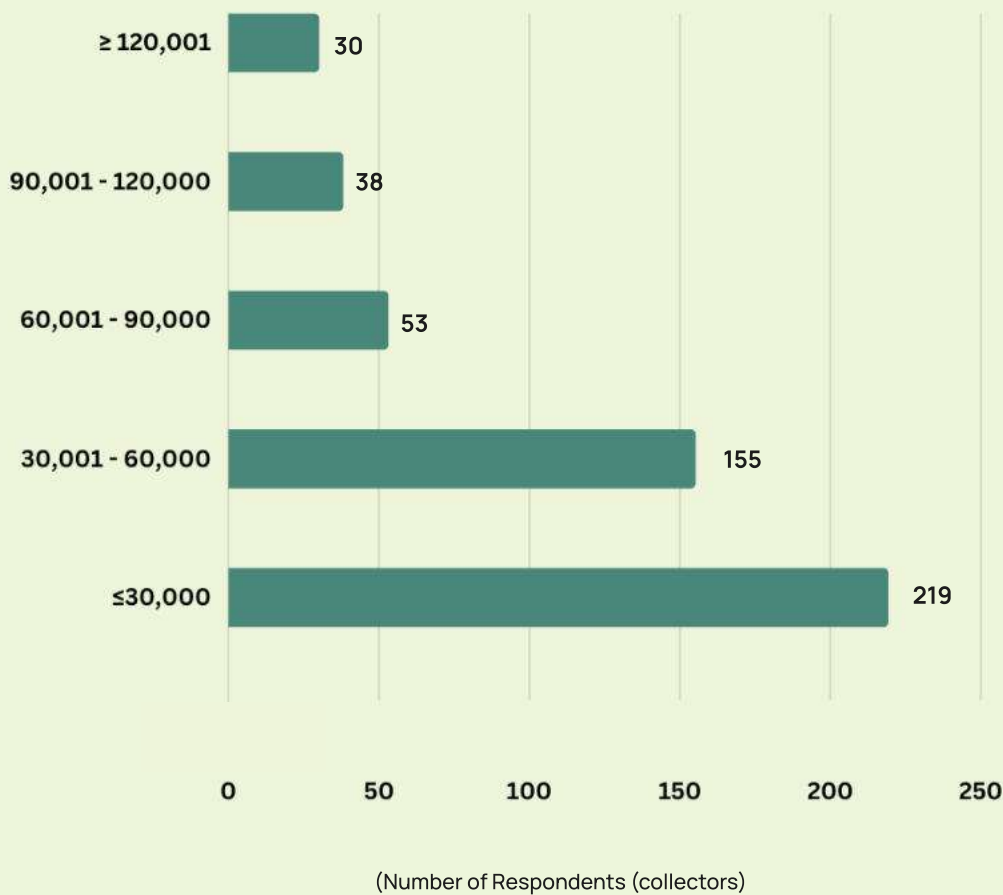


Figure 5: Monthly income distribution of the respondents (collectors).

2.5.3 Demography of the Respondents Representing Corporate Organization

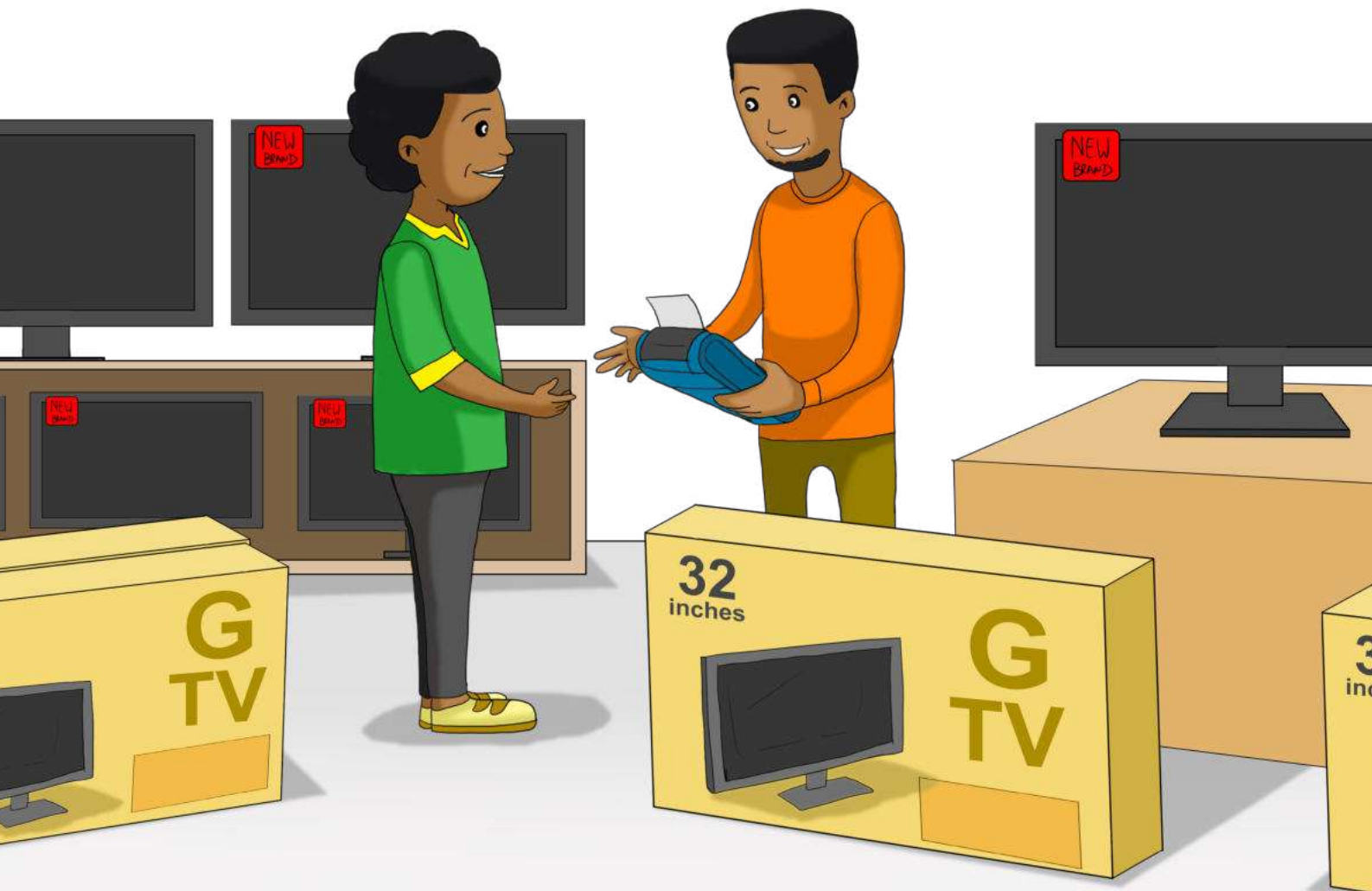
A total of 126 people representing different organizations responded to the IDI: 21 in Ogun State, 20 in Rivers State, 19 in Abia, Abuja, Adamawa, and Kano States, and nine in Lagos. Approximately 69% of the respondents identified as male, while the remaining 31% indicated female. The majority of respondents worked in the EEE sector (import/assembly, for example) and the corporate business sector (Figure 6).



Figure 6: Respondents' organizations

SECTION 3:

CONSUMERS' BEHAVIOUR



SECTION 3:

CONSUMER BEHAVIOUR

3.1 CONSUMERS' AWARENESS OF CIRCULAR ECONOMY

The study found that 28% of the respondents were familiar with CE, whereas the majority of them (72%) were not. The respondents' State of residence and monthly income were cross-tabulated with their awareness of the term "circular economy." Presented in Table 4 are the results of the Chi-square statistical analysis, which reveals that there is an association between respondents' State of residence and their awareness of the term CE, but no association between monthly income and awareness of the term CE ($p < 0.05$).

Table 4: Association between Consumers' State of residence and their Awareness of CE

Variable	Familiar with Circular Economy		X ²	df	p- value	
State of residence	No n (%)	Yes n (%)	Total n (%)			
Abia	413 (68.2)	193 (31.8)	606 (100)	16.95	6	0.00
Abuja	334 (70.9)	137 (29.1)	471 (100)			
Adamawa	285 (78.9)	76 (21.1)	361 (100)			
Kano	482 (73.7)	172 (26.3)	654 (100)			
Lagos	511 (72.2)	197 (27.8)	708 (100)			
Ogun	258 (69.5)	113 (30.5)	371 (100)			
Rivers	405 (74.5)	139 (25.5)	544 (100)			
Monthly Income						
≤30,000	1183 (73.2)	433 (26.8)	1616 (100)	8.65	4	0.07
30,001 - 60,000	884 (72.2)	340 (27.8)	1224 (100)			
60,001 - 90,000	265 (73.8)	94 (26.2)	359 (100)			
90,001- 120,000	134 (63.8)	76 (36.2)	210 (100)			
>120,000	222 (72.5)	84 (27.5)	306 (100)			

When further subjected to logistic regression, respondents living in Abia State were 1.2 times more likely to have heard about CE than those living in Lagos State (OR 1.2, 95% CI: 0.96 – 1.54) while those living in Kano State were 0.93 times more likely to have heard about CE than those living in Lagos State (OR 0.93, 95% CI: 0.73 – 1.17) (details on Table 5).

Table 5: Relationship between State of residence and familiarisation with CE

Variable	p-value	OR (95% CI)
State (Lagos as indicator)		
Abia	0.11	1.20 (0.96 – 1.54)
Abuja	0.64	1.06 (0.82 – 1.38)
Adamawa	0.02	0.69 (0.51 – 0.94)
Kano	0.53	0.93 (0.73 – 1.17)
Ogun	0.36	1.14 (0.86 – 1.49)
Rivers	0.37	0.89 (0.69 – 1.15)

The adjusted prediction of the awareness of the term CE across the States of residence is represented in Table 6. This depicts that the probability of an individual residing in Lagos, Adamawa, and Rivers State to be aware of CE are 0.28, 0.21, and 0.26, respectively (Table 6).

Table 6: Probability that a consumer residing in a given State is aware of CE

State	Probability	95% CI
Abia	0.32	0.28 – 0.36
Abuja	0.29	0.25 – 0.33
Adamawa	0.21	0.17 – 0.25
Kano	0.26	0.23 – 0.29
Lagos	0.28	0.25 – 0.31
Ogun	0.30	0.26 – 0.35
Rivers	0.26	0.22 – 0.29

Figure 7 shows that only 150 of the 1027 respondents (14.6%) who were familiar with CE reflected a very good understanding of the term. Majority of the respondents (49.2%) had an average understanding of CE while 36.2% reflected very little understanding of the term. To gauge understanding of CE, respondents were given four options, separately, to identify terms synonymous with CE. About 33.3% of respondents thought that reduced waste generation was synonymous with CE. Another 42.3% thought that CE was synonymous with recycling. Furthermore, 11.4% of the consumers related CE to green economy. Also, 7.8% of the respondents associated quality electronics with CE (Figure 8).

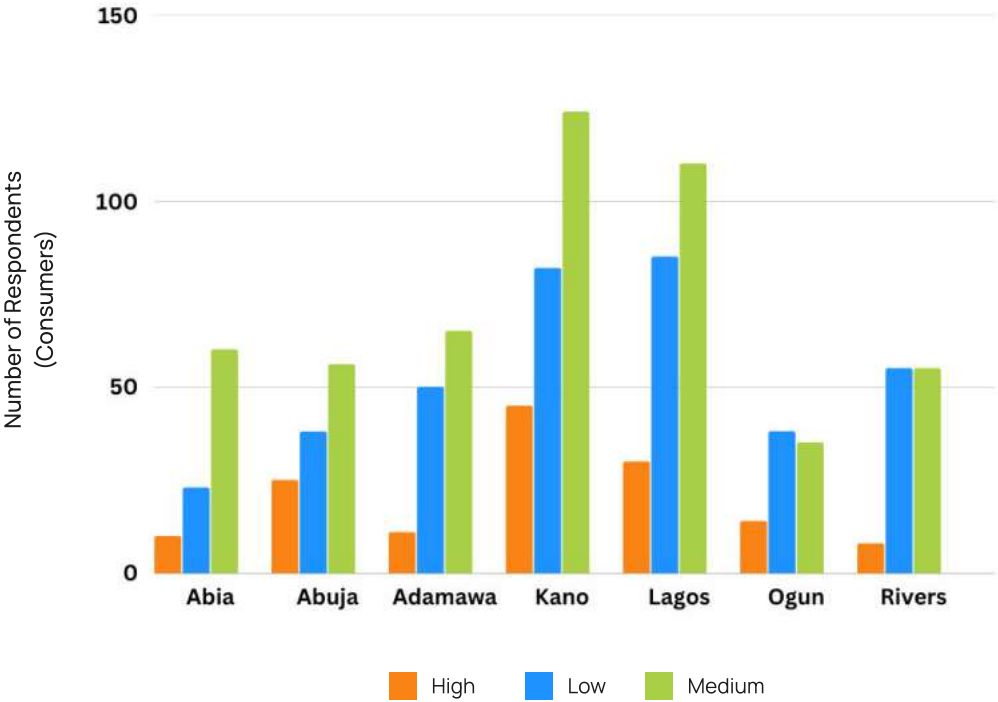


Figure 7: Level of consumer awareness of CE across the States of residence

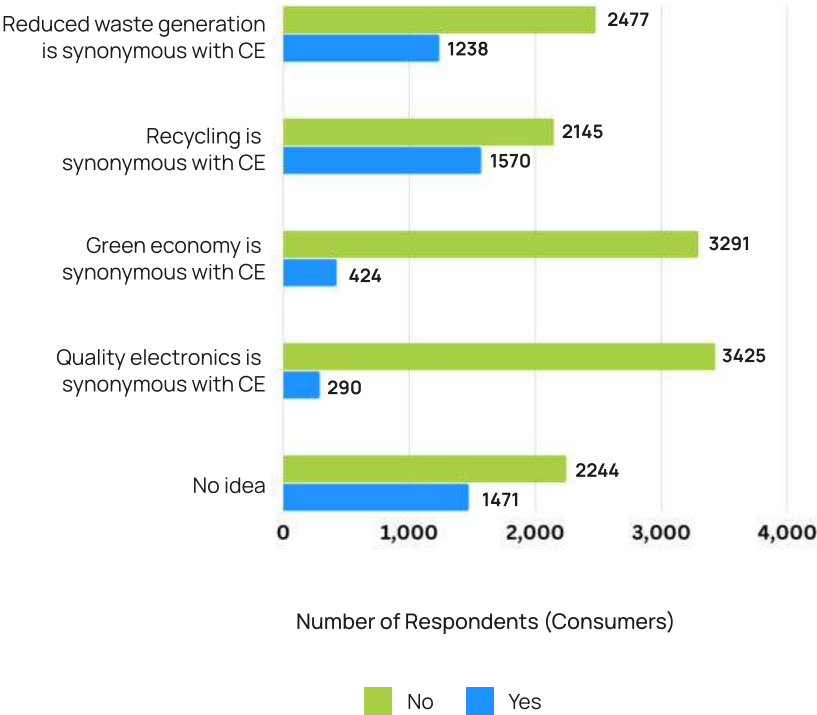


Figure 8: Consumers Expression of their Understanding of CE

When investigating the level of understanding of repair and reuse as a practice of CE, about 59.3% of consumers expressed that repairing and reusing old malfunctional electronics could save energy (and reduce waste generation). About 38% of the respondents indicated that their understanding of circular economy affected their purchasing decisions for EEE (Figure 9). It was also interesting to see that their awareness and understanding of circular economy also influenced their e-waste disposal attitude as this was true of 44.8% of the consumers surveyed (Figure 9).

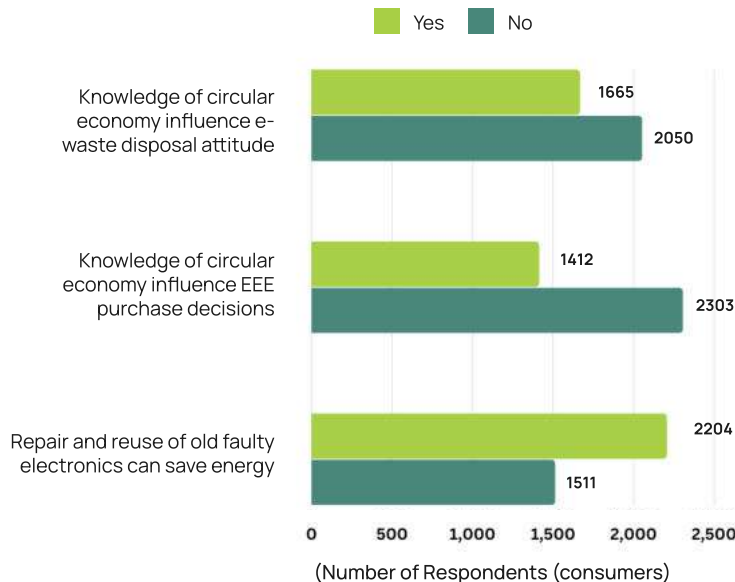


Figure 9: Influence of Awareness of CE on EEE purchase and e-waste disposal attitude

3.2 AWARENESS OF E-WASTE ISSUES (NEGATIVE IMPACTS OF E-WASTE AND EXISTING REGULATIONS)

About 74% of the consumers indicated that they were unaware of existing regulations governing e-waste management and related policies. Only about 28% of them were aware of the ban on the importation of used CRT screens, the outstanding 72% were not aware of the ban. Similarly, only about 36% of consumers were unaware of the ban on importation of e-waste while 64% were unaware of the ban on e-waste. Respondents who earned between N90,001- N120,000 monthly were 1.48 times more likely to be aware of Nigeria's e-waste collection and management law than those who earned $\leq$ N30,000 (Table 7).

Table 7: Relationship between monthly income and Awareness of Regulations governing E-waste in Nigeria

Variable	p-value	OR (95% CI)
Monthly income ($\leq$30,000 as indicator)		
30,001 – 60,000	0.58	1.0 (0.89 – 1.25)
60,001 – 90,000	0.99	0.99 (0.77 – 1.30)
90,001- 120,000	0.01	1.48 (1.09 – 2.02)
>120,000	0.04	1.32 (1.01 – 1.73)

The probability that an individual who earns >N120,000, between N60,001 – N90,000 and ≤N30,000 will be aware of regulations guiding e-waste collection and management are 0.30, 0.25 and 0.25, respectively. The details of the adjusted prediction of awareness of e-waste collection and management law in Nigeria in relation to consumers' monthly income are presented in Figure 10.

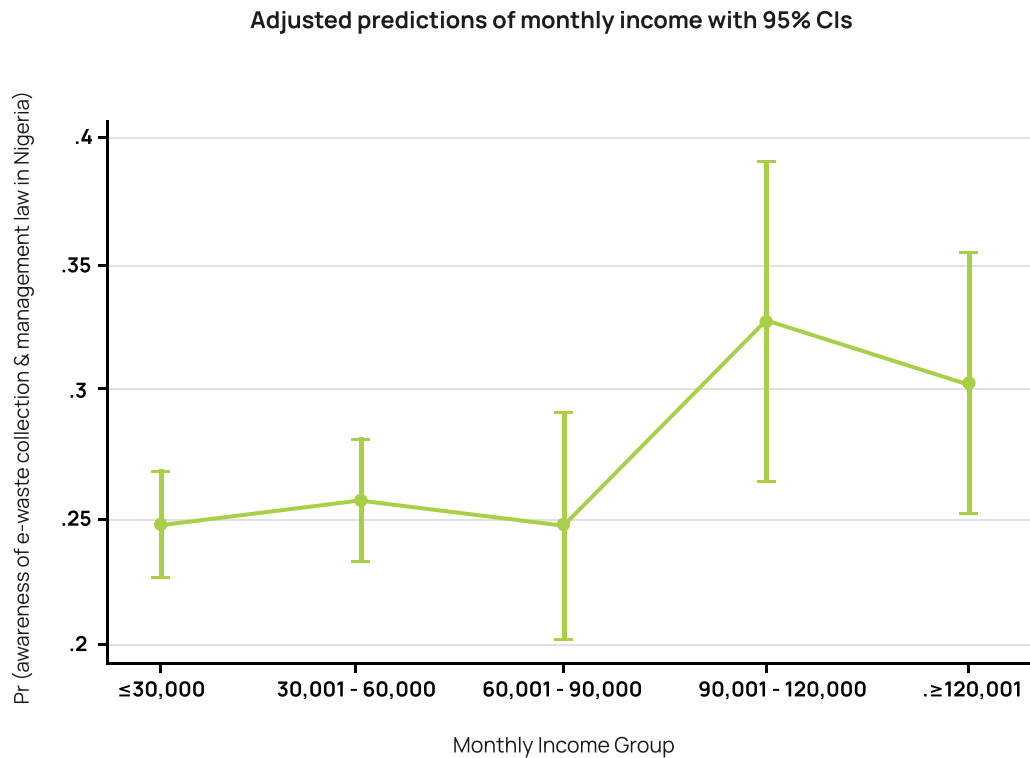


Figure 10: Prediction on Awareness of e-waste management law and monthly income

Only 10% of the consumers expressed awareness of the EPR principle. About 60.3% of the respondents who expressed awareness of EPR perceived it as a concept derived from the “polluter pays principle”. Another 30.4% considered it a global strategy to produce electronics while 9.3% stated that they had no idea.

About 90.6 % of respondents were not aware that there is an EPR programme for EEE in Nigeria. Only 6.8% of the respondents had heard about EPRON as an organization that implements EPR for EEE in Nigeria. When considering the level of awareness of EPRON in the participating States, it was especially surprising to see that Abia State respondents exhibited the highest level of awareness of EPRON amongst the respondents. Sixty (60) of the Abia State respondents stated that they were aware of EPRON, the next highest was experienced in the FCT, Abuja with 50 respondents, and then Kano State had 45 respondents acknowledging EPRON.

The State where the respondents least expressed awareness of EPRON was Adamawa State with just 15 respondents. About 96% of the respondents were not aware of EPRON while only about 4% of consumers were aware that EPRON coordinates the implementation of EPR for EEE in Nigeria. The probability that individuals residing in Lagos, Abuja, and Kano States would be aware of EPRON are 0.05, 0.11 and 0.07, respectively. Presented in Figure 11 is the detail of the prediction of awareness of EPRON in the participating States.

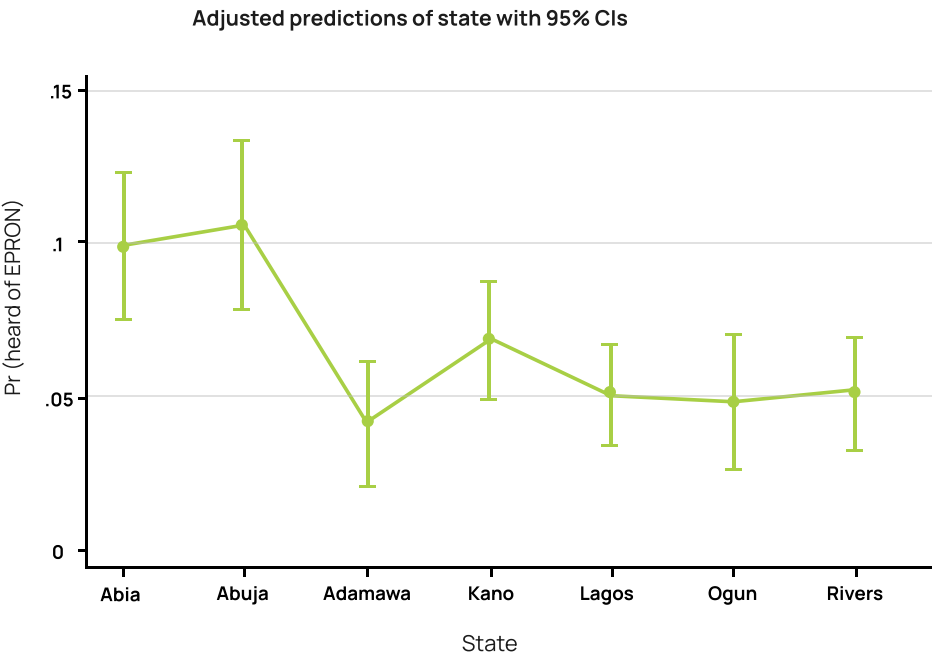


Figure 11: Prediction on awareness of EPRON in the participating states

3.3 EEE PURCHASING DECISIONS AND E-WASTE DISPOSAL ATTITUDE

Majority of the consumers expressed their preference for purchasing new EEE instead of used ones. Specifically, 76.8% preferred to buy new EEE; 12.5% to buy imported used EEE, 5.95% had purchased locally used EEE, while 2.3% said they had participated in the exchange of old for new acquisition of EEE. Presented in Figure 12 is the experience of respondents with purchasing new EEE and repairing before use. Approximately 19.8% of the respondents reported that they had had to repair a brand new EEE purchased item because it simply did not work. This surprising phenomenon revealed that new but substandard EEE products were available in the Nigerian market.

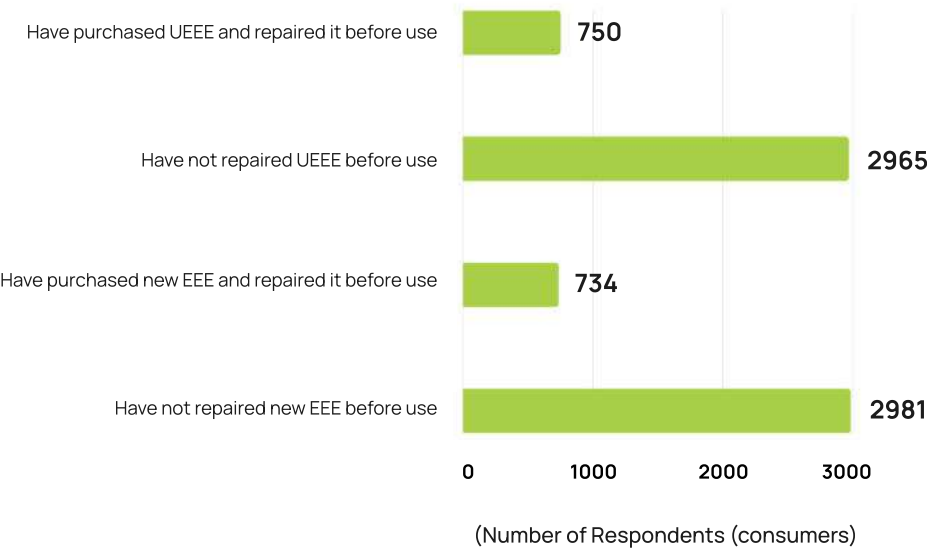


Figure 12: Consumer experience with repairing freshly purchased new EEE and imported UEEE before use.

3.4 CONSUMERS BEHAVIORS TOWARDS EEE ACQUISITION, USE, STOCKS AND DISPOSAL AT EOL

When consumers were probed on their preferred country of manufacture of EEE products, majority of the respondents preferred buying electronic gadgets made in Germany (36.8%) followed by U.S.A (20.6%) and then China (20.5%). Only 10.3% would like to buy EEE made in Nigeria while the outstanding 11.9% expressed no preference for products from any particular country.

Further investigation was conducted to determine if Consumers would be willing to pay a premium for products from selected countries. Figure 13 shows that more consumers would prefer to pay 10% premium, for EEE manufactured in selected countries because they believed that products manufactured from those countries were of superior quality. Their perception of product superiority in relation to the countries was ranked in the order of Germany > USA > China > Malaysia (Figure 13).

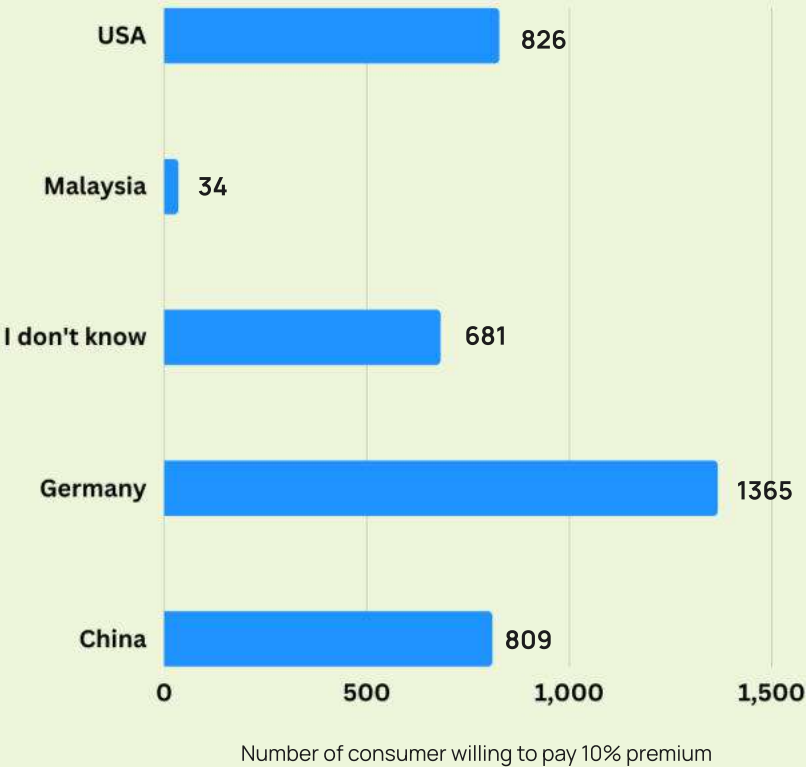
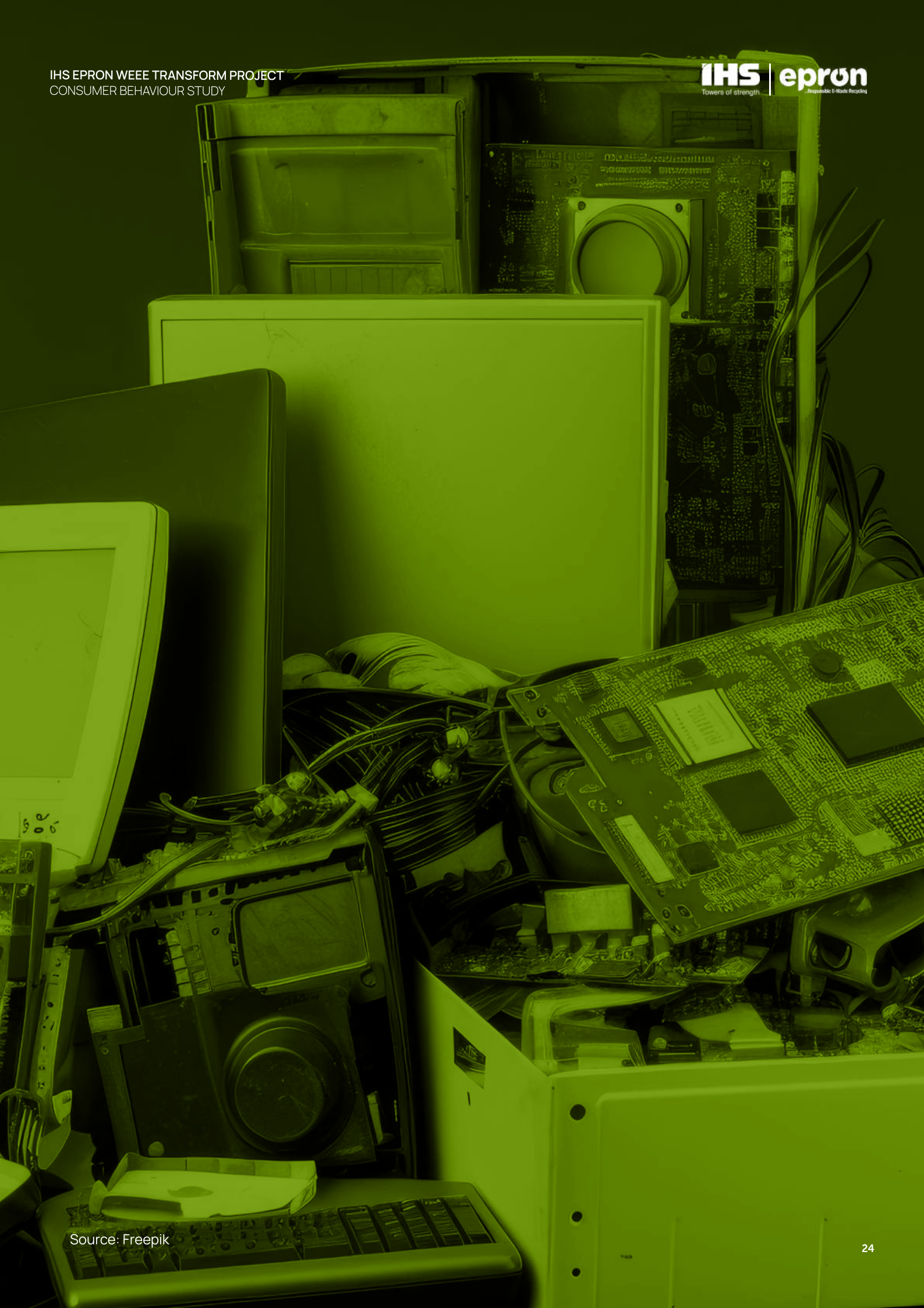


Figure 13: Willingness of Consumers to pay 10% extra for quality of EEE from selected countries



This is clearly owing to their assessment of quality EEE based on past experience. Further investigations into the possible reasons that could lead to consumers paying an extra 10% for EEE from some selected countries observed that their perceived quality and durability of EEE were the major reasons the respondents were willing to pay an extra 10% on the price of EEE (Figure 14). Consumers associated country of origin/manufacture of EEE with the durability and quality of the products.

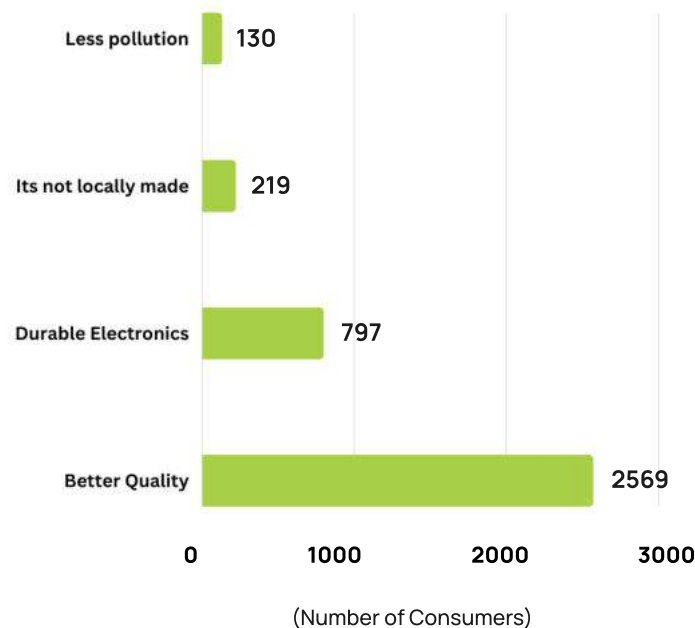


Figure 14: Reasons that consumers are willing to pay extra 10% for EEE from some selected countries

A sizeable proportion (60%) of the consumers also indicated that they were willing to pay more money for a less polluting EEE. About 87.8% of the consumers were willing to pay 10% extra; another 9.7% were willing to pay a 20% premium for less polluting products, 1.5% were willing to pay a premium of 30% while another 1.0% were willing to pay 40% more for less polluting products. The respondents' choice of television type demonstrates that the majority (98%) preferred flat screen television sets to the CRT television; thus, confirming that flat screen is the new trend.

3.5 HOUSEHOLD POSSESSION OF EEE AND E-WASTE GENERATION PATTERNS

Figure 15 depicts the distribution of EEE owned by households that participated in the study. Only about 2.2% of the respondents said that they did not have any EEE. This reveals that EEE use in Nigeria is part of day-to-day existence. When considered in relation to the population of the country this reveals that e-waste generation volume will be quite enormous.

It is also interesting to note that the five EEE items most owned by the respondents household were in the order of mobile phones > television sets > pressing irons > refrigerators > radio sets. The least owned device of all the options presented was vacuum cleaners (Figure15).

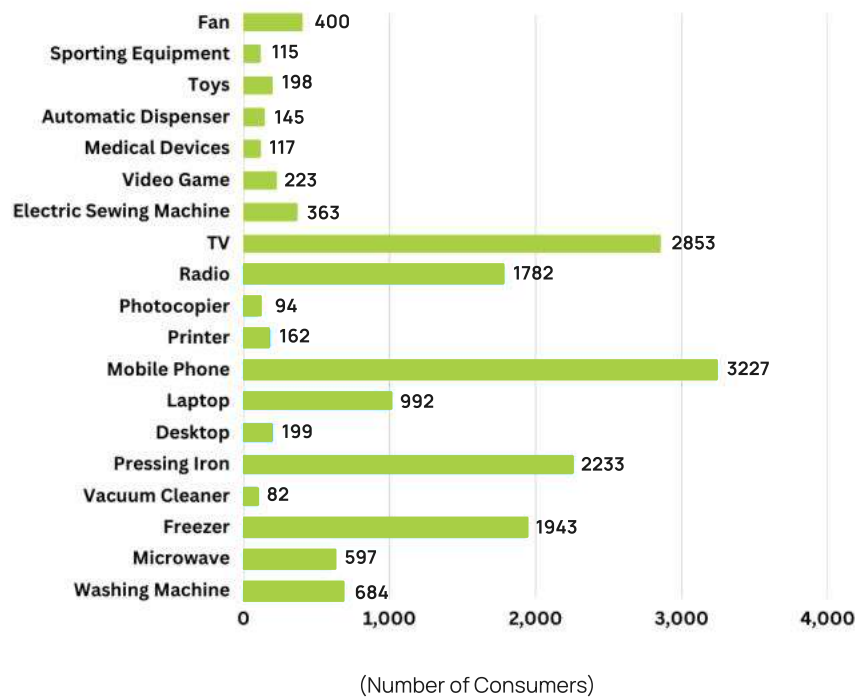


Figure 15: Household possession of EEE

The consumers' responses to the investigation of e-waste generation patterns over the past five years are presented in Figure 16. About 62% of the consumers reported that one or more of the EEE that they used had become malfunctional in the last five years (Figure 16). Of all the product options presented, the hand-held mobile phone was reported to become malfunctional more frequently than any other product (32.1% of the time), closely following this were television sets(TV) which accounted for 17.6% , pressing irons (14.3%) were next, radio sets (10.3%), and freezers (9.3%).

Incidentally this order aligns with the list of that which was mostly possessed by consumers previously presented in Figure 15. What becomes of these products was the next question to ask, and the answer is not far-fetched as 66.2% of the respondents indicated that they repaired malfunctional EEE, 13.3% (414 of the 3103 respondents) said they gave out faulty EEE, 12.4% (385 of 3103 respondents) claimed they had sold faulty products, while about 22.5% (697 of 3103 respondents) had their malfunctional EEE stored at home.

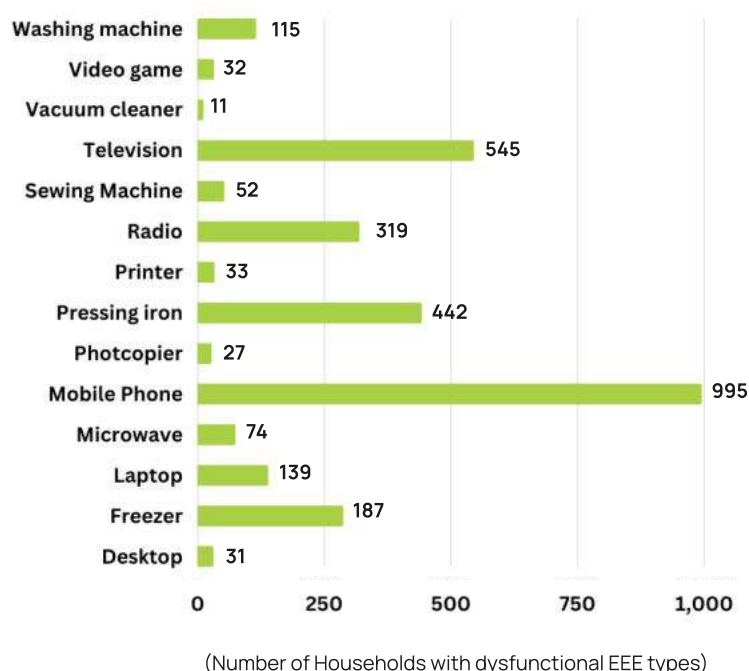


Figure 16: EEE that became malfunctional more often

Overall, 66.2% of faulty EEE were repaired by consumers. The data analysis indicated that the respondents' decision to repair their faulty equipment depended on the equipment type (at $\alpha = 0.05$). As expressed in Figure 17, the type of EEE most often repaired by the respondents were mobile phones (74.3% of 995 respondents), the next type in the hierarchy was television sets (65.1% of 545), followed by pressing irons (61.5% of 442 respondents). Others were radio sets (58.3% of 319 respondents); freezers (69.7% of 287 respondents), and laptops (64.0% of 139 respondents).

Other types of regularly repaired devices were washing machines (69.6% of 115 respondents), microwave ovens (43.2% of 74 respondents), electric sewing machines (73.1% of 52 respondents), printers (66.7% of 33 respondents), video games (37.5% of 32 respondents), desktop computers (25.8% of 31 respondents), photocopiers (63.0% of 27 respondents), and vacuum cleaner (18.2% of 11 respondents).

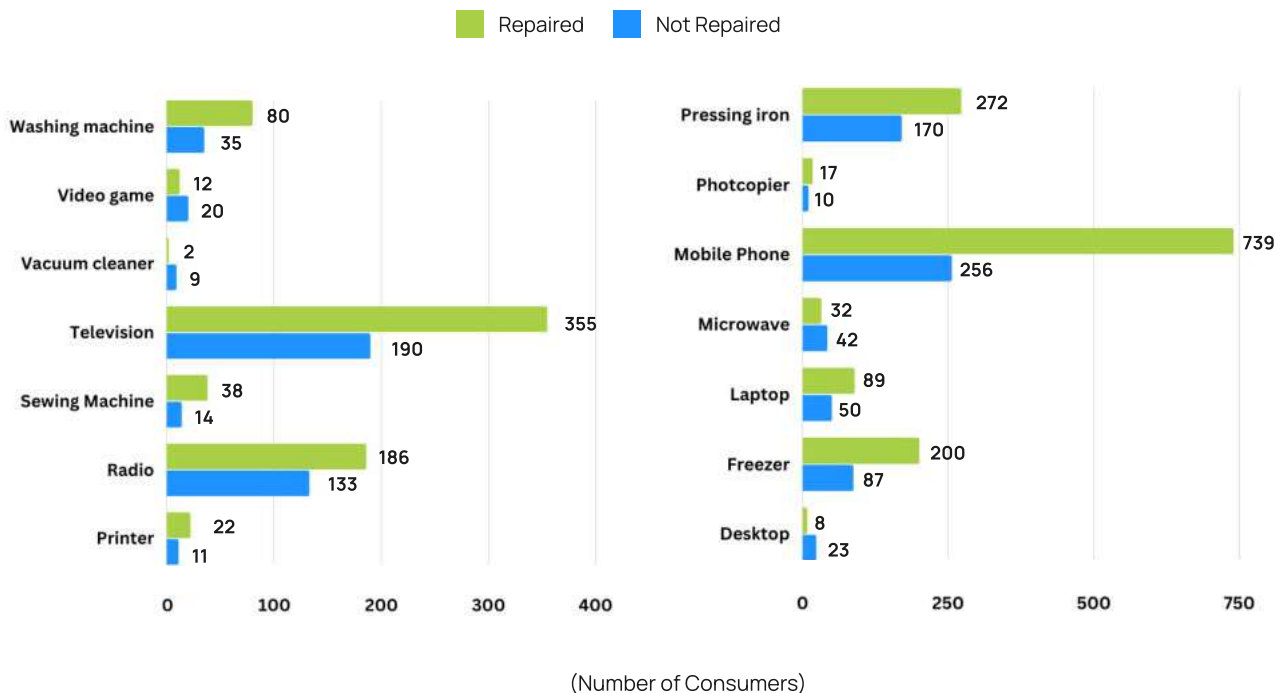


Figure 17: EEE types repaired more often by consumers

Presented in Table 8 is a summary of consumers' attitude towards malfunctional EEE in relation to the three options; namely: to give out the EEE, to sell the EEE or to store the EEE. As previously indicated in Figure 13, mobile phones were the most possessed EEE (86.9%) and about 37% of the respondents reported that their mobile phones had become faulty. Incidentally, mobile phones also happened to be the device that was most frequently given out in comparison to other EEE types considered in this study. This is followed by TVs, pressing irons, radio sets, and freezers. Overall, an average of 13.4% of faulty EEE were given out by consumers, 12.4% were sold, while 22.5% were stored.

Statistical analysis showed that the respondents' decision to give out their faulty equipment depended on the equipment at $\alpha = 0.05$; thus, indicating that the respondents' decision to sell their faulty EEE was influenced by the equipment type ($\alpha = 0.05$). Table 8 also highlights the list of faulty EEE stored at home by consumers. Mobile phones were stored more often, followed by TVs, pressing irons, radio sets, and freezers. Despite the fact that consumers' success rate for repair of faulty EEE was high (87.0%), it is interesting to observe that consumers still stored their malfunctional EEE. One of the reasons consumers gave for storing and not repairing and reusing malfunctional EEE was the cost of repair.

Consumers pointed out that the cost of repair for some devices was so exorbitant that it discouraged them from repairing and reusing EEE. About 24.9% of them also noted that occasionally, depending on product brands, the cost of repair was so high that a little addition of cash would purchase another new brand device. Other reasons include lack of trust/faith in the technicians (24.6%), technicians post assessment feedback that the device was irreparable was another important factor which made about 20.2% of respondents give up on repair. The absence of funds to repair was a repair limiting factor for 10.6% of the respondents, also important was skills inadequacy on the part of the technicians (8.6%) and inaccessibility of technicians within reach of the consumers (11.1%).

Table 8: Household attitude towards malfunctional EEE (%)

EEE Type	Gave out faulty EEE		Sold faulty EEE		Faulty EEE stored	
	No	Yes	No	Yes	No	Yes
Desktop	29 (94%)	2 (6%)	22 (71%)	9 (29%)	18 (58%)	13 (42%)
Freezer	257 (90%)	30 (10%)	253 (88%)	34 (12%)	225 (78%)	62 (22%)
Laptop	118 (85%)	21 (15%)	120 (86%)	19 (14%)	111 (80%)	28 (20%)
Microwave	62 (84%)	12 (16%)	63 (85%)	11 (15%)	46 (62%)	28 (38%)
Mobile phone	817 (82%)	178 (18%)	858 (86%)	137 (14%)	842 (85%)	153 (15%)
Photocopier	25 (93%)	2 (7%)	23 (85%)	4 (15%)	20 (74%)	7 (26%)
Pressing iron	390 (88%)	52 (12%)	391 (88%)	51 (12%)	320 (72%)	122 (28%)
Printer	31 (94%)	2 (6%)	29 (88%)	4 (12%)	24 (73%)	9 (27%)
Radio	288 (90%)	31 (10%)	279 (87%)	40 (13%)	221 (69%)	98 (31%)
Sewing machine	51 (98%)	1 (2%)	50 (96%)	2 (4%)	39 (75%)	13 (25%)
Television	490 (90%)	55 (10%)	494 (91%)	51 (9%)	414 (76%)	131 (24%)
Vacuum cleaner	9 (82%)	2 (18%)	6 (55%)	5 (45%)	7 (64%)	4 (36%)
Video game	24 (75%)	8 (25%)	27 (84%)	5 (16%)	22 (69%)	10 (31%)
Washing machine	97 (84%)	18 (16%)	102 (89%)	13 (11%)	96 (83%)	19 (17%)
Total	2688 (87%)	414 (13%)	2717 (88%)	385 (12%)	2405 (77.5%)	697 (22.5%)

The major challenge that consumers expressed as their experience while trying to repair and reuse malfunctional EEE is the absence of OEM certified technicians or expert technicians (28.6%) for certain EEE products and the uncertainty that these devices could be repaired (22.8%). Other reasons were unavailability of replacement parts (20.0%), and product obsolescence associated with the availability of newer technologies and products (15.2%). About 13.4% of the consumers revealed that their chances of proceeding to repair and reuse diminished when they could readily afford new devices.

The major factor that consumers expressed as their reason for repairing and reusing EEE was the durability/product brand (55.9%) that they had acquired, and because they could not afford new devices (38.1%). Only 6.0% of the consumers repaired their malfunctional EEE because of their Organization of circular economy. About 43.3% of the consumers indicated that they had one or more EoL EEE stored at home while 56.7% did not store EoL EEE. Storing old non-functional devices at home, a practice which is often described as hoarding is a phenomenon that is not peculiar to Nigeria alone. A recent UNITAR study on the update of WEEE collection rates, targets, flows, and hoarding in the EU-27, United Kingdom, Norway, Switzerland, and Iceland revealed that households possessed an average of 74 EEE items (excluding luminaries and lamps). Nine out of these items were functional but hoarded, four were malfunctional but hoarded, while 61 items were in use (Balde et al., 2022).

It was very encouraging to observe that 58.5% of the consumers were aware that “fixing and reusing” malfunctional EEE saves pollution and 82.3% of them said that it was this realisation that drove them to fix malfunctioning EEE (Figure 18). Some consumers had also mentioned that they had experienced having to repair or service newly acquired EEE items before using them. Approximately 20% of the consumers indicated that they had repaired imported UEEE after purchase (before putting such into use). A comparable proportion (19.8%) noted that they had had to repair new EEE (after purchase) before use.

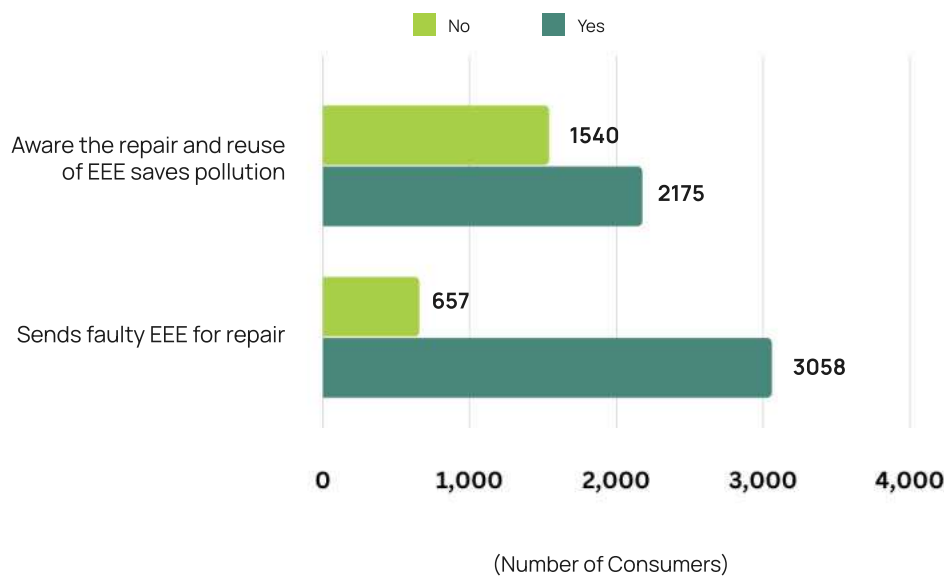


Figure 18: Consumers Level of Awareness on energy saving potential of repair and reuse

Further probing revealed that a majority (75%) of the respondents had repaired some gadgets at least twice, with 21% having to repair some devices three to four times. About 5% of the respondents reported that they had to repair certain EEE devices more than 5 times. It is noteworthy to mention that approximately 46% of the consumers expressed willingness to trade in malfunctioning gadget to purchase new ones.

3.6 E-WASTE DISPOSAL METHODS AMONG CONSUMERS

The study attempted to comprehend reasons why consumers discontinued using their EEE and the fate of EoL EEE or EEE that they had discontinued using. It was revealed that most users (62%) ceased using gadgets even if the equipment was still whole but inoperable. Around 26% of consumers ceased using gadgets because they were both damaged and non-functional, while 12% stopped using some EEE even though they were still intact and functional. Not many discontinue using functional products; possibly this could be attributable to the fact that most of the respondents were not from the high-income earning range, and therefore did not regularly update their products even when they were still functional.

Most of the e-waste generated by the consumers (48.0%) was sold to door-to-door collectors (Figure 19). About 19.1% of the consumers indicated they disposed their EoL EEE with regular household rubbish, while 17.2% gave such gadgets to family and friends. About 2.7% disposed of EoL EEE at retail shops, 6.5% used old-for-new schemes and 5.3% traded their EoL EEE for other goods. Only 1.2% of consumers took back to approved e-waste collection centres. Figure 19 gives an overview of consumers' approaches to managing their defective EEE that was no longer valuable to them.

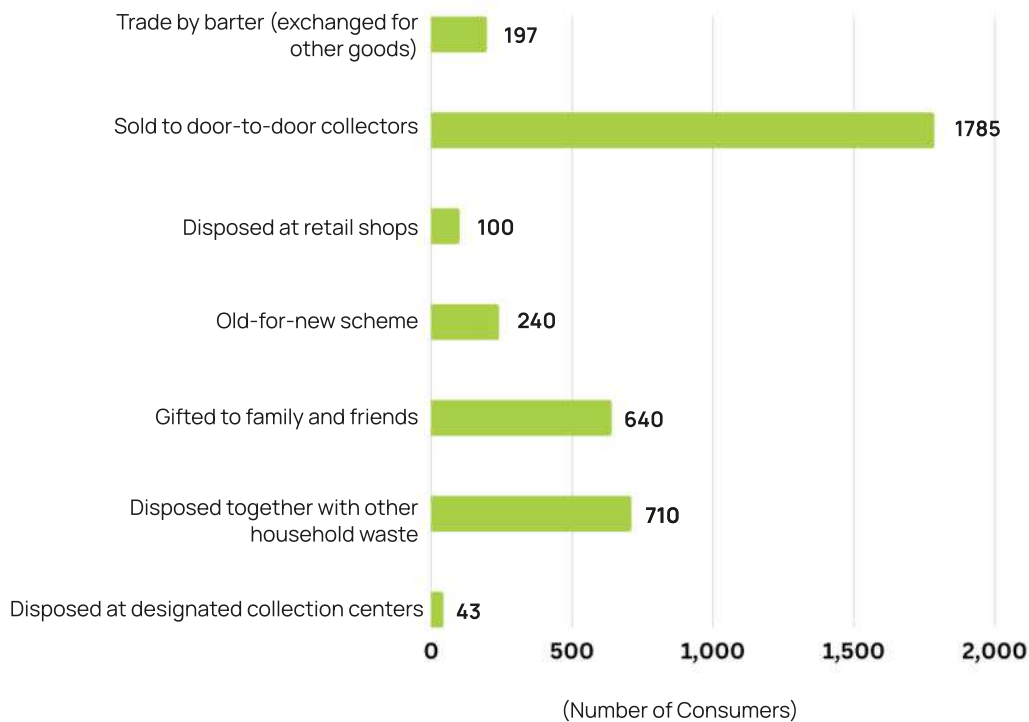


Figure 19: Consumer attitude towards (EoL) EEE

Figure 20 presents the data on the types of e-waste most commonly discarded by the respondents in the past five years. Consumers reported disposing of mobile phones (33.5%) more frequently, followed by television sets (12.3%), pressing irons (9.8%), and freezers (5.2%). Only about 17% of consumers reported that EEE retailers urged them to return their EoL EEE for free. Furthermore, just 7% indicated that recyclers had approached them about turning in their EoL EEE for ESM.

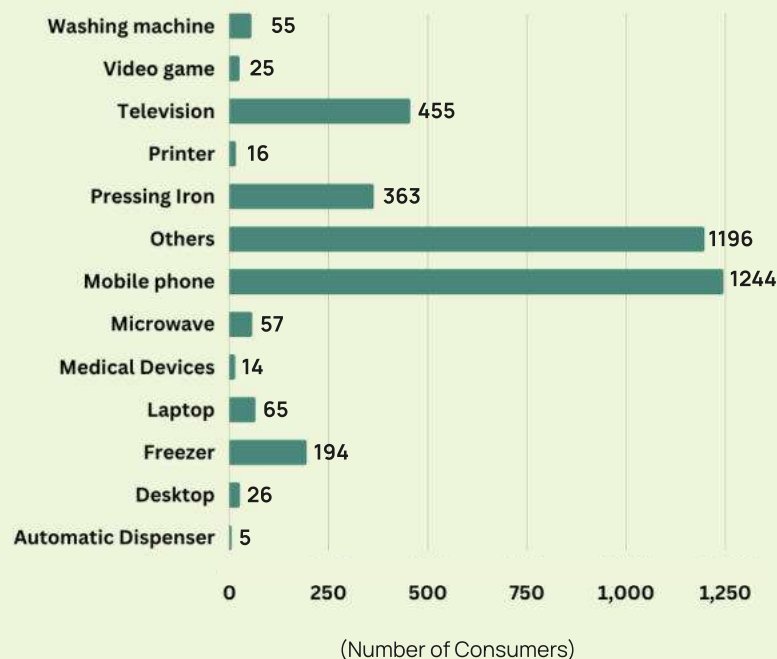


Figure 20: E-waste mostly disposed by the respondents in the last five years.

Figure 21 depicts some of the factors that would motivate respondents to readily give up their e-waste for recycling. Most people preferred to be provided with cash incentives to hand in their e-waste, whereas the least motivating factors found were collection through the use of mobile app, to send out collection notice information to collectors or recyclers or using their websites to do so.

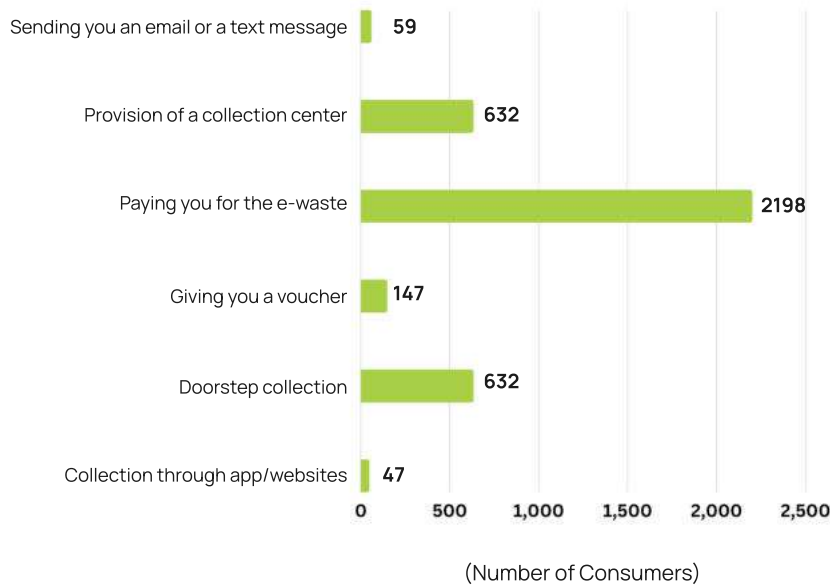


Figure 21: Factors that motivate consumers to hand in their E-waste

3.8 MOTIVATION/BARRIERS TO PROPER E-WASTE DISPOSAL AND PREFERRED E-WASTE COLLECTION APPROACHES

Most respondents were not motivated to turn in their e-waste to a registered collection centres or to collectors. In response to factors that would motivate them to give up their e-waste for recycling through collection centres, about 32.0% of the respondents expressed that their motivation to recycle e-waste was because they cared about the environment. Most of the respondents (70.0%) indicated that their motivating factor would be incentives provided the collectors, while 25.5% highlighted that it would be the collectors' accessibility. When probed further on their current level of accessibility to collectors most of the respondents (74.5%) reported having difficulties locating collectors, while just 25.5% had convenient access to collectors.

The study probed further to determine what collection approaches consumers would appreciate and readily adopt and what would be the motivation for that. Approximately 70% of the respondents favoured door-to-door e-waste collection. This might be related to the financial advantages provided by door-to-door e-waste collectors. Only 16.9% accepted the option of dropping off e-waste at EEE retail stores. This is also consistent with the reaction of the consumers when they were presented with the option of dropping off e-waste at recycling centres: just 18.1% agreed to participate. Similarly, 23.4% of consumers favoured e-waste disposal at authorized collection facilities. Only 9% of the consumers preferred to send official e-waste collection invitations to collectors or recyclers through mobile applications or e-mails.

3.9 CONSUMERS AWARENESS OF E-WASTE COMPOSITION

The majority of respondents (77.0%) understood that e-waste can be beneficially recycled, and 41.5% understood that some e-waste components contain precious materials such as gold and silver (Figure 22). Meanwhile, just 54.8% of people were aware that some e-waste components contain hazardous materials like lead. Around 75.1% of the consumers were aware that improper e-waste management might contaminate the environment, while 65.7% were aware that dumping e-waste into a surface water body used for domestic purposes (e.g. a stream) can render the water unfit for domestic use (Figure 23).

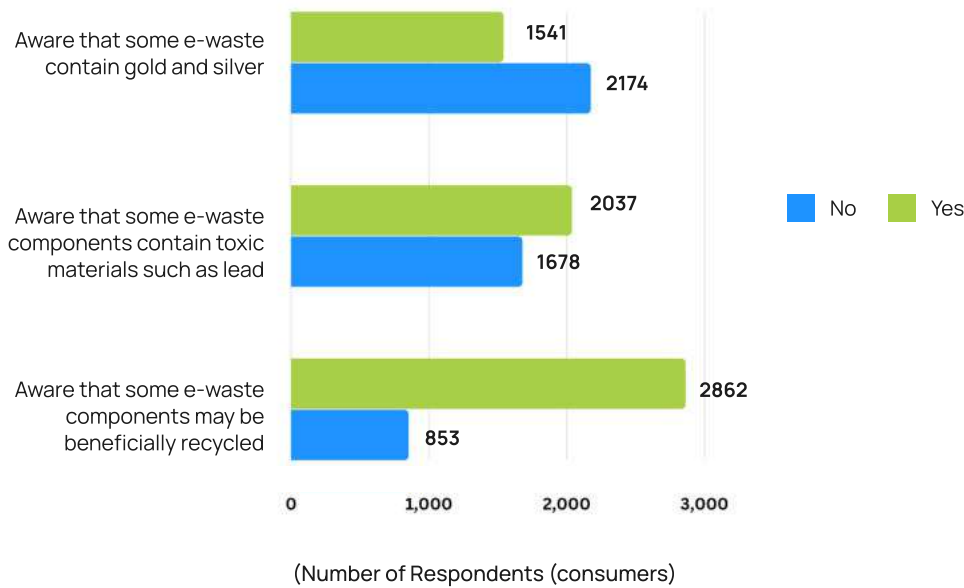


Figure 22: Consumers' Awareness of E-waste composition of valuable and toxic materials

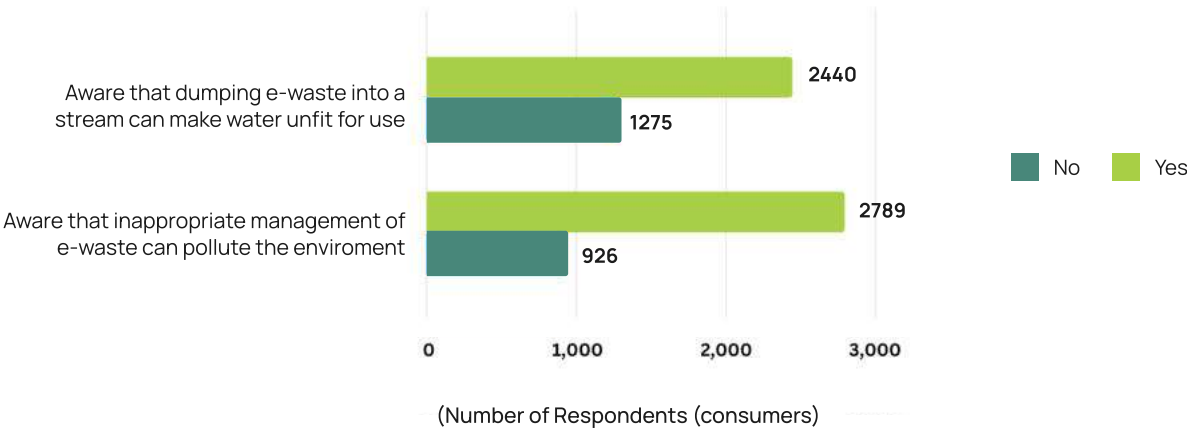


Figure 23: Awareness that pollution results from adopting inappropriate E-waste management approaches

About 61.4% of the respondents expressed willingness to pay a 'recycling fee' to encourage effective recycling with a view to safeguarding the environment, while 65.4% would be willing to pay more for a phone if it is manufactured in a way that does not and will not contaminate the environment. Most respondents (51.6%) believed that there was insufficient infrastructure to effectively collect and handle e-waste in the country.

SECTION 4:

E-WASTE COLLECTORS' ACTIVITIES



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4.1 COLLECTORS' AWARENESS OF THE CONCEPT AND E-WASTE AND ASSOCIATED REGULATORY REQUIREMENTS

Collectors in Lagos State expressed the highest level of awareness of the e-waste concept with 73.8%, followed by Kano (62.1%), Ogun (63.6%), Rivers (61.0%), and Abia (50.7%). The percentage level of awareness in other States was less than 50.0%, including Abuja (43.1%) and Adamawa (31.0%). Overall, this study found that 57.8% of collectors were aware of the e-waste concept, while the remaining 42.2% were not. In testing the hypothesis on the collectors' knowledge about e-waste, it was observed that their knowledge about e-waste depended on their State of residence with $p = 0.000$. It was also observed that collectors working for collection centres (79%) were familiar with the e-waste concept, followed by agents of recycling facilities (67%) (Figure 24).

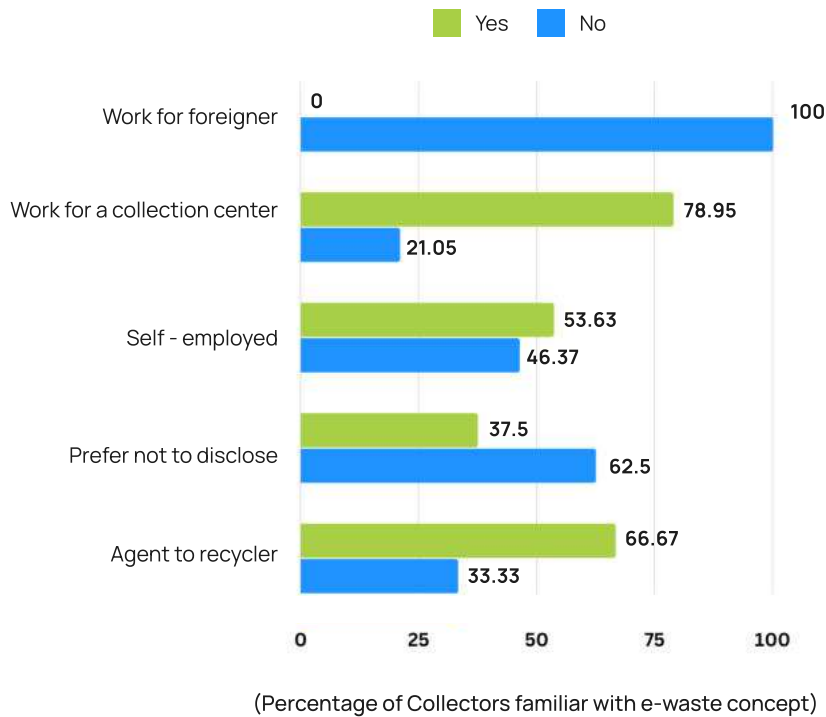


Figure 24: Awareness of E-waste concept among Collectors in relation to their form of employment(%)

The majority of collectors, 61.6%, were unaware of existing e-waste regulations. As a result, public awareness campaigns are advised. To determine if collectors' level of knowledge of e-waste was related to their State of operation, it was discovered that the collectors' knowledge of e-waste management legislation varied according to their State of residence ($\alpha = 0.05$). Figure 25 depicts a prediction of collectors' understanding of Nigerian regulations governing e-waste and associated activities based on the State of residence.

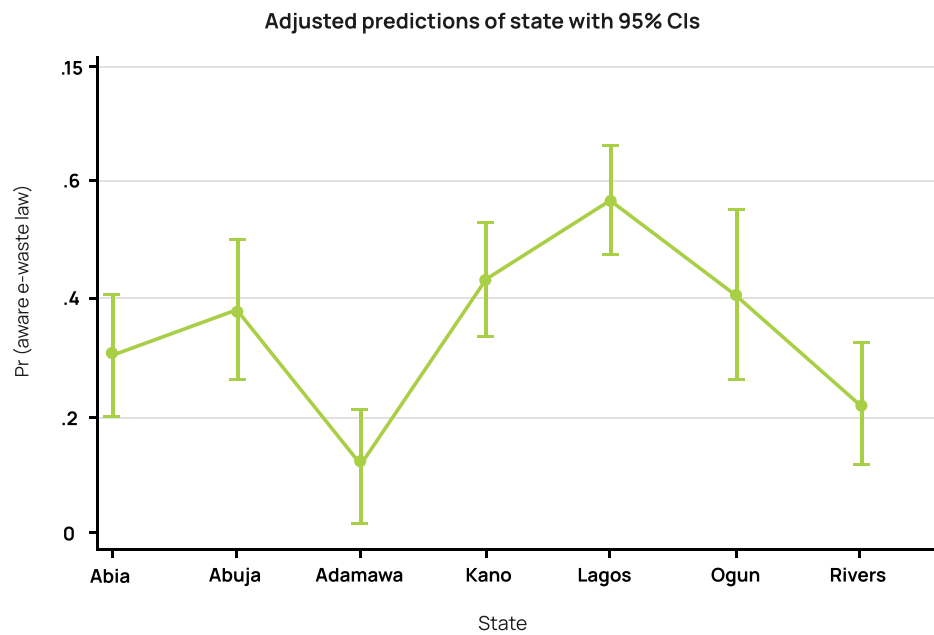


Figure 25: Predictive model of Organization of Nigerian E-waste Law among collectors

This shows that collectors in Lagos had a 0.57 probability of being aware of Nigeria's e-waste law while Ogun and Adamawa had a probability of 0.41 and 0.12, respectively.

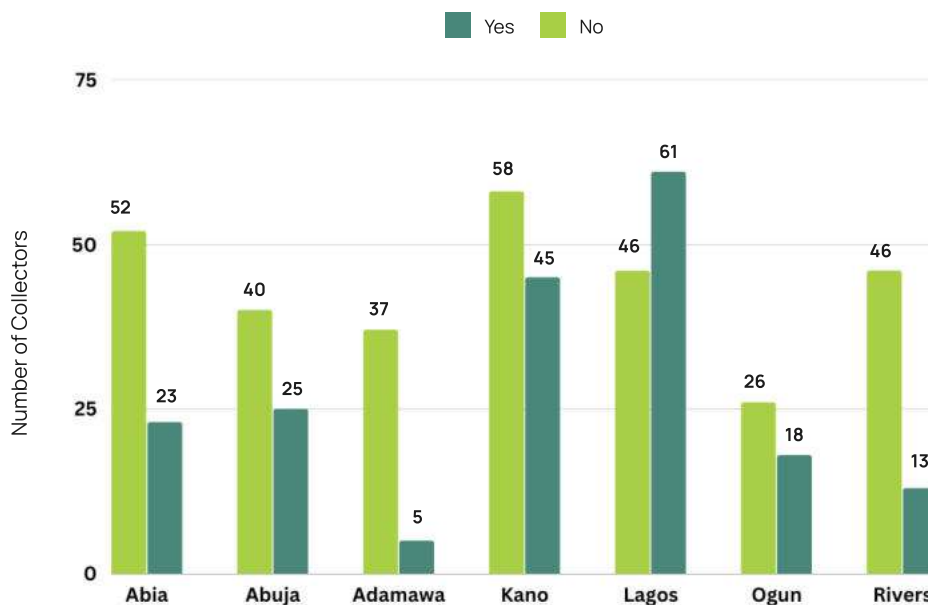


Figure 26: Awareness of E-waste Law among Collectors according to State of residence

Figure 26 depicts the degree of understanding of the National regulations governing e-waste among collectors. Collectors in Lagos State had the highest level of Organization (57.0%), followed by Kano (43.7%), Ogun (40.9%), Abuja (38.5%), Abia (30.7%), Rivers (22.0%), and Adamawa (11.9%). Overall, 38.4% of collectors were aware of the e-waste law, while the remainder (61.6%) had not heard of it. Awareness of e-waste law among collectors according to employers is presented in Figure 27. Only 1 collector indicated working for a foreigner. Presented in Figure 28 is a predictive model of awareness of the e-waste concept among collectors according to their States of operation.

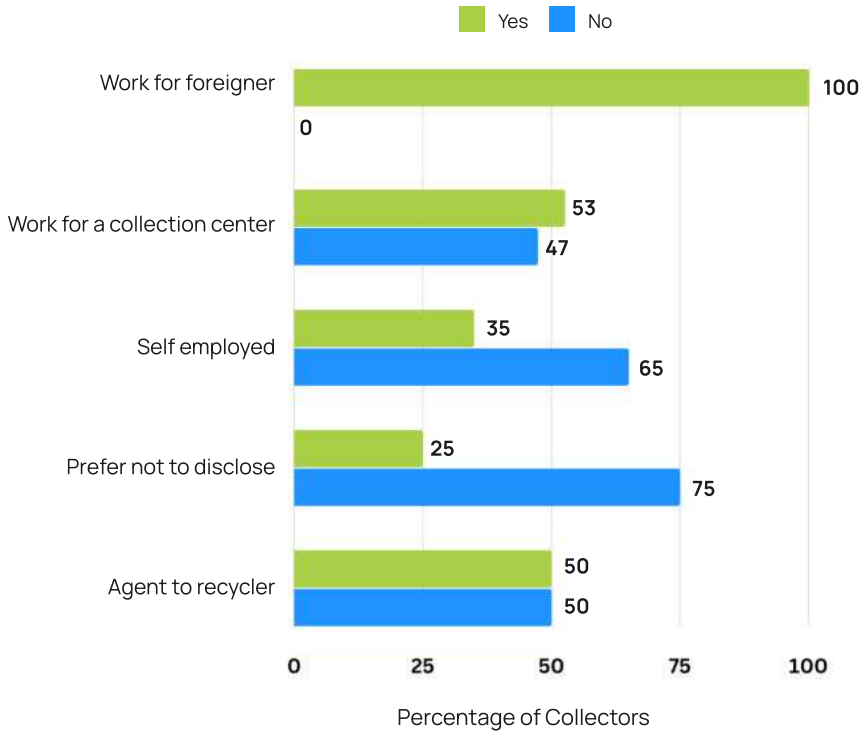


Figure 27: Collectors' Level of Awareness of Regulations Governing E-waste in Nigeria

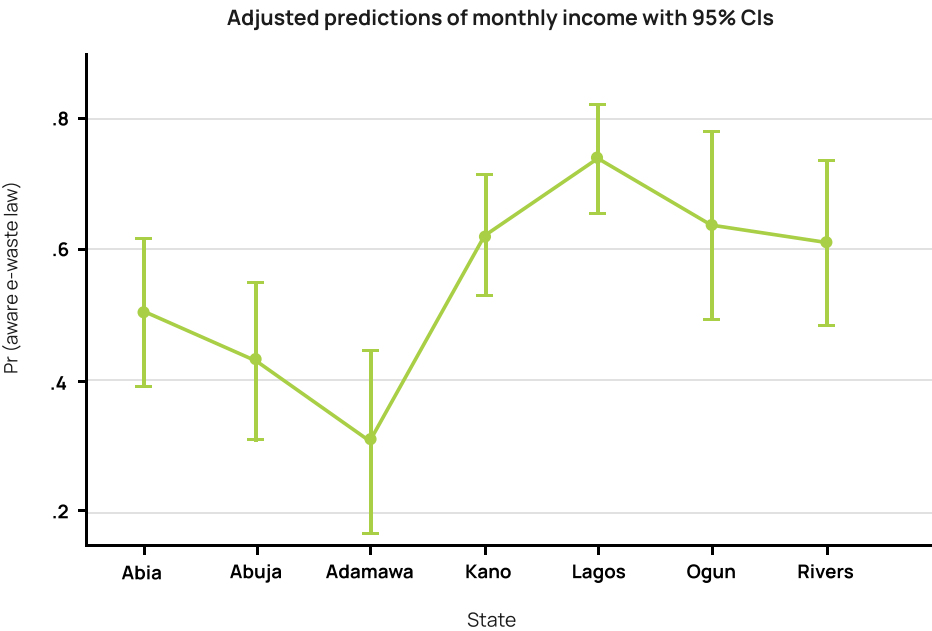


Figure 28: Predictive model of Awareness of E-waste concept among collectors

4.2 AWARENESS OF POLICY BANNING IMPORTS OF CRT AND E-WASTE

According to the study's findings, 288 (58.2%) collectors were unaware that the importation of e-waste and CRT devices (TV and monitor) is prohibited in the country. Only 207 collectors (41.8%) claimed to be aware of the national legislation. In addition, the respondents' knowledge of the ban on the importation of e-waste and CRT TV was found to depend on their State of residence/operation with $p = 0.006 < 0.05$. Awareness of the government's ban on the importation of CRTs was highest in Lagos (53.3%), followed by Abuja (47.7%), Abia (45.3%), Rivers (42.4%), Kano (36.9%), Ogun (29.6%), and Adamawa (21.4%). Most collectors were aware of the large-scale importation of UEEE, the majority of which are non-functional. Abia (72.0%) and Lagos (71.96%) had the highest percentage of collectors who were aware of this, followed by Kano (70.9%), Rivers (67.8%), and Abuja (61.5%). Adamawa (40.5%) and Ogun (31.8%) had less than 50% awareness. Overall, 63.6% of collectors were aware that huge volumes of UEEE were imported into Nigeria, and that the majority of such consignments were non-functional.

4.3 SOURCES AND CONDITIONS OF E-WASTE COLLECTED

It was quite insightful to see that the primary source of e-waste for the collectors was households. About 55.2% of the collectors stated that their predominant source of e-waste was from house-to-house collection (Table 9). Only about 19.6% of e-waste was collected from stores, 14.1% from businesses/offices, and 11.1% from waste dump sites/landfills. Further statistical analysis was done to relate the volume collected from the different sources to the collectors' operating States (Table 9). In testing the hypothesis, it was concluded that the collectors' source of e-waste depended on their States of residence at $\alpha = 0.05$.

Table 9: Sources of collected e-waste according to Collector's State

	Companies / Offices	Dumpsites	Houses	Shops
Abia	18 (24.00%)	6 (8.00%)	24 (32.00%)	27 (36.00%)
Abuja	10 (15.38%)	9 (13.85%)	32 (49.23%)	14 (21.54%)
Adamawa	0 (0.00%)	3 (7.14%)	33 (78.57%)	6 (14.29%)
Kano	6 (5.83%)	9 (8.74%)	79 (76.70%)	9 (8.74%)
Lagos	30 (28.04%)	11 (10.28%)	34 (31.78%)	32 (29.91%)
Ogun	2 (4.55%)	15 (34.09%)	25 (56.82%)	2 (4.55%)
Rivers	4 (6.78%)	2 (3.39%)	46 (77.97%)	7 (11.86%)
Total	70 (14.14%)	55 (11.11%)	273 (55.15%)	97 (19.00%)

The collectors revealed that in a lot of cases, consumers gave up e-waste fractions instead of whole products. The data presented in Figure 29 demonstrates that few collectors (22.8%) had regularly collected EoL devices which had no missing components, whereas e-waste with missing parts were collected more often (40%). Approximately 34% of collectors confirmed that the EoL devices they collected were damaged, while 3.0% reported missing cables. The hypothesis tested showed that the condition of the EoL devices collected (by the collectors) depended on their State of residence ($\alpha = 0.05$).

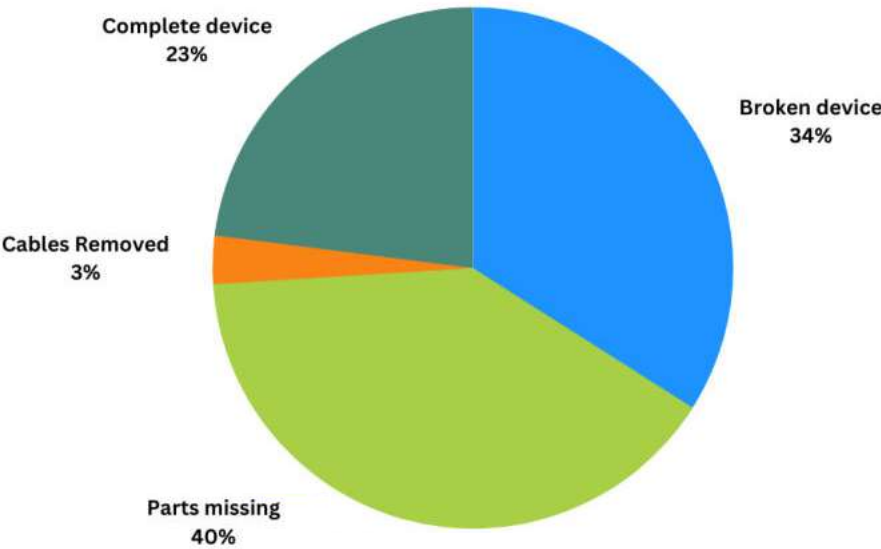


Figure 29: Condition of the e-waste collected

Figure 30 depicts the state of most of the devices when they were collected. Collectors in Ogun State reported collecting more damaged EoL devices (63.6%), followed by Adamawa (59.5%) and Kano (48.5%); while collectors in Abuja had the best potential to collect complete EoL devices (40.0%), followed by Lagos (29.9%) and Rivers (28.8%). The collectors were more likely to collect EoL devices with parts missing in Rivers State (54.2%), followed by Lagos (42.1%), and then Abia (41.3%).

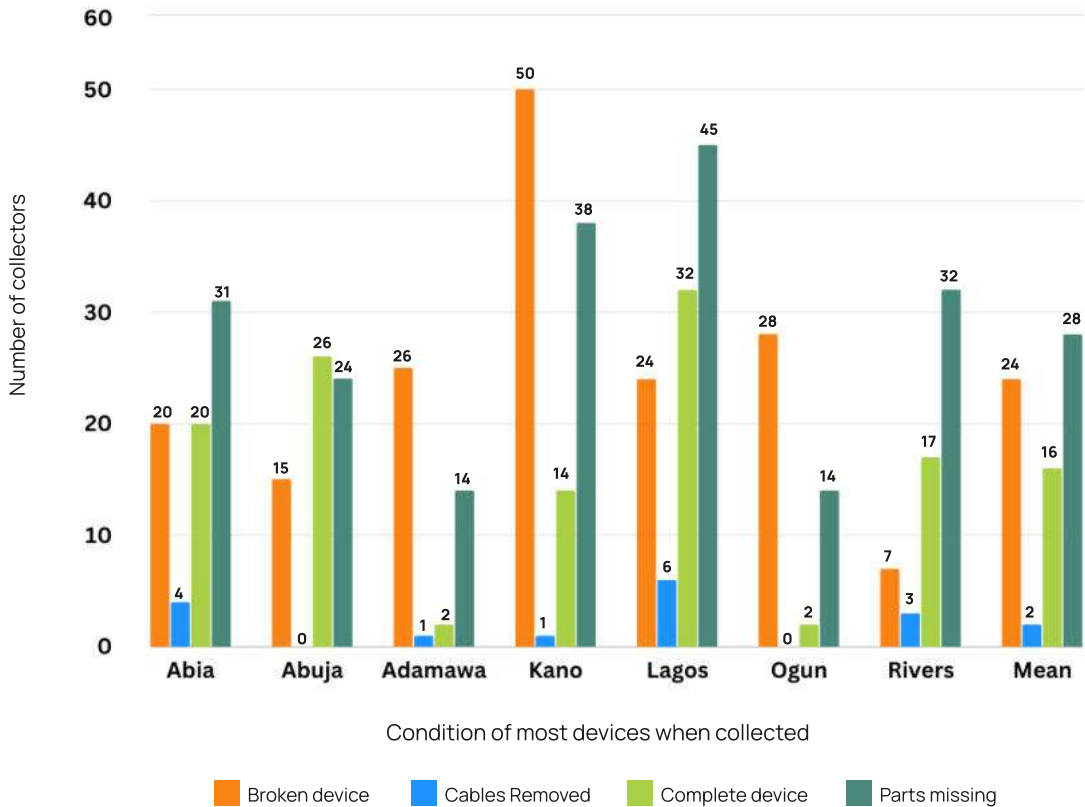


Figure 30: Condition of most devices when collected

Collectors also reported picking up e-waste from dealers of UEEE. Approximately 72% of collectors reported collecting e-waste from the stores of UEEE dealers at some point. This suggests that a considerable proportion of imported UEEE may be non-functional, and dealers may be disposing of them or performing repairs in their shops, resulting in the disposal of e-waste. In Lagos, around 80.4% of collectors reported collecting e-waste near UEEE dealers' stores, followed by Ogun (77.3%), Rivers State (76.3%), Kano (71.8%), Adamawa (69.1%), Abuja (64.6%), and Abia State (60.0%).

4.4 PREFERRED E-WASTE COLLECTION APPROACH

The majority of collectors, approximately 54%, opted for door-to-door e-waste collection, whereas 18% favoured collection from EEE retail and technicians' shops. Only 11% preferred collection from dump sites, whereas 17% preferred collection from offices and corporate organizations. Approximately 84% of collectors stated that they compensated consumers for e-waste, with this happening more often in certain States than in others (Figure 31).

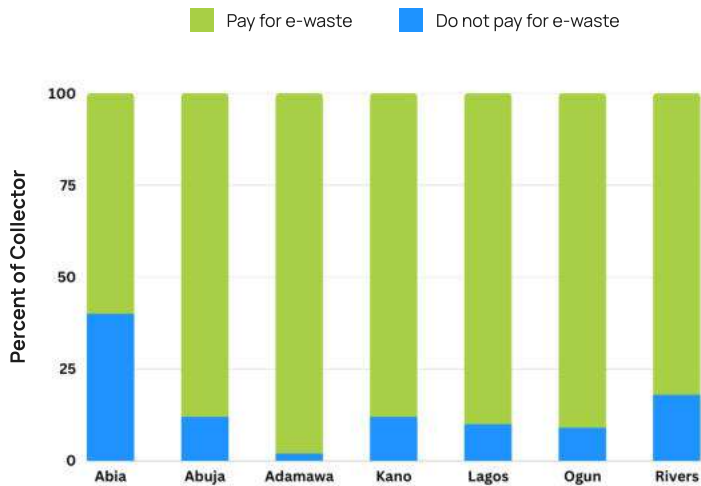


Figure 31: Collectors pay for e-waste according to state of operation

Collectors preferred that consumers call them for e-waste collection (Figure 32). This was true in all States but was preferred more by collectors in Adamawa (97.6%), Kano (97.1%), and Lagos (91.6%). Overall, 89% of collectors would like a call to come pick up e-waste. Figure 33 shows a prediction model of collectors' preference for requests to collect e-waste based on State.

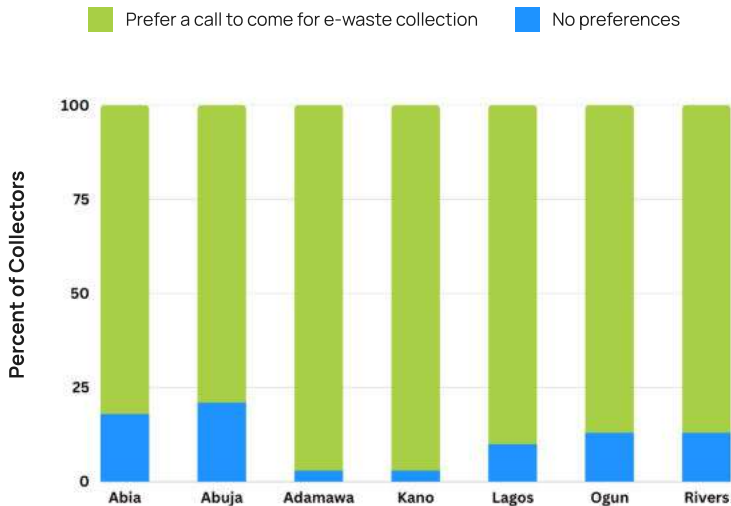


Figure 32: Collectors preferred invitation by phone call for e-waste collection



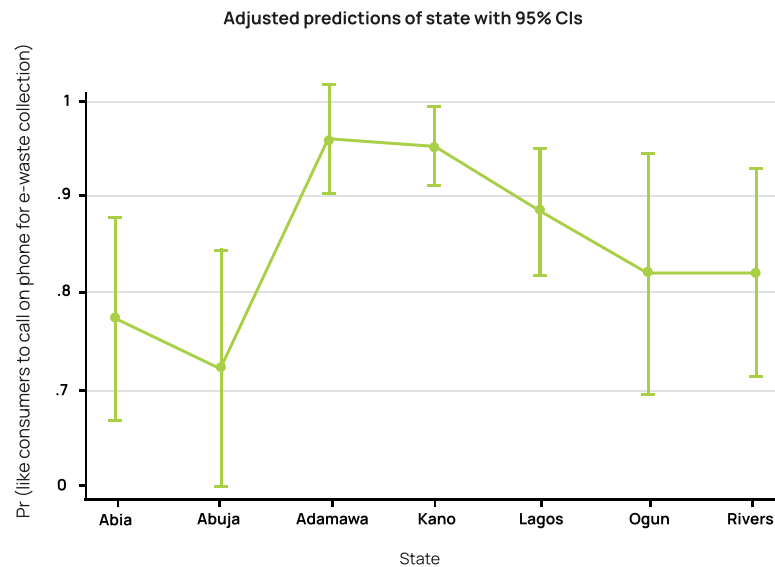


Figure 33: Predictive model of collector's preference of calls to collect e-waste

4.5 E-WASTE COMPONENTS COLLECTED/NOT COLLECTED

Results from this study also revealed that collectors did not collect e-waste plastics (62.4%), CRT glass (34.6%), bulbs and fluorescent tubes (45.9%), phone screens (32.3%), and plasma TV screens (24%) (Figure 34).

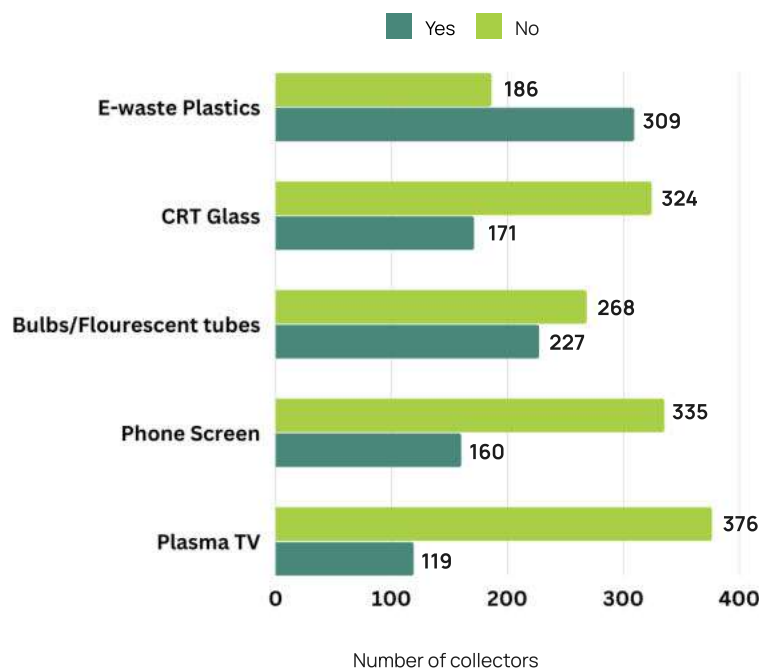


Figure 34: E-waste fractions not collected among collectors

A little over fifty percent of the collectors (54.8%) stated that they did not collect all sorts of e-waste, while 45.2% stated that they did collect every sort of e-waste and other metal scraps. Most of the collectors in Ogun State, about 70.5% of them, collected all sorts of e-waste. Rivers State had the fewest (11.9%) collectors who collected all e-waste types, while Abia, Abuja, Adamawa, Kano, and Lagos had values of 17.3%, 63.1%, 54.8%, 49.5%, and 54.2%, respectively. Figure 35 depicts the likelihood that collectors in each State would collect all types of e-waste.

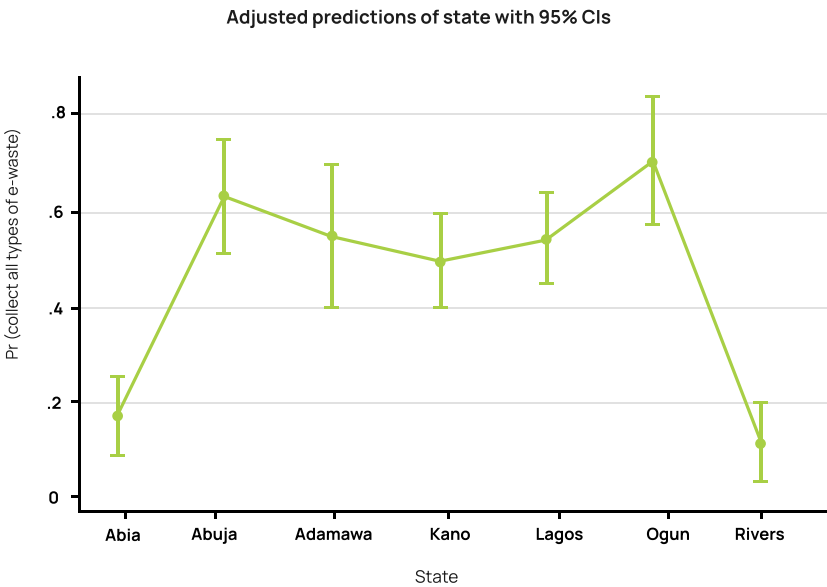


Figure 35: Predictive model for collection of all types of e-waste

4.6 E-WASTE PRE-PROCESSING BY COLLECTORS

After collection most of the collectors sorted the e-waste that they collected, 73.9% of the collectors in Abuja to 96.1% of collectors in Lagos stated that they sorted collected e-waste (Figure 35). Overall, 85.9% of e-waste collectors took the effort to categorize collected items by type/component. The vast majority of e-waste collectors pre-processed the e-waste (Figure 36). Approximately 83% of collectors in this survey pre-processed e-waste, namely disassembling and sorting them by material type. In terms of their State of operation, more than 70% of collectors in all the States pre-processed e-waste (ranging from 73.3% in Abia to 93.2% in Ogun) (Figure 37).

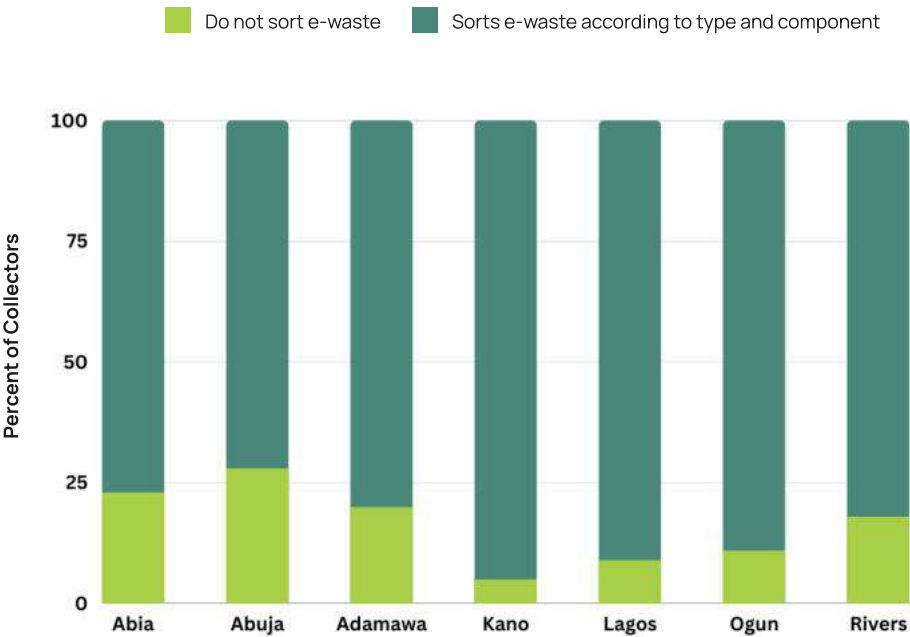


Figure 36: Sorting of collected e-waste among e-waste collectors

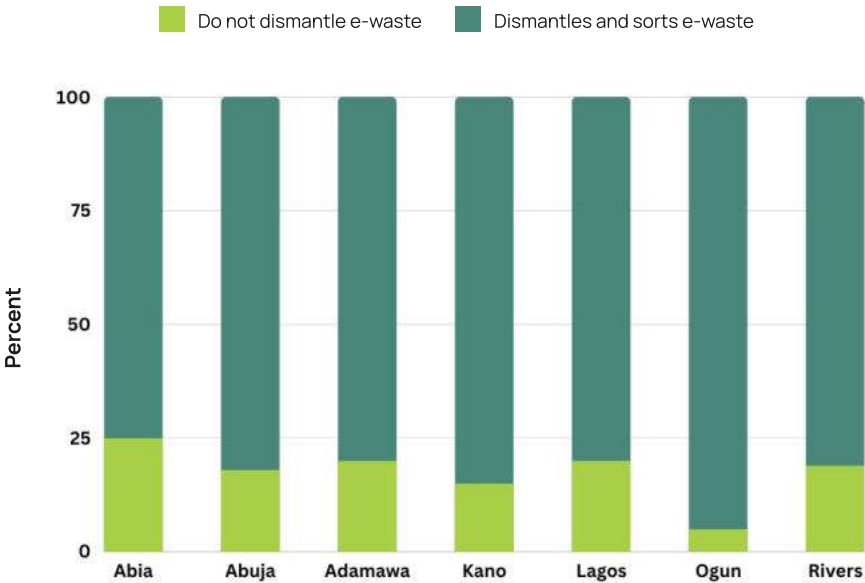


Figure 37:Pre-processing of e-waste (dismantling) among collectors

4.7 DESTINATION OF COLLECTED/PRE-PROCESSED E-WASTE

According to the findings of this study, 43.6% of collectors transferred their acquired e-waste to collection centres, 40.6% sent theirs straight to recyclers, and 15.8% kept theirs to accumulate before selling. Most collectors were motivated by profit, so they transported their e-waste to the collection centre which offered the highest incentive (Figure 38).

E-waste collectors also sold some of the e-waste they collected for repair and reuse. Approximately 78% regularly sold e-waste components or full devices for repair and reuse, while 78% said they also retrieved and sold components for use in device repair. For gases in cooling systems, collectors frequently discharged the gases into the air (37%), sold the gas-containing system with the gas (47%), and only a smaller percentage (16%) took such equipment to professionals for gas recovery.

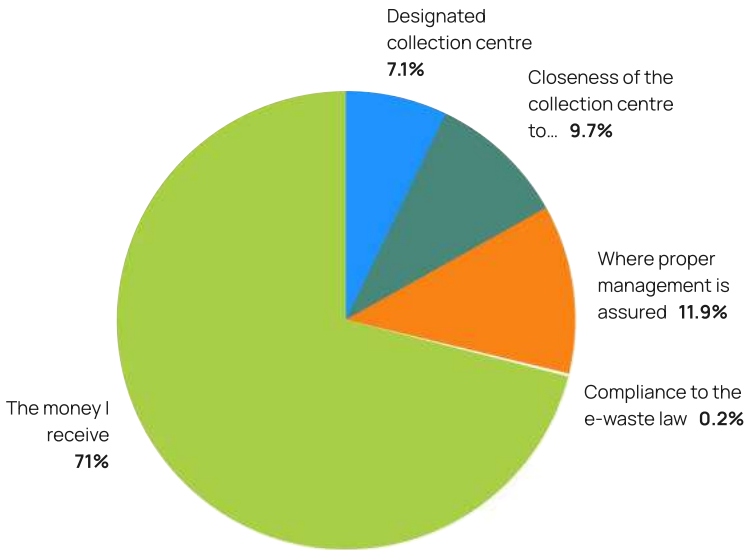


Figure 38:Factor that determines the destination of collected e-waste

4.8 RECORD KEEPING BY COLLECTORS AND QUANTITIES COLLECTED

When trying to determine the quantity of e-waste collected by the collectors, it was discovered that they did not have good record-keeping practices. The majority of collectors (68.3%) did not keep records of the e-waste they collected, pre-processed, or transported to collection centres. Table 10 shows an overview of the estimated e-waste collected weekly and monthly from the collectors. According to the information gathered from the 495 collectors, they collected as much as 25 tonnes of e-waste daily – most likely at large collection centres which buy from individual collectors or smaller collection centres with an average of 266.6kg (± 1828 kg). The average monthly collected e-waste was 4876 kg (± 31412 kg) with a maximum of 600 metric tonnes.

Table 10: Daily and monthly quantities of e-waste collected (kg) according to State of operation.

State	Variable	Number of Collectors	Mean	Std.Dev	Min	Max
Abia	Daily Quantity	75	133	310	0	2000
	Monthly Quantity	75	4067	12625	0	100000
Abuja	Daily Quantity	65	67.1	160	0	1000
	Monthly Quantity	65	2621	12587	0	100000
Adamawa	Daily Quantity	42	2284	5896	0	25000
	Monthly Quantity	42	35308	99574	0	600000
Kano	Daily Quantity	103	62.0	95.8	1	500
	Monthly Quantity	103	1573	4815	1	30000
Lagos	Daily Quantity	107	39.8	112	2	1000
	Monthly Quantity	107	569	1118	1	10000
Ogun	Daily Quantity	44	21.0	16.5	2	85
	Monthly Quantity	44	472	894	30	6000
Rivers	Daily Quantity	59	171	672	0	5000
	Monthly Quantity	59	3586	15035	0	100000

Figure 39 depicts some of the e-waste components and other metal-containing products that collectors identified as materials they collected most frequently. The most often collected things include television sets, mobile phones, freezers, pressing irons, radio sets, laptop computers, and toys. Aluminium products (e.g., aluminium cans), automated dispensers, bathtub metals, electric torches, gas stoves, metals from solar panels, rechargeable lamps, satellite dishes, sewing machines, stabilizers, and vacuum cleaners were among the less commonly collected things. Again, there is a similarity between the types of e-waste given up mostly by consumers (Figure 16) and what is collectors' take-back (Figure 39).

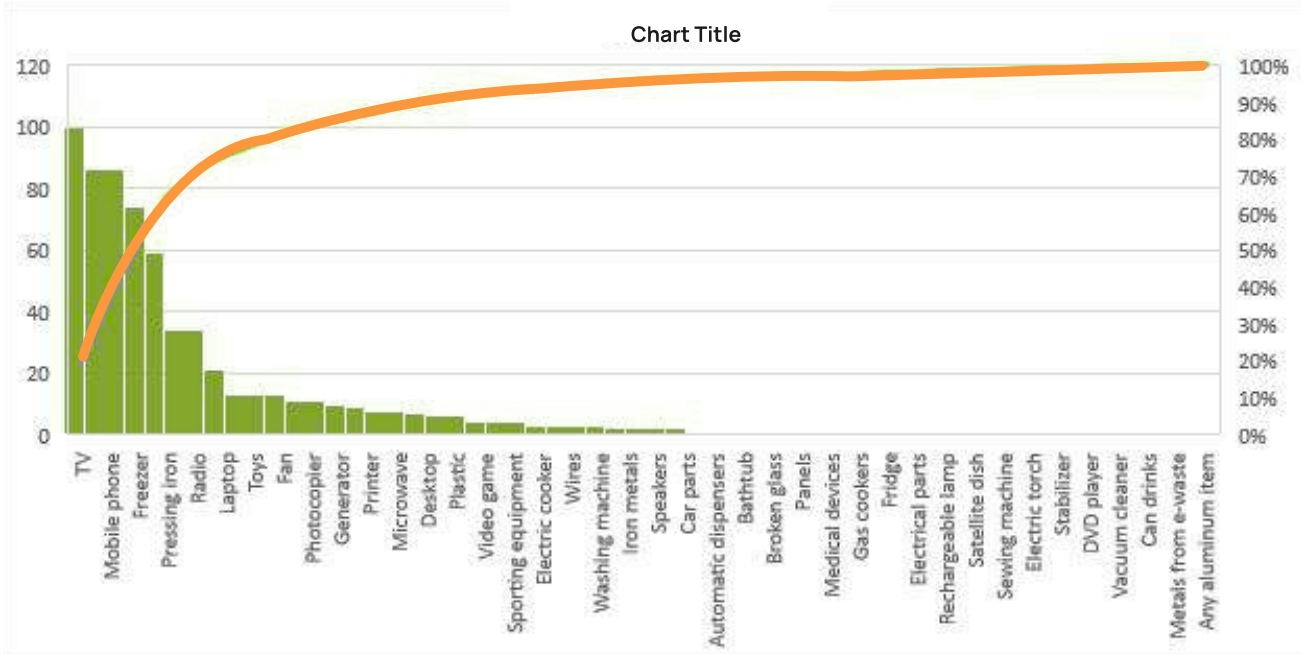


Figure 39: Items identified by collectors as items that are most commonly collected

4.9 HEALTH AND SAFETY TRAINING AND USE OF PERSONAL PROTECTIVE EQUIPMENT AMONG COLLECTORS

Collectors were quite aware that e-waste contains hazardous components. They were also aware that e-waste could be appropriately recycled if directed to professional recyclers (Figure 40). The majority of respondents, 72.9%, were aware of the risks involved in handling e-waste with open wounds, whereas 27.1% were not. The vast majority of collectors (76.2%) had had no health and safety training.

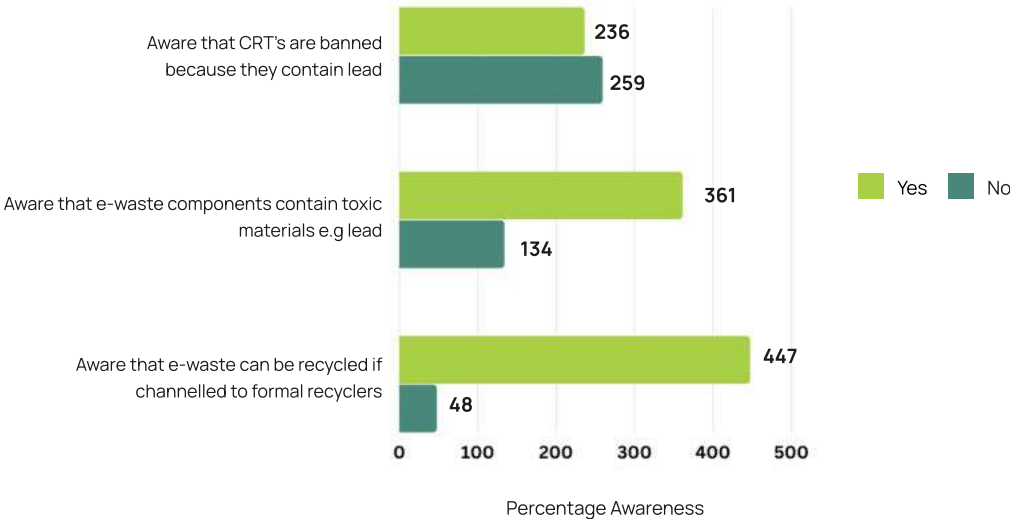


Figure 40: Collector's awareness of hazardous components of e-waste

Approximately 76% of collectors who participated in this study had never gone through any health and safety training (Figure 41). In addition, it was concluded after testing the hypothesis that the respondents' past training experience is related to their State of residence/operation with $p = 0.000 < 0.05$.

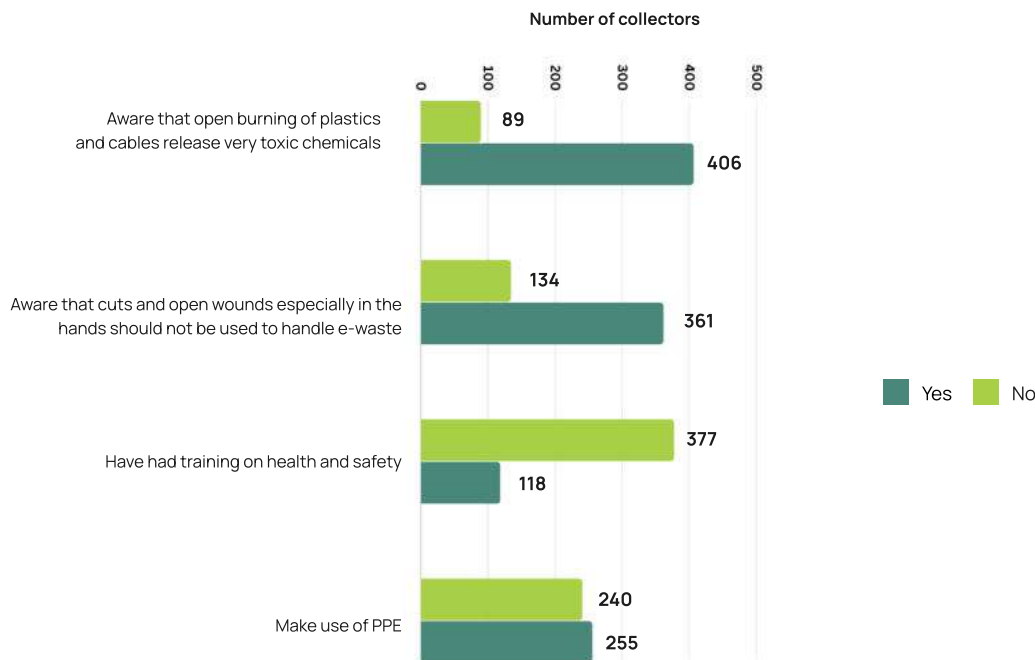


Figure 41: Collector's Awareness of occupational hazards, training, and use of PPEs

A significant number of respondents (255; or 51.5%) utilized personal protective equipment (PPE), whereas 240 (48.5%) did not. Figure 42 depicts the prevalence of the use of PPE among e-waste collectors in the participating States. Half of the collectors who did not use PPEs necessitated the sensitization of collectors to the importance of wearing safety equipment and/or the consequences of not utilizing protective equipment. Collectors in Lagos were more likely than those in other States to have attended such training (Figure 43). After testing the hypothesis (Figure 44), it was concluded that the respondents' attitude towards the use of protective equipment depended on their State of residence/operation at a 95% confidence level but independent of their income at $\alpha = 0.05$.

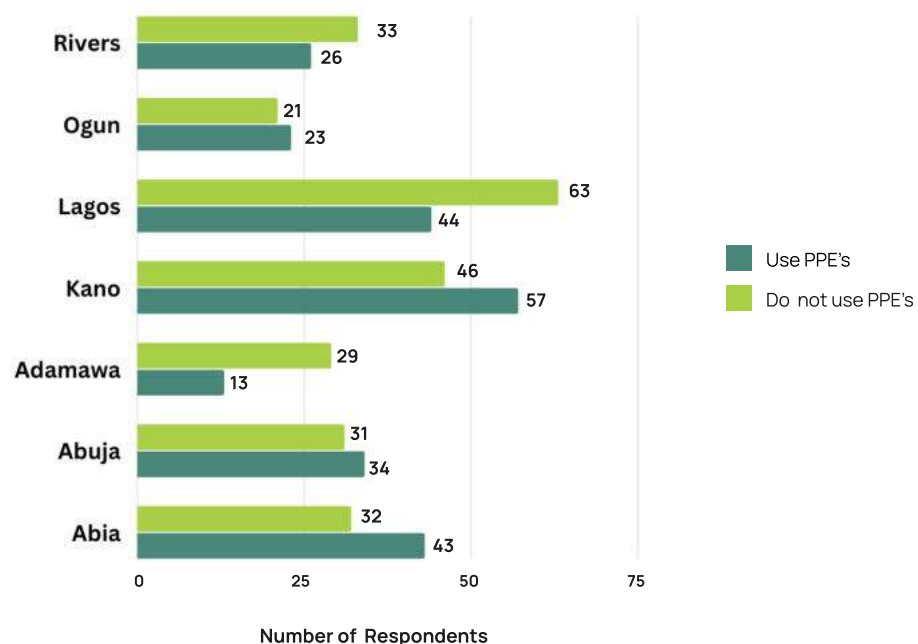


Figure 42: Collectors attitude towards the use of personal protective equipment

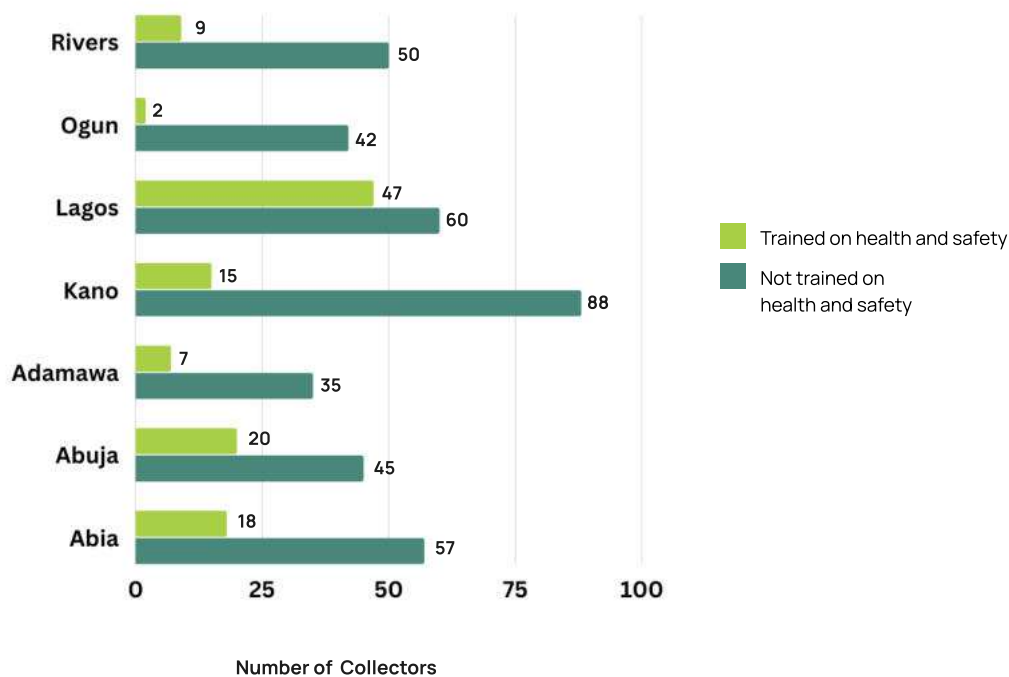


Figure 43: Training on health and safety among collectors

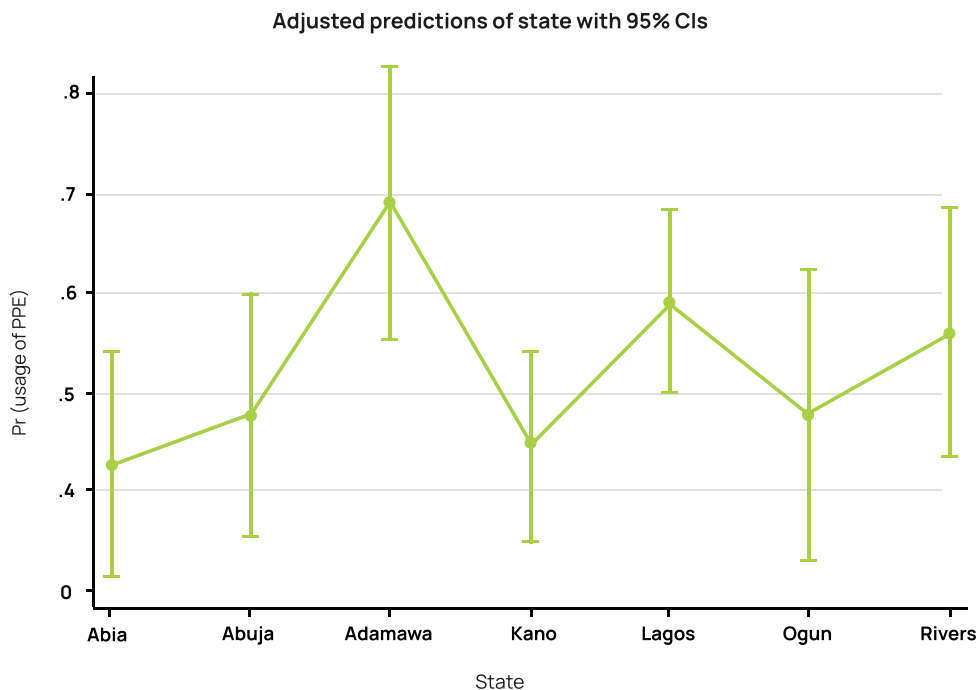


Figure 44: Predictive model of use of PPEs according to State of residence

SECTION 5:

E-WASTE MANAGEMENT APPROACH OF CORPORATE ORGANIZATIONS



SECTION 5:

E-WASTE MANAGEMENT APPROACH OF CORPORATE ORGANIZATIONS

5.1 CORPORATES' LEVEL OF AWARENESS OF EXISTING LEGISLATIONS GOVERNING E-WASTE IN NIGERIA

It was quite interesting to see that approximately 64% of the respondents classified e-waste as “old and non-functional EEE,” 26% classified them as “outdated but functional EEE”, 6% of the respondents described them as “emissions radiated from telecom devices,” and 4% described e-waste as “unused data.” In response to the question querying their level of awareness of regulations guiding e-waste management, only 39% of the interviewees were aware that there are regulations governing e-waste management in Nigeria. About 49% of respondents reported that existing e-waste policy had changed how e-waste is managed in their organization. Only 24 of the 126 respondents (19%) were aware that NESREA is the regulatory agency in charge of enforcing appropriate e-waste management in Nigeria (Figure 45).

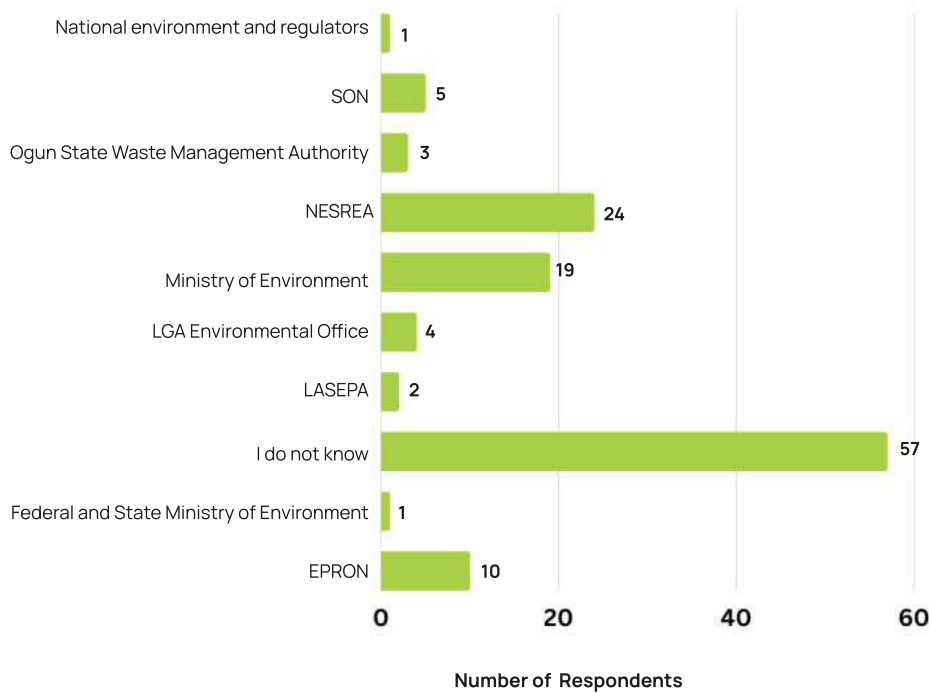


Figure 45: Awareness of e-waste regulatory agencies among Corporate Organizations

Approximately, 32% of the respondents assumed that another sort of entity (government/private/non-governmental organization/others) was in charge of establishing, enforcing, or implementing e-waste policies/legislation/regulation in the nation. Only 25.4% were aware of the e-waste take-back policy.

5.2 AWARENESS OF CIRCULAR ECONOMY AND EPR

The majority of respondents were unaware of the CE idea: 44% were aware, while the remaining 56% were not. When questioned further about their knowledge of the CE, only 41% answered that CE meant “recycling,” while others provided their interpretation. Some of their replies included, but were not limited to: ‘no waste of resources/materials’, ‘reformation’, ‘refurbishing’, ‘reprocessing of waste’, ‘reducing environmental hazards’, ‘disposable electronics’, ‘grinding or melting of polythene’, and ‘well-managed economy’.

Most organizations' policies seemed not to include CE ideas. None of the 56 respondents precisely stated what CE meant to their organization. Rather, their replies emphasized repair and reuse, as well as recycling, but also minimizing waste, sanitizing the environment, decreasing waste, and preserving the environment for safe practices/good health.

Some of the respondents reported that their organizations had in place a policy of acquisition and usage of UEEE (59), another 29 mentioned that their organizations shared EEE, and finally, 15 respondents said their organizations practised EEE leasing (Figure 46). Majority of other organizations likewise prepared to use this strategy. Most organizations base their EEE purchasing decisions on product functionality, length of products life span, and the existence of repair hubs/service centres (Figure 47). Only 112 respondents shared information about the variables driving EEE purchasing choices in their organizations. The majority, 34.1% of respondents prioritized product functionality, followed by product life span (26.2%) and the existence of repair centres (26.2%). The ease of recycling was the least important aspect (6.4%).

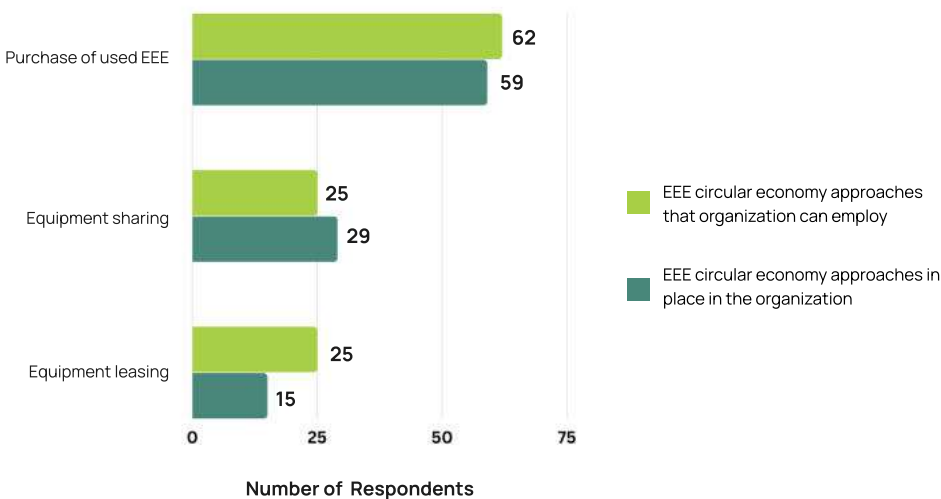


Figure 46: Circular economy approaches in place or likely to be adopted by organizations

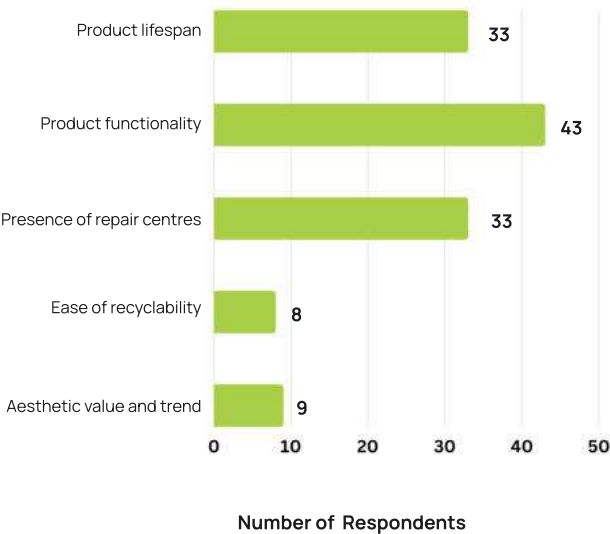


Figure 47: Factors influencing EEE purchase decisions within corporate organizations

Approximately 81.8% of collectors were unaware of the National EPR programme in the EEE sector mandating producers to take responsibility for their EEE products at EoL. Only 23 respondents could name the Nigerian entity responsible for implementing EPR for EEE: 34.8% were aware that EPRON is in charge; 17.4% believed it was NESREA; and the remainder were either unaware (26.1%) or had suggested other agencies such as the Ministry of Environment, Abuja Environmental Protection Board, or collaborations between NESREA and the Ministry of Environment, etc.

5.3 EEE AND UEEE PURCHASE, REPAIR, AND REUSE BY ORGANIZATIONS

On the mode of acquisition of EEE, the majority responded that their organization's policy was based on needs and procurement departments' choices and that they preferred to buy new EEE (97 respondents). Most organizations who wanted the highest quality and durability preferred to buy from major dealers and importers of EEE, while some chose to go all the way to Lagos to acquire EEE – since the main dealers in Lagos guaranteed durability and quality. Some organizations imported EEE for their offices. Other organizations purchased EEE from the open market, including new EEE and used refurbished devices. Some of the respondents (10.3%) were unaware of their company's policy.

Among the factors expressed as impediments to repairing defective EEE was the lack of a certified repair facility (16.7%), needless delays at repair centres (26.7%), the cost of repair (23.3%), and the repair centre's inability to correctly fix the devices (10.0%). Some Organizations (23.3%) had a no-repair policy. Some Organizations did not buy imported UEEE because it violated business policy (53.6%) or because UEEE did not come with a warranty (25.0%). Other firms believed that purchasing and using UEEE "degraded" the company's status (21.4%).

Only 118 respondents supplied information about their Organization's attitude regarding malfunctional EEE. Approximately 65.3% repaired damaged EEE, 10.2% gave out such malfunctional devices, 8.5% sold such gadgets, and 16.1% still had such devices stored. Approximately 92.2% of the respondents reported that defective EEE was successfully repaired and reused. Only 37 respondents explained why their organizations did not repair and reuse faulty EEE (Figure 48).

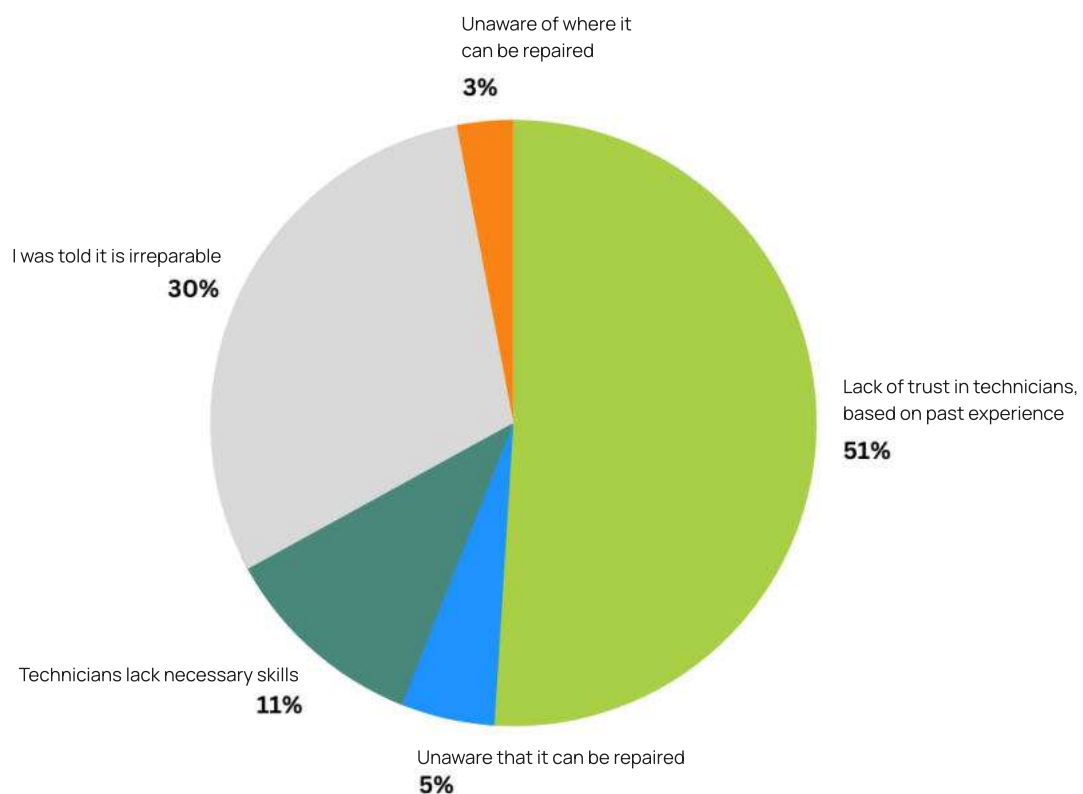


Figure 48: Reason for not repairing malfunctional/faulty EEE

Overall, 48.8% of the corporate organizations changed EEE because they had been financially depreciated or become malfunctional. Approximately 84.5% of respondents had a strong understanding of their organization's EEEE replacement pattern, while the remainder had limited (5.8%) or no understanding (9.7%). According to the respondents, their organizations replaced EEE when they became malfunctional (32.7%), after a number of years (11.2%), or both (25.2%), while others (30.8%) had no clue. Figure 49 depicts a summary of EEE in use at home/office and the amounts (percentage) malfunctioning in the last 5 years.

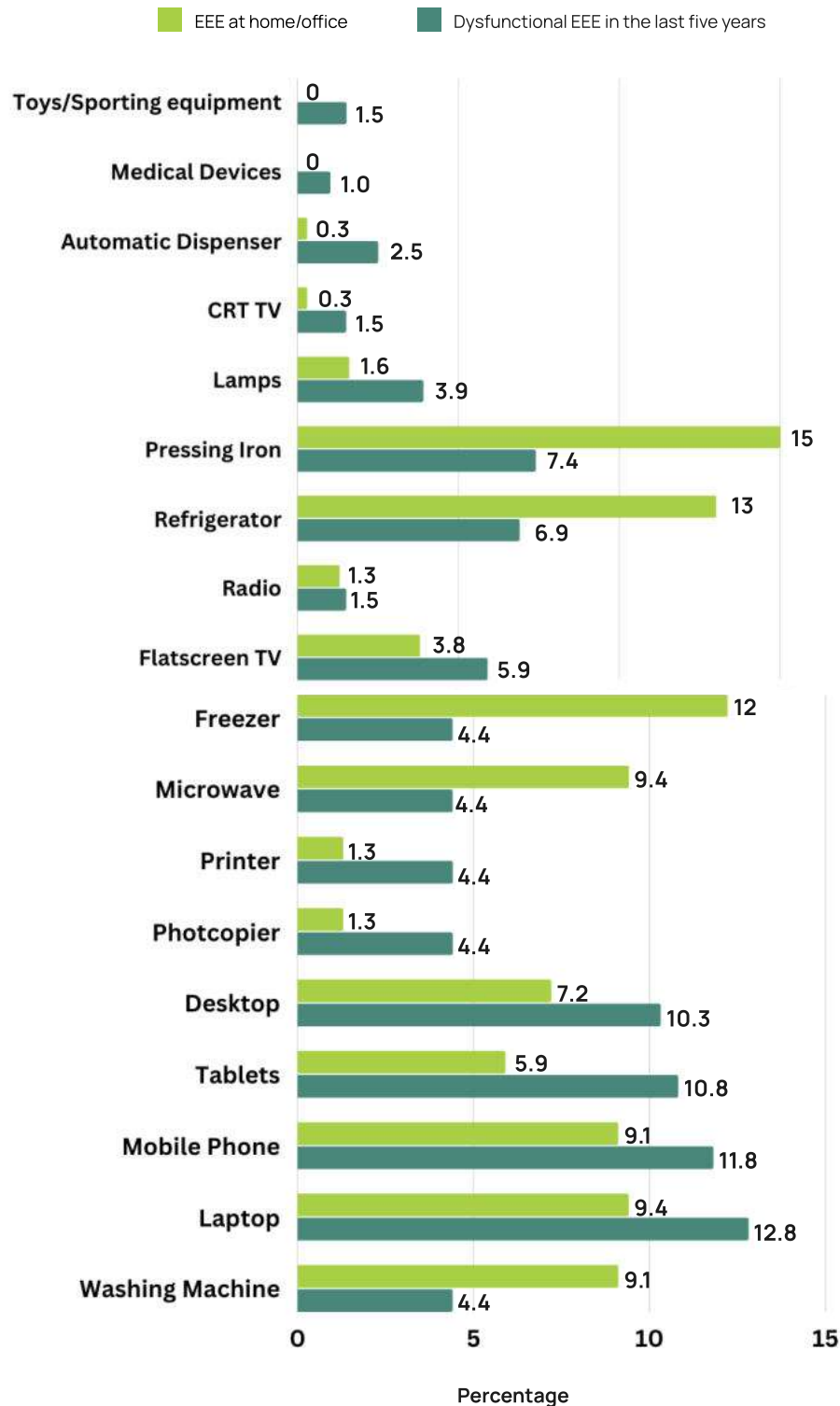


Figure 49: EEE in use at home/office and quantities (percentage) dysfunctional in the past 5 years



Respondents indicated that their Organizations would choose to repair faulty EEE (59.6%), dispose of (12.5%), or both (13.5%), while 4.8% would store faulty EEE, while 9.6% had no clue how their institution handled such devices. Most of the respondents stated that their organization repaired and reused damaged EEE, about 74.2% of businesses repaired and reused EEE. About 49.4% of respondents reported a positive post-repair experience with EEE in their organization, while 19.5% said their experience was fair. Approximately 11.5% had a bad experience repairing EEE, while 19.5% indicated no experience.

Some of the barriers to EEE repair highlighted by the organizations included lack of accredited repair centres (16.7%), delays at repair centres (26.7%), a lack of an organization's repair policy (23.3%), and experience with defective EEE not being repaired satisfactorily (33.3%). Repairing faulty EEE was effective in around 92.2% of cases. Some of the reasons given by the organizations for not bothering to fix faulty EEE included a lack of faith in the repair personnel (51.4%) and a technician's lack of requisite abilities (10.8%). Other explanations included a lack of knowledge that such devices might be successfully repaired (5.4%) and where they could be repaired (2.7%), while others reported being told that such EEE was irreparable (29.7%). The majority of the organizations (82%) did not give out malfunctioning or old EEE to staff or to charity.

For organizations that gave out malfunctioning EoL EEE, respondents identified the following options for distributing malfunctioning or old EEE to staff: auction, balloting, on request/interest, service year, family and friends, reward for hard work, and distribution to persons in charge of the unit (stores). Approximately 91% of the organizations that distributed defective and outdated devices had no policy in place to guarantee that ESM is applied when the devices reach EoL.

5.4 E-WASTE GENERATION AND MANAGEMENT BY ORGANISATIONS

Only 32 respondents provided information on their perception of e-waste (EoL EEE) management in the Nigeria. Approximately 53.1% of the respondents believed e-waste was recycled; 25.0% believed it was reconditioned; 9.4% believed it was resold; and 3.1% believed it was disposed of with domestic waste. Some respondents had no idea (25.3%) or little idea (11.6%) of their organization's practices regarding e-waste generation and management, while the majority (63.2%) claimed to have a good idea.

The study probed further to understand the level of awareness of the existing e-waste collection practices among respondents. Out of the 92 respondents, 25 identified door-to-door e-waste collection, 11 knew about the informal collection, 7 pointed out the use of existing collection centres, and 4 identified collection from dump sites. However, 37 respondents had no idea of e-waste collection practices in Nigeria, two recognised old-for-new programmes as a take-back scheme. The organizations preferred formal e-waste collection approaches including pick-up by formal collectors (43.0%), returning to producers/retailers (30.8%), drop-off by staff in charge of wastes (17.8%), or inviting e-waste collection using existing mobile app (8.4%).

To motivate consumers/collectors and recyclers to ensure proper e-waste management, the respondents recommended the use of incentives (42.5%), good governance (31.0%), payment for e-waste (25.3%), and the implementation of the old-for-new programme (1.1%). Respondents were asked to name any of Nigeria's two e-waste treatment/recycling facilities, but none of the 89 respondents could name either of the country's formal e-waste treatment facilities. While 77 respondents (86.5%) did not know, 5 (5.6%) listed EPRON as a Nigerian e-waste processing/recycling company. Others who responded suggested the Ministry of Environment, a State Municipal Board, and even UNEP as e-waste recycling facilities.

The vast majority of the respondents (78.5%) were unaware of any safe and controlled procedure/method for ESM of hazardous waste including e-waste in Nigeria. Similarly, 70.8% were unaware of any enclosed/contained and safe hazardous waste incineration plant. Only 15.8% of respondents were Organization that e-waste in Nigeria is pre-processed. When questioned about e-waste recycling (material recovery) in Nigeria, 48.7% stated that they were organization that it happens in the country. Approximately 46% of those organizations' staff polled were aware that e-waste is shipped abroad for recycling.

When requested to specify what they thought would be the solution to Nigeria's e-waste challenges, respondents felt that good governance would solve Nigeria's e-waste challenges. Among the 93 respondents who identified barriers to developing a sustainable e-waste management system in Nigeria, 27% identified bad governance, 25% lack of awareness, and 10% shortage of collection centres and recycling facilities. Figure 50 depicts some of the barriers to appropriate e-waste collection and management in Nigeria as recognized by personnel of organizations and other stakeholders. Bad governance was identified as the major challenge to ESM of e-waste.

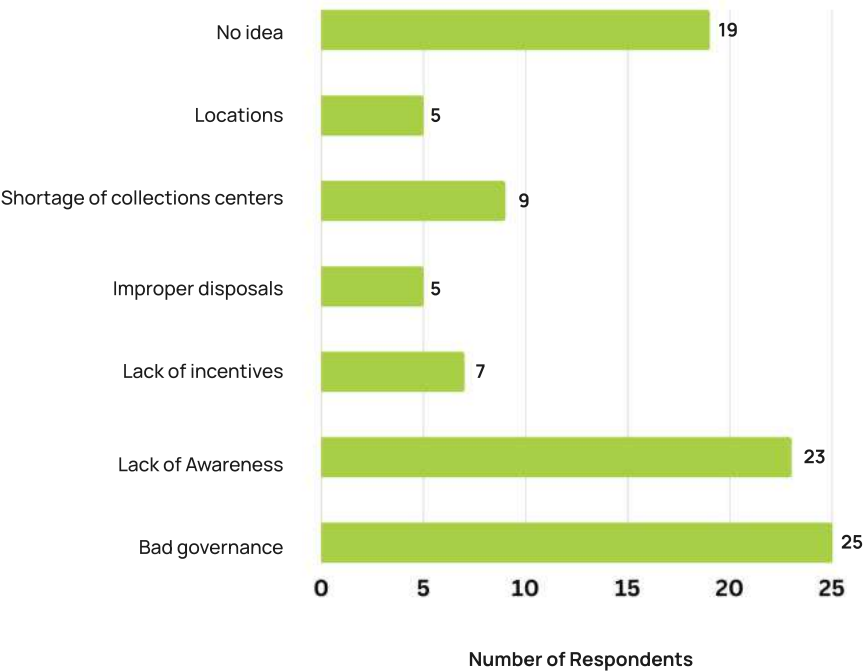


Figure 50: Challenges to proper e-waste collection and management in Nigeria

The study sought respondents' opinions on solving the e-waste problem in Nigeria. Respondents felt that good governance would solve Nigeria's e-waste challenges. Among the 84 respondents who made further suggestions for developing a sustainable e-waste management system in Nigeria, 20 advocated for better governance, 14 for more awareness, and 14 suggested the establishment of more collection and recycling facilities. The majority of respondents (33%) had no suggestions, while one advocated for EPR deployment.

SECTION 6:

CHALLENGES AND RECOMMENDATIONS



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The findings of this study indeed provide an insight into the minds of consumers across the country. They highlight their current practices and future preferences in relation to e-waste management approaches. They also shed light on the activities of e-waste collectors in the value chain. It is noteworthy to mention that most of the findings of the study had commonalities across the States with a few outliers only in very few areas. Highlighted in this section of the study are some of findings of this study that could pose a challenge to achieving a CE, ESM of e-waste, and also to the successful implementation of the EPR system. This section also highlights some recommendations to address these challenges.

6.1 CHALLENGES TO EFFECTIVE E-WASTE MANAGEMENT

- **Low Awareness of Circular Economy and the Value of ESM of E-waste among Consumers**

Even though the consumers (individuals and corporate) inherently practised quite a number of CE approaches, their knowledge of the concept was quite low, making it difficult for them to fully comprehend the value of the CE and the implication of keeping the linear model. Also, the fact that they were willing to pay more for quality products and recycle bad products provides evidence for circularity potential. While they readily repaired faulty EEE, even corporates propagated reuse by giving up their old EEE to staff and in some cases auctioned them. However, the reasons why these practices were done were not oriented towards the achievement of a CE as reflected by some of their practices. For example, consumers had preferred to be handed cash incentives before surrendering their e-waste and because of this they were very comfortable trading it with the informal collectors.

It is clear from the study findings that they were unaware that dealing with these informal operators could result in the adoption of inappropriate management practices such as open burning and dumping of hazardous fractions which result in human exposure to a mixture of toxins and also to environmental pollution/contamination. Some respondents also expressed preference for storing up EoL EEE to channelling them through available formal network that will guarantee ESM. This study observed that roughly 32% of respondents are motivated to recycle e-waste because they care about the environment. Without that level of awareness about the value of ESM and CE practices, consumers cannot be appropriately oriented towards effective e-waste management and they will keep giving it to unregulated informal collectors with their polluting practices.

- **Lack of Awareness of the Legislative Framework Guiding E-waste Management**

There was a very low awareness of the framework governing e-waste among corporate and individual consumers as well as the collectors. More than 90% of consumers were unaware that there is an ongoing EPR programme in the EEE sector, while 74% were not aware of the national regulation/law governing e-waste. In a similar vein, 61.6% of the collectors were not aware of the existing regulation, which smacks of poor public enlightenment in the sector. Expectedly, without appropriate information of the regulatory expectations, consumers' attitudes will fall short of required expectations. In the same vain collectors too will not comply. Challenges with the implementation of EPR in Nigeria are hampering the knowledge of the legislative framework.

EPRON was established in 2018 as the sole EEE PRO with a mandate that includes the establishment of a registry that will determine market shares of producers, collection of the EPR levy, and utilization of the funds to support recyclers and collectors, raise awareness, conduct research, establish standards, and support its administration. Unfortunately, EPRON's activities have been hampered by a lack of adequate take-off funds³. The implication for this is poor public enlightenment. Further exacerbating the poor public awareness is the fact that there is no programme for monitoring the effective implementation of the existing regulations.

³Exploiting Extended Producer Responsibility (Epr) Schemes For Achieving Sustainable And Sound Ewaste Management In African Cities

- **Lack of Training Among Informal Operators**

On the part of the collectors, many of them processed the e-waste that they took back from the consumers, without regard for the existing regulation which forbids such practices. Also critical is the fact that they had had no formal training either on appropriate material recovery procedures or health and safety measures as reflected by the data that 76% had no health and safety training. This invariably means that their activities will remain polluting not just to themselves but also to the environment and to other people. Also, the material recovery procedure will be sub-optimal.

- **Barriers to Repair and Reuse**

Consumers prioritized repairs of their malfunctional EEE, as expressed by 75% of the respondents who indicated that they had repaired some gadgets at least twice, another 21% had repaired the same device three to four times, and another 5% of the respondents had repaired certain EEE devices more than 5 times. Nonetheless, their ability to readily repair was hampered by some important factors such as the high cost of repairs which was sometimes almost equivalent to the cost of a new product.

Also identified as barriers were needless delays at repair centres, which could also be related to inadequate certified repair facilities and the inability of a lot of repair centres to correctly fix the devices. On the part of the corporates, some of the Organizations had a no-repair policy for EEE. A lot of them also did not purchase UEEE because it violated their business policy, or because the UEEE did not come with a warranty. Other organizations found it derogatory to purchase UEEE. These situations, if persistent, will clearly reduce the repair and reuse potential of EEE.

- **E-waste Generation Pattern and its Fate**

The e-waste generation patterns established reveal that an average of two devices were generated every five years by Consumers. A majority of these were mobile phones, followed by TV sets, pressing irons, radio sets, and freezers which were frequently used day-to-day gadgets. Given the fact that consumers were discouraged from repairing these frequently used equipment, due to the high cost of repairs and paucity of certified technicians who would readily repair these items, the malfunctional products ended up either in the hands of informal collectors as they were given up for cash incentives, or they were given away to friends and families who might give the items another lease of life; or they were simply stored away, since some consumers revealed that they safely stored lots of e-waste away.

Evidently these items will need to be replaced, thus, driving up the volume of e-waste generated. Also critical is the fact that collection centres are unavailable for consumers to take back the e-waste that they generate. These factors, namely repair barriers and the absence of collection centres do not bode well for the CE and the EPR system. They keep materials in the hands of the informal sector and give room for hoarding.

■ 6.2 RECOMMENDATIONS

- **Information Exchange and Regulatory Implementation Strategies**

Effective information exchange strategies are at the heart of behavioural change and informed decision-making. To achieve the desired consumer behaviour in relation to EEE which is rooted in the adoption of CE principles across their point of interaction with the products. From the point of purchase, to use, and its eventual fate at EoL, information dissemination programmes on the hazardous substances contained in e-waste should be made known to consumers; and should be complemented with increased awareness of CE principles. This will include awareness campaigns on the benefits of prolonging product life, switching to durable alternatives, and education and training programmes for stakeholders from the private and public sectors. For example, awareness on the approaches available for reducing e-waste generation could be initiated by EPRON.

This will encourage consumers to practise them effectively and to use the right channel for e-waste disposal which will influence their EEE purchasing decisions and general waste disposal attitude. Knowledge of the CE needs to be expertly ingrained into the larger society in a way that consumers would link their attitudes to knowledge and thus consolidate into a proliferation of CE approaches to enhance sustainable EEE consumption. Increased awareness will result in the conscious adoption and application of CE principles both in the EEE and other sectors. EPRON and NESREA should provide more information to the general public on the toxic substances contained in e-waste and their deleterious effects on health and the environment.

Also important are providing incentives for behavioural change as well as providing financial and logistical support for beneficial initiatives. For instance, EPRON could initiate approaches to work with businesses to set voluntary e-waste recycling targets. Awareness among informal operators should especially focus on the provisions of the Regulations and other government policies on e-waste with emphasis on prohibited activities.

It is especially commendable that the federal government has already developed appropriate legislative instruments such as the National Environmental (Electrical/Electronics) Regulation S.I. No 79, (of 2022) and the Guidance Document for the Electrical and Electronics sector in line with Circular Economy (CE) Approaches. Additional efforts are required in areas of enforcement of these tools across the entire value chain. Without enforcement, the desired pollution control will not be achieved. The EPR is a completely enforcement-dependent tool and will thrive only if the compliance plan is communicated to stakeholders and implemented across board through the National and relevant State environmental regulatory agencies. Enforcement also requires appropriate monitoring. Monitoring synergies between the National and State environmental regulatory agencies are very important in this regard.

• Training and Re-Training of Operators and Regulatory/Enforcement Agencies

The staff of relevant government agencies who are responsible for monitoring and enforcement should be trained on data collection and pre-processing and effective monitoring of collection/treatment facilities. Record-keeping and reporting by producers and other stakeholders (collectors/collection centres, recyclers, etc.) should be mandatory. All parties should maintain records, report the quantities of EEE POM, WEEE collected and recycled, and demonstrate compliance with regulatory requirements. This data helps monitor the effectiveness of the WEEE management system and enables policy adjustments if needed.

Training should pass on the importance of data collection and the preferred format to the collectors and collection centre operators. Periodic training programmes should also be organized for informal operators on the limits of what they are allowed to do by the regulation (e.g. no dismantling) and also on data collection and submission to regulatory agencies. More attention should be placed on organizing awareness and training in the awareness-deficit States. Beyond training the informal sector, an arrangement should be made to organize them into co-operatives linking them to specific collection centres in their areas of operations.

• Producers Should Encourage Repair/Reuse

OEMs and their representatives should make conscious and deliberate efforts to train and certify technicians to provide expert and trusted repair services across the country. They should not see repair as a form of loss of revenue based on reduced sales; they should rather view part-replacement as another source of revenue, making original parts of equipment available to facilitate repairs in a way that will enhance the transition to a CE. This study found phones, TVs, and pressing irons as the most generated e-waste types and producers of such items should improve arrangements for the collection and recycling of these products. Trading options that allow consumers to exchange products, especially for consumers who prefer certain new product versions, should be explored by retail outlets as these appear to be the options that consumers are interested in.

• Investment in E-waste Collection and Incentivizing Take-Back

Since more consumers expressed willingness to give their e-waste at the household level to informal collectors with incentives, collection models/approaches can be developed around this, considering the prevalence of informal collectors. To achieve this, collection centres should be made more accessible to encourage take-back; it should also be well publicised among consumers. More collection points, drop-off locations, and authorised treatment facilities should be established. E-waste treatment facilities should be required to meet specific environmental and safety standards to ensure the proper handling of hazardous materials. Also, incentive mechanisms should remain a tool to encourage e-waste collection among individuals and the minimum collection incentives should be set and publicised. More innovative approaches to encourage take-backs from households need to be explored by the collection centres. Government should encourage the separation of e-waste at the source.

Investment in the sector is encouraged since large quantities of e-waste are generated and many are in storage. Labour is cheap and government incentives, such as tax breaks, can be facilitated. Associations and cooperatives of collectors exist already and these will facilitate stakeholders' scoping. That about 61% of respondents would be willing to pay to encourage effective recycling of e-waste to safeguard the environment is encouraging enough for any investor.

7. CONCLUSION

This study, aimed at identifying the patterns of consumer behaviour regarding the CE as it relates to the electrical and electronic sector, has shed light on consumers' behaviour toward EEE use and e-waste generation and disposal patterns in Nigeria. The findings indicate several important aspects that need attention and action from various stakeholders, the producers, consumers, and regulatory agencies. Consumer behaviour plays a significant role in EEE generation and disposal practices. The frequent replacements of certain types of electronic devices result in e-waste generation and these are mostly channeled towards the informal operators because they offer cash incentives. The adoption of some inappropriate management channels by informal operators exacerbates environmental pollution and presents health risks to operators and residents.

The findings highlight the lack of awareness of the CE, e-waste concept, and the need for ESM among consumers and corporate organizations. Even where consumers are willing to follow the right channel for e-waste disposal, collection facilities are not readily available. The implementation of EPR is expected to fund collection and treatment infrastructure and the focus for this will be on EoL products. Repair and re-use are however time-tested methods that can advance circularity in the EEE sector; however, consumers have barriers to practising them. Manufacturers should prioritize reparability and meet their obligations by subscribing to the EPR in Nigeria and be responsible for the entire life cycle of their products, including proper disposal and recycling.

Moreover, the government's role in enforcing regulations and implementing an effective e-waste management system is crucial. Stakeholders and NGOs should introduce programmes and initiatives to promote responsible consumer behaviour and encourage EEE reuse, and proper disposal and recycling of e-waste. Considering the large amounts of e-waste generated in Nigeria, foreign investments in e-waste collection and recycling will yield good returns. Collaboration between the government, the private sector, and entities interested in e-waste business is essential for tackling this issue effectively. Private foreign entities investing in e-waste management should be given some tax waivers by the government.

Lastly, fostering a culture of sustainability and raising awareness among consumers will lead to a long-term change in attitude. Educational campaigns should focus on the environmental and health impact of improper EEE disposal, while also highlighting the benefits of responsible consumption and recycling. Encouraging the adoption of eco-friendly practices, such as repairing, donating, or recycling EEE can significantly contribute to reducing the overall environmental impact.

The recommendations in this study should be implemented in the spirit of achieving sustainable development and meeting the Sustainable Development Goals number 12 which is to attain responsible consumption and production. Expectedly, this will bring about opportunities to attain other associated benefits which will move the country further to the attainment of SDG number 13 which is climate action and SDG number 6 which is clean water and sanitation.



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ANNEXES

1. EPRON-IHS WEEE TRANSFORM PROJECT QUESTIONNAIRE FOR CONSUMERS.
2. EPRON-IHS WEEE TRANSFORM PROJECT QUESTIONNAIRE FOR COLLECTORS/PRE-PROCESSORS
3. IHS EPRON WEEE TRANSFORM PROJECT

