

## E-Waste Management in Benue State: A Case Study of Mobile Phone Wastes in Makurdi Metropolis

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### Abstract

Due to the rapid increase in population, rapid urbanization, increased technological advancement which has led to an increase in the use of Electrical and Electronic Equipment (EEE) worldwide, e-waste has become a critical environmental issue for many governments and the world. To address this challenge, this study investigates the management of mobile phone wastes in Makurdi, Benue State. Enquiries were made as to identify the sources, management and identification of those involved in phone waste management. Employing the descriptive research design using qualitative research and quantitative data in its approach through the use of semi-structured interviews conducted using questionnaires based on a sample size selected. The study explored the practices of e-waste disposal and recycling among residents to which a total of four hundred respondents were interviewed in ten (10) out of the eleven (11) council wards in Makurdi LGA. Findings revealed that 55.75% of mobile phones and accessories are sourced in the state, 29.75% from outside the state but within Nigeria and 14.5% came from outside Nigeria. A predominant reliance on informal recycling channels, with most mobile phones sold to scrap dealers (53.5%), primarily based outside the study area was also identified. The absence of formal recycling facilities within Makurdi exacerbates the issue, leading to indiscriminate dumping of phone waste. This research underscores the urgent need for a comprehensive e-waste management system in the region to mitigate environmental and health risks, recover valuable resources, and promote sustainable development.

**Keywords:** *Environmental, Recycling, Sustainable*

### Introduction

Nigeria, like many developing nations, is experiencing rapid technological advancement, particularly in the telecommunications sector. The proliferation of mobile phones has connected millions of Nigerians, driving economic growth and social development. However, this digital revolution has also generated a significant and growing challenge: e-waste (Andeobu *et al.*, 2023). Adama, *et al.* (2019) define e-waste as any electronic device that is either of the following; damaged beyond repair, whose life cycle has expired, has become obsolete, can still be used, but consequently rejected by the user. The commonality among the definitions of e-waste is that the device in question is no longer needed or useful to the initial owner.

Technically, electronic waste is only a subset of Waste Electrical and Electronic Equipment (WEEE) as defined by OECD (Organization for Economic

Co-operation and Development) as any appliance that uses an electric supply and has reached its end-of-life (Fon, 2018). According to Kuehr, *et al.* (2024), the world's generation of electronic waste is rising five times faster than documented e-waste recycling. According to Euro news, 3 Nov. 2022, Europe has the world's highest e-waste collection and recycling rate at 42.5% followed by Asia, at 11.7%, the Americas and Oceania at 9.4% and 8.8% respectively and Africa had the lowest rate at 0.9%. The monetary worth of e-waste raw materials is estimated to be \$57.0 billion. However, only \$10.0 billion worth of e-waste is recycled and recovered sustainably, offsetting 15.0 million tons (Mt) of CO<sub>2</sub> which is an important greenhouse gas that helps to trap heat in our atmosphere. Several studies have pointed out that failure to adopt appropriate recycling practices for e-waste may cause environmental disasters and health concerns to humans due to the presence of hazardous materials such as Lead,

Mercury, Nickel, Polybrominated Diphenyl Ethers (PBDE's) and Polychlorinated Biphenyls (PCB's). Burning e-waste, a common practice in developing countries, may generate dioxins, furans, Polycyclic Aromatic Hydrocarbons (PAH's), Polyhalogenated Aromatic Hydrocarbons (PHAH's) and Hydrogen Chloride. Mobile phones by weight share only a small portion of total e-waste but due to factors like toxic nature of materials used, shorter life span and high energy requirements during production and use, its environmental impact has become a matter of concern. The Greenpeace report published in 2008 also indicated mobile phones as one of the major environmental threats in terms of e-waste generation, hence the need for this project in order to bring to the front burner amongst other environmental challenges, the dangers of this small but seemingly dangerous e-waste. Mobile phones, with their short lifespan and constant technological upgrades, have become a major contributor to the e-waste crisis in Nigeria. Improper disposal of these devices pose serious environmental and health risks due to the presence of hazardous materials such as lead, mercury, cadmium, and beryllium. These toxic substances can leach into the soil and water, contaminating ecosystems and posing threats to human health (Okwu *et al.*, 2022). Furthermore, developing countries, including Nigeria, by virtue of being third world economies are disposed to being major consumers of used Electrical Electronic Equipment (Okorhi *et al.*, 2020). The informal e-waste recycling sector in Nigeria, often involving hazardous manual dismantling, exposes workers to severe health risks. Children are particularly vulnerable to the toxic fumes and materials prevalent in these informal recycling operations. The management of e-waste in Nigeria is further complicated by a lack of comprehensive regulations, limited awareness, and inadequate infrastructure for proper disposal and recycling. As a result, a significant portion of e-waste, including mobile phones, end up in landfills, dumpsites, or is illegally exported to other countries.

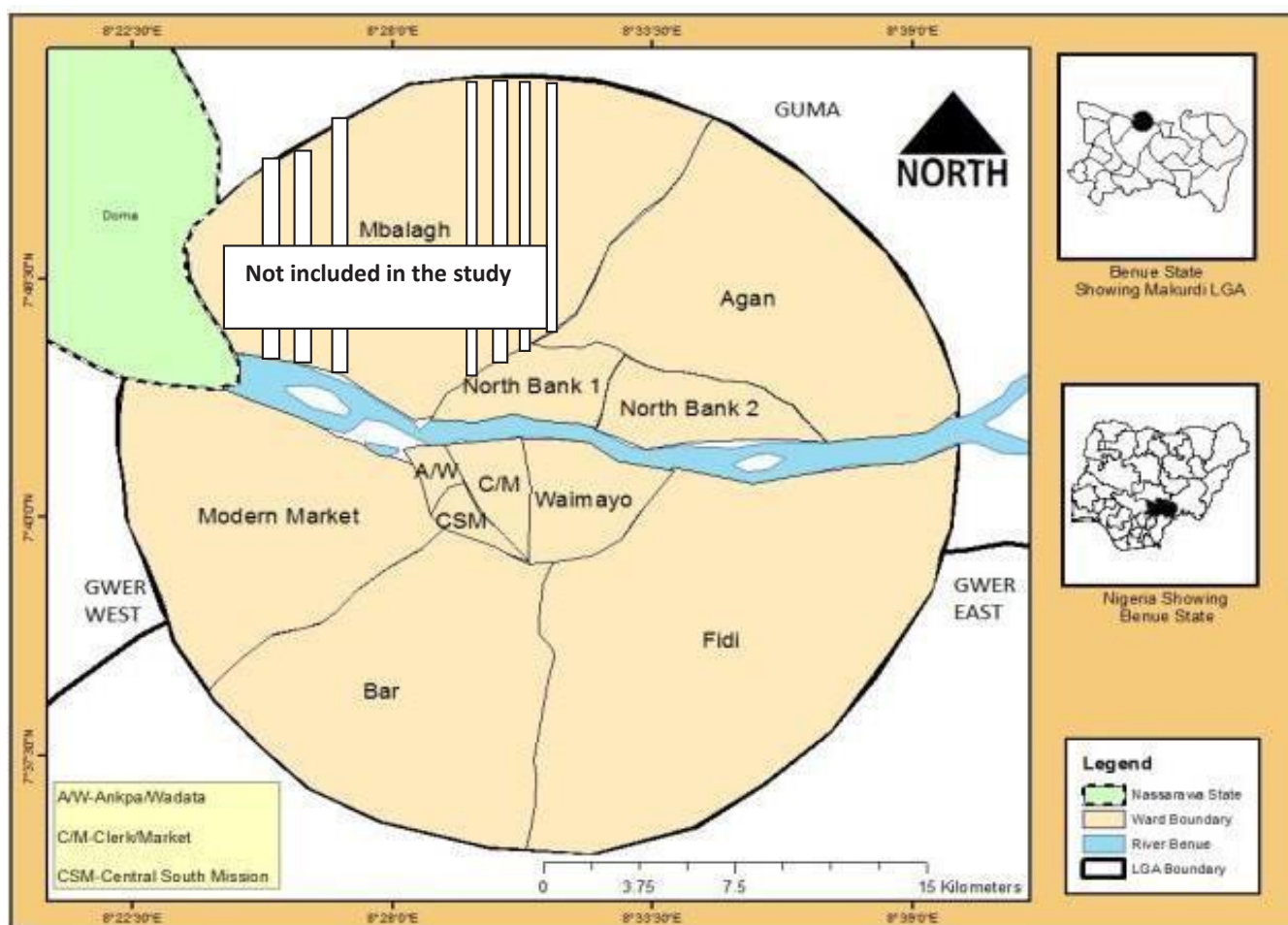
The aim of this study was to empirically examine the sources of phone waste generation in Makurdi,

Nigeria and their final destination when it reaches its end of life. The objectives of the study were to identify the sources of phone waste generation in Makurdi LGA, appraise the existing structure of phone waste management in Makurdi LGA, and identify those engaged in phone waste management in Makurdi LGA.

## Materials and Methods

### *The Study Area*

The study was carried out in Makurdi LGA which is located in North-Central Nigeria, latitude 7° 33' 00" N to 7° 47' 00" N and longitude 8° 27' 00" E to 8° 4' 00" E. The local government is bordered by Guma to the north, Gwer-east to the south, Gwer-west to the west and Doma local government area of Nassarawa State to the north-west (Figure 2). Covering 804 km<sup>2</sup> land mass in a 20km radius circle, Makurdi became the capital of Benue state in the year 1976 following the division of Benue-Plateau into two distinct states (Isma'il and Kersha, 2018). Because of its centrality and high economic activity present, Makurdi serves not just as the capital of Benue state, but also as the administrative headquarter of Makurdi local government with 11 council wards (Agan, Ankpa, Bar, Clerks/Market, Central/South Mission, Fiidi, Mbalagh, Modern Market, North-bank 1, North-bank 2, and Wailomayo wards). The study area is one of the major cities and the main location of commercial activities, serving as a local trade center harboring majority of mobile phones traded and the corresponding e-wastes. According to the 2006 census of the National Population Commission, Makurdi had an estimated population of 300,377. This is below the Nigeria Metro Area Population estimates that the current metro area population of Makurdi in 2024 is 472,000 a 3.96% increase from 2023. The town covers an area of 800 km<sup>2</sup>. It started as a small river port in 1920s and gained prominence in 1927 when it became the headquarters of Benue Province.



Source: Ikyapa et al. (2022)

Figure 1: Map of Makurdi Showing the Council Wards Visited

## Data Collection

### Field Analysis:

The data for this study was collected from ten (10) council wards in Makurdi LGA of Benue State and included Agan, Ankpa, Bar, Central South Mission, Clerk Market, Fiidi, Modern Market, North Bank I, North Bank II, Wailomayo. A structured interview (also known as a standardized interview or a researcher-administered survey) was administered to 400 respondents to obtain quantitative information.

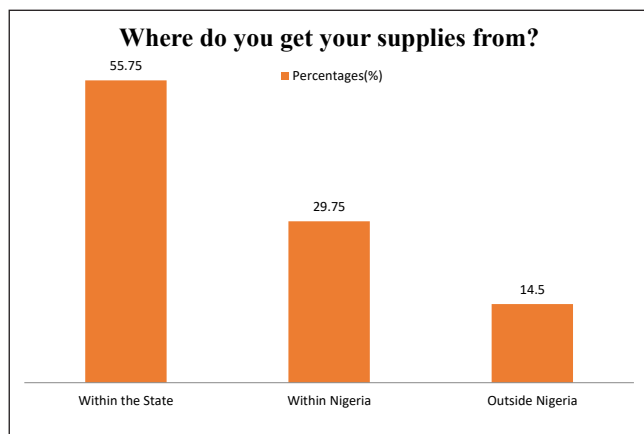
### Statistical Analysis:

The data recorded were analyzed using SPSS version 19 while descriptive statistics were used to interpret the analyzed result.

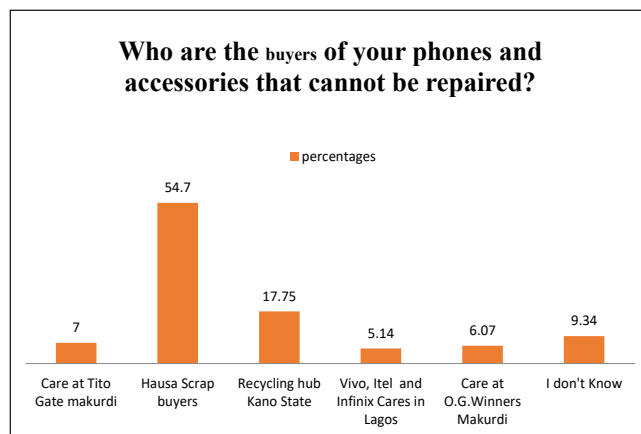
## Results and Discussion

### Analysis of Responses to the Questionnaire

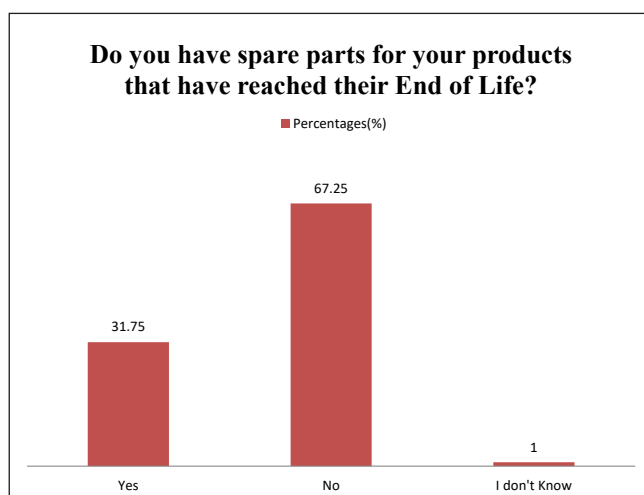
A total number of 400 respondents answered the semi-structured interview questions and the responses were meticulously analyzed and presented in the following charts in relationship with the research objective and research questions which sought to identify the sources of phone waste, the existing structure of phone waste management and those engaged in phone waste management in Makurdi, LGA.



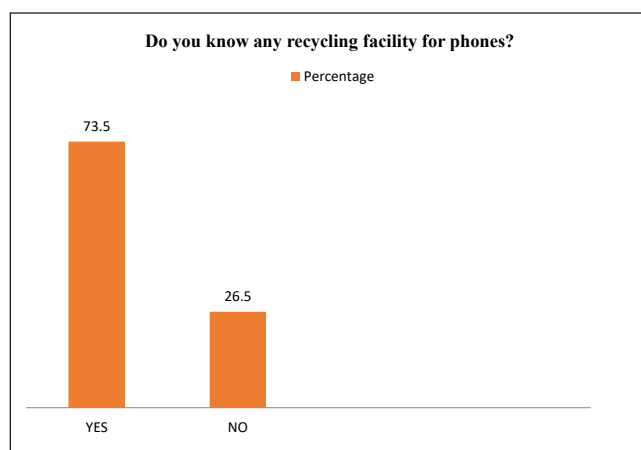
**Figure 2:** Responses on Sources of E-waste in Makurdi local government



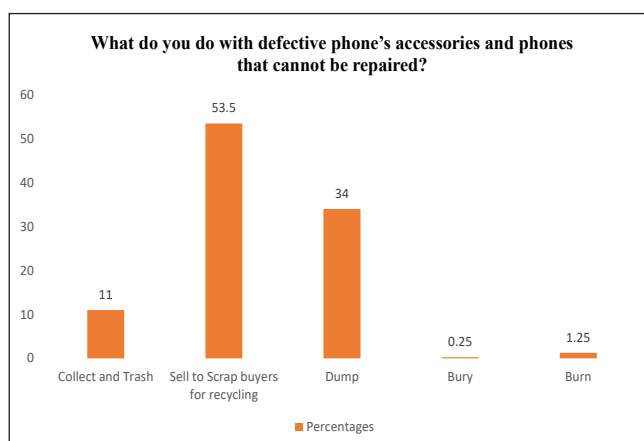
**Figure 5:** Responses on Buyers of E-waste in Makurdi local government



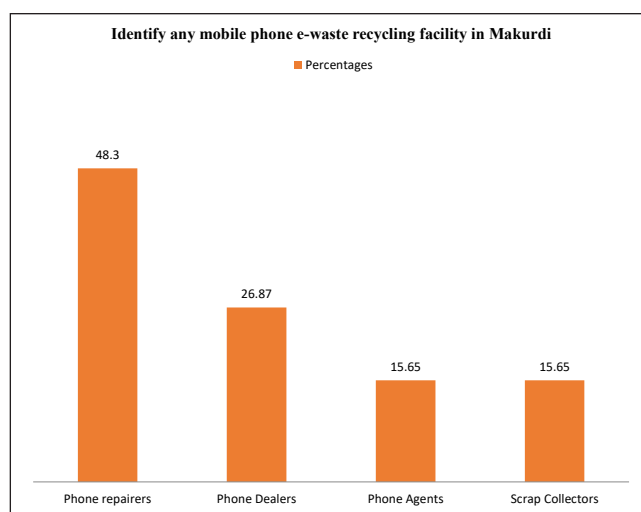
**Figure 3:** Responses on availability of E-waste in Makurdi LGA



**Figure 6:** Responses on Mobile Phone-waste recycling facilities



**Figure 4:** Responses on Disposal of E-waste in Makurdi LGA



**Figure 7:** Identify any mobile phone-waste recycling facility in Makurdi



The rapid evolution of electronic devices and the 'throwaway' habit that is being cultivated around the globe ensures that this practice will continue for a long time except drastic and determined steps are taken to address the issue. For countries such as Nigeria who lack indigenous formal recycling plants, the prevalence of manual and informal recycling will continue to be one of the means of recycling e-waste thus exposing humans and the environment to poisonous chemicals inherent in decomposing electronic devices. As observed in the study, majority of the respondents attested that they source for the materials internally within the state. This finding contradicts with the popular notion that e-wastes are mainly imported into Nigeria (Greenpeace, 2018). However, the finding corresponds to the report by Kuehr, Hirsch, and Collins (2024) whose report in Global E-Waste Monitor, 2024 who posit that as technology advances, older devices like desktop computers, laptops, televisions, and audio systems become outdated and are often discarded and the rapid proliferation of smartphones has led to a high turnover rate, with old devices being replaced by newer models. For these reasons, older phone models are constantly discarded by the teeming population in Makurdi LGA. It is also found that e-wastes in Nigeria are imported from advanced nations, evidenced by the response from some dealers of the e-wastes materials particularly mobile phones who import them from outside the country into Nigeria which corresponds to the findings of (Okwu *et al.*, 2022; Greenpeace, 2018). The findings from this inquiry revealed a rudimentary and informal system for managing mobile phone wastes. A significant portion of respondents indicated that when their mobile phones become obsolete or dysfunctional, they opt to sell them to recyclers. This practice, while seemingly contributing to a form of recycling, is often characterized by informal and unregulated processes that may pose environmental and health risks. Another common disposal method identified in the study was outright dumping of old mobile phones by both users and repair technicians. This practice is prevalent when individuals are unable to find buyers for their used devices. The indiscriminate disposal of phone waste in this

manner exacerbates the environmental pollution problem and contributes to the accumulation of electronic waste in landfills and other unauthorized dumping sites (Ideho, 2012; Bimir, 2020; Okwu *et al.*, 2022; Andeobu *et al.*, 2023).

The reliance on informal recycling and the absence of a structured e-waste management system in Makurdi underscores the urgent need for interventions. The sale of mobile phones to recyclers, while appearing to be a solution, is often accompanied by substandard recycling practices that can lead to the release of hazardous substances into the environment. Moreover, the dumping of e-waste by users and repairers highlights the lack of awareness and concern about the environmental consequences of improper disposal (Nnorom *et al.*, 2020; Okwu *et al.*, 2022).

This corresponds to findings of Ideho, (2012), which could be attributed to the lack of environmental regulation or legal framework targeting e-waste as a special waste stream in Nigeria. There are existing laws that regulate the trans-boundary movement of toxic, hazardous and radioactive wastes and the achievement of environmentally sound management of hazardous substances. However, none is specific to the presence and management of e-waste.

The majority of mobile phone wastes in Makurdi is purchased by informal buyers, predominantly identified as Hausa scrap dealers indicates a significant reliance on the informal sector for e-waste management in the state. While some recycling activities occur within Makurdi, a considerable portion of the mobile phones collected, is transported to larger recycling hubs located outside the state such as Kano and Lagos. The export of phone wastes to other regions for recycling indicates a potential loss of valuable resources and economic opportunities for Benue State.

Despite the presence of some recycling initiatives in Makurdi, such as those operated by Care at Tito Gate and O.G. Winners Plaza, these facilities appear to be relatively small-scale and unable to handle the entire volume of phone wastes generated in the area. The unsold mobile e-waste which ends up being dumped indiscriminately imply significant

contribution to environmental pollution and potential health hazards.

## Conclusion

In conclusion, the discussion highlights how the rapid evolution of electronics and a pervasive “throwaway” culture have led to an overwhelming accumulation of e-waste in Nigeria. With the absence of formal recycling facilities, especially in regions like Makurdi, informal methods—such as manual recycling and indiscriminate dumping dominate. These practices, while providing some economic activity, expose communities and the environment to harmful chemicals and pollutants. Moreover, although some mobile phone waste is sourced internally, the importation of e-waste from advanced nations further complicates the issue. The findings underscore the urgent need for a comprehensive approach: establishing formal recycling centers, launching public awareness campaigns, implementing a targeted policy framework, engaging the private sector, and enhancing research efforts. Addressing these challenges is essential not only for safeguarding health and the environment but also for unlocking potential economic benefits from properly managed e-waste.

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## APPENDIX: Phone e-waste



*Scrap phones packed for movement to recycling centers*



*Phone screen guards dumped along the roadside*



*Dismantled scrap phones*