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# Waste trading: an emerging strategy of household disposal and management of solid waste in Delta State, Nigeria

**Jomata Lucky Igben**

## ABSTRACT

This study explores the practice of waste trading as an emerging strategy of municipal waste management in Delta State, Nigeria. It aims to examine the socio-economic and demographic attributes of persons involved in the practice, typology of solid waste items traded on and the physical distances traverse by buyers. Primary data were collected from questionnaires administered on 250 sellers and 50 buyers of waste items. The multi-stage sampling technique was used to select sample of sellers. The first stage involved purposive selection of one settlement from 30 urban settlements. The second stage is the systematic random sampling of 250 households, and 50 buyers were selected by availability sampling. The questionnaire for the sellers contains information on the socio-economic and demographic characteristics of household heads and typology of solid waste traded on, while the second questionnaire covers the distance traverse by buyers. Data were analysed by use of descriptive statistics and Pearson Correlation analysis. The result revealed that a variety of solid waste items are traded on: iron/steel, aluminum and other metals (33%), plastics (32%), wood and furniture (17%), electrical and electronics wastes (13%), others (5%). In addition, there was positive and direct relationship between distance traversed by buyers and volume of waste items purchased ($r=0.394$, $p<0.05$). The study recommends enactment of laws to regulate the practice and provision of soft loans to buyers.

**Key words**: Solid waste, waste trading, itinerant chart-pushers, municipal waste management, Delta State

## 1. INTRODUCTION

Man's interaction with the various components of the physical environment results in the generation of different categories of wastes; namely, solid, liquid and gaseous, which are deposited in the environment. In this light, the United Nations (1984) refer to the environment as an ecosystem which both supplies and serves as a repository for wastes. Of these types of wastes, the most conspicuous are the solid wastes which impacts on the aesthetics of the physical environment in addition to polluting and posing health hazards to the population. The variety and volume of solid waste generated in a geographical area is dependent upon

the socio-economic and demographic characteristics of the people that constitute the population. These characteristics also define the level of rurality or urbanism of the population. Thus, a distinction can be made between the types and volume of solid wastes generated in the rural and urban areas.

Most comments and studies on solid waste focus mainly on the problems associated with disposal and management of household solid waste particularly in urban areas of developing countries, Nigeria inclusive (Piocene, 2009; Adeyemi *et al*, 2001; Ogueleka, 2009; Nabegu, 2016; Douti, *et al*, 2017). For instance, Abila and Kantola (2013) opined that the problem of solid waste in urban areas otherwise known as municipal solid waste (MSW) is primordial and a current issue in developing counties such as Nigeria as well as being a concern for human health air, water and land pollution. This is because solid waste generated in urban areas is poorly handled by individuals, households, consumers and management companies as a result of inadequate information on the benefits of waste management, lack of producers' involvement and poor implementation of government policies.

In a similar vein, Douti *et al* (2017) study of solid waste management challenges in urban areas of Ghana revealed that municipal landfill did not meet the required standard of the people as well as lack of awareness on issues regarding waste. In addition, there was indiscriminate disposal of waste by the people who viewed the local government as the sole authority charge with the duty to dispose waste. Hence, Peretomode (2018) asserted that the collection and disposal of solid waste in urban areas have become a major issue as a result of the failure of local authorities to provide waste collection services to inhabitants of their respective areas.

Zurbrugg and Shertonleib (1988) contented that municipal solid waste problems in developing countries emanates from inadequate service coverage, operational inefficiencies, limited utilization of cyclic activities, inadequate management of industrial hazard waste and inadequate landfill disposal. Furthermore, Mondol *et al* (2013) are of the view that improper solid waste management is a threat problem to the environment since it degrades our climate, modifies the environment as well as creates unsuitable situations in most developing countries. Furthermore, several studies of waste management in Nigerian urban areas such as Ayotamuno and Gabo, 2004; Ogbonna et al, 2007 and Ezeah and Roberts, 2014, indicate that solid waste management in cities; namely, Port Harcourt and Lagos Metropolis is carried by both government and private organisations and in many cases waste are deposited in open dumps, some of which are unapproved by relevant government authorities.

According to the United Nations Habitat (2018), many cities grapple with the increasing challenges of solid waste as a result of increasing urbanization, absence of technical and financial capacity or low policy priority. Moreover, the adverse effects of poor collecting methods of solid waste results in environmental pollution as well as diseases, poverty and social exclusion. Therefore, there is the need to strategize in an emerging economy to ensure sustainable development of the urban environment.

None of the above known study has considered trading on waste items as a strategy to dispose and manage solid waste. However, one common way of disposing solid waste generated by households in the study area is by selling unwanted household items to itinerant waste buyers or mobile chart pushers who take them to collection points where they are sorted, resale or further traded off to recycling plants. The sale of domestic solid waste to chart pushers and the movement of such over space has two dimensions: namely, the human and physical aspects. The human aspect composes sellers and buyers while the physical aspect comprises the items of trade which is solid waste.

Following from the above, this study considers the inter-play of the two aspects. Specifically, its objectives are (i) ascertaining the socio-economic and demographic characteristics of household heads who engage in the sale of solid wastes, (ii) ascertain the volume and typology of solid waste traded on, and (iii) determine distance traversed by buyers of solid waste. The study is hinged on the hypothesis that distance traversed by buyers is directly related to volume of solid waste items purchased.

**Theoretical Framework of Study**

This study is hinged on the expanded IPAT model proposed by Harrison and Pearce (2001), which is the broad spectrum of Population-Environment linkages. The original model by Ehrlich and Holdren (1971) considers the fact that demographic impact on the environment is a product of three factors; namely, population, consumption per person and technology. Furthermore, the factors have multiplicative impact on each other. The interaction between population and the environment, therefore, is represented as; I = P x A x T. Where I = Impact or pressure on the environment; P= Population (size, distribution and rate of growth); A = Affluence (measured in terms of consumption level of individuals); T= State of technology of the population (Ehrlich and Holdren, 1971).

The initial conceptualization of this model is considered inadequate in explaining the link between man and environmental impact but takes the amount of waste or pollution produced as a proxy for environmental damage. In many situations, an extra factor has to be added to arrive at the true damage - the sensitivity of the environment (Harrison and Pearce, 2001). The model was consequently expanded to accommodate more variables, thus;



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I = P x C x Tr x Tw x S

Where I, P and C are as used in the first equation; Tr = Technology of resources; Tw=Technology of waste management, and S = Change in the environment as a result of pollution.

The expanded IPAT model is of direct relevance to the study. The environmental impact of solid on the human population is the function of the multiplying effects of the population (urbanization), the affluence and level of the people, as measured by the level of consumption and well-being of the individuals, the state of technological advancement in the use of resources and generation and management of waste. This model underlies the need for proper management of solid waste in order to promote sustainable growth and development of urban areas; hence, this study focuses on the emerging strategy of waste selling as one of the methods of disposal of solid waste.

## 2. MATERIALS AND METHODS

**Study Area**

Delta State is one of the thirty-six political divisions or states that comprise Nigeria. It lies roughly between Latitudes $5^{0}00'$ and $6^{0}30'$ north and Longitudes $5^{0}00'$ and $6^{0}45'$ east, over an area of 22,159 square kilometres, of which more than 60 per cent is made up of land (Igben, 2012). The state is bordered in the north by Edo State, by Ondo State to the northwest, Anambra State to the east and Bayelsa State to the southeast. On its southern flank is the Bight of Benin, which covers approximately 160 kilometres of the state's coastline (Ihayere and Igben, 2020). The state is further divided into twenty-five Local Government Areas (L.G.A) as depicted in Figure 1.

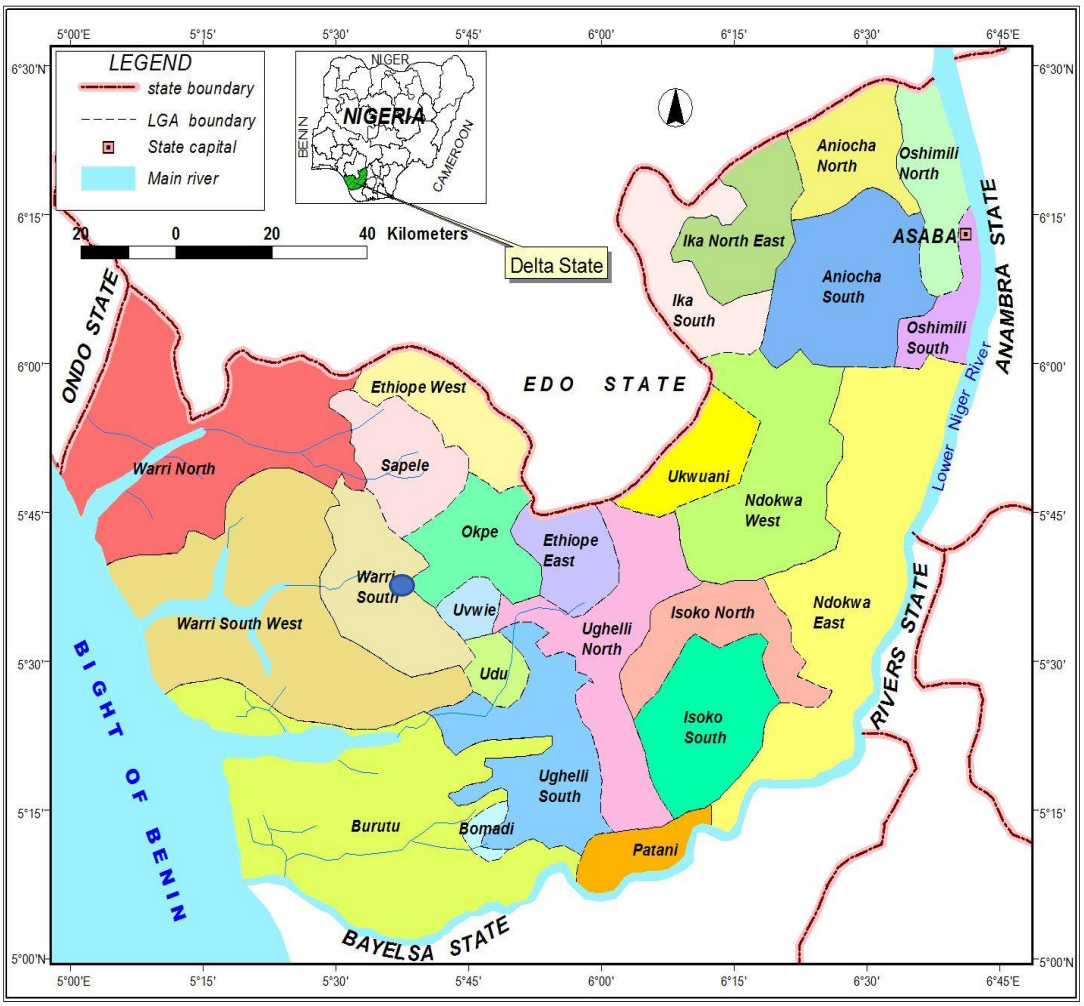


**Figure 1:** Study Area

Delta State is generally a low-lying, with the exception of the Asaba Plateau, which stretches from Agbor to Asaba. Land elevation is generally below 30 metres above sea level and vast parts of the state are either flat or gently undulating, with the land elevation decreasing towards the Atlantic Ocean. The state is drain in the western part by numerous rivers notably among them are Benin, Escravos, Warri, Ethiope, Jamieson, Forcados and Ramos, while River Niger is in the eastern flank.

Delta State has a tropical climate characterized by uniformly high rainfall and temperature throughout the year. The average annual rainfall is high, about 266.5cm in the coastal areas and 190.5cm in the extreme north. (Aweto and Igben, 2003; Igben, 2012). Temperatures are generally high throughout the year, with a mean of between $24^0$C ($75.2^0$F) and $27^0$C ($80.4^0$F). There is no significant variation between day and night temperatures. There is, however, a slight seasonal variation averaging about $25^0$C ($82^0$F) in the rainy season and $28^0$C ($82^0$F) in the dry season. Relative humidity is normally over 90 per cent in the early morning, but falls to between 60 and 80 per cent in the afternoon (Udo, 1970)

Furthermore, the state spans four ecological zones: namely, coastal barrier island or ridges, mangroves, fresh water swamp forest and lowland rainforest. However, Ikporukpo (1996) divided the zones into the outer delta and the inner delta. The former composes muddy sheltered creeks, deltas, brackish and or strong tidal waters characterized by mangrove (*Rhizophora race mosa)* as the most common plant, and the latter comprise predominantly of swamp rainforest which is not as wet. The zone comprises wet lowland evergreen rainforest in the north and mangrove forests in the south.

According to the 2006 provisional national population census, Delta State has a population of 4,098,391 persons made up of 2,074,306 males and 2,024,085 females, with close to 25 per cent of the total population living mainly in towns and cities (NPC, 2006; NPC, 1991). Apart from Asaba, the state capital, other rapidly growing towns are Agbor, Abraka, Ugborikoko, Ugbolokposo, Ugbomroro, Ebrumede and Enerhen Oghara, Warri, Ughelli, Sapele, Effurun, Ogwashi-Uku and Kwale which are located on the relatively dry, upland areas. Others are Burutu, Bomadi and Patani in the swampy riverine areas of the southern part of the state. The major occupations of the people farming, fishing, and hunting, tapping of rubber, and raffia palm, mining of sand and petroleum resources, trading and manufacturing.

**Research Design**

This study adopts the experience survey design, a type of exploratory research studies. Kothari and Garg (2019) asserts that this type of survey relies heavily on the practical experience of respondents as it relates to the problem of study. Consequently, respondents who are competent are carefully selected to ensure adequate representation of different types of desired experience. The choice of this design is predicated on the fact that both itinerant buyers and sellers of solid waste or household heads are knowledgeable about the business of waste trading and their responses will elicit more information on the problem under study.

**Population and Sample**

The target population for this study include persons engage in the buying and selling of solid waste items in Delta State. Sample for the study was derived by multi-stage sampling technique. The first stage involved selection of urban settlements where is solid waste trading is carried out. This was by identifying and listing of urban settlements in the study area. In all, 30 settlements were listed, from which one was purposively chosen. The selected settlement is Effurun in Uvwie LGA. The choice of Effurun is based on the fact that the settlement is the headquarters of the LGA and is growing rapidly by its annexation of the neighboring settlements of Ugborikoko, Ugbolokposo, Ugbomroro, Ebrumede and Enerhen; thus, forming a sprawling metropolis.

The second stage is the selection of households in the sampled settlement. This was done by first, listing the major streets and roads in the area, and second, randomly selecting three streets/roads; namely, PTI Road, Jakpa Road and Okito Street. The systematic random sampling technique was employed for the selection of households in each selected street/road. This involved a serial numbering of the households, after which the household was randomly picked. Subsequent ones were picked at a chosen interval until the total number of required sample size was achieved. A total of 250 households were in the selected settlement. Furthermore, the availability sampling technique was used to choose the sample of buyers, in which 50 buyers were selected.

Two sets of questionnaire forms were designed for the study. One meant for sellers and the other for buyers. The questionnaire for the seller were administered on household heads or the representatives. It contains information on the socio-economic and demographic characteristics of household heads who engage in the sale of solid wastes and typology of solid waste traded on. The second set was designed to collect information on the distance traverse by buyers and the volume of solid waste items traded on. In all, 250 questionnaire forms were administered on buyers or sampled household heads and 50 questionnaires on buyers.



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**Methods of Data Analysis**

Data collected for the study were summarised by the use of descriptive statistics such as means, group mean, mode, standard deviation and percentages, and presented in tables and graphs. The process of data analysis was facilitated by the use of the Statistical Package for Social Sciences (SPSS).

The hypothesis that distance is directly related to volume of waste purchased in the study area was tested using the Pearson Correlation Analysis. The test is a measure of the degree of linear relationship between two variables. In using this test, the volume of solid waste is the dependent variable (y), while distance traversed by buyers, is the independent variable (x). Moreover, the volume of waste purchased was measured by the number of chart-loads. This was done because of the heterogenous nature of the items purchase. The average size of the charts is about 2m long, 1m wide and 0.75m deep; thus, the volume of each chart is about 1.50m$^3$. The roads and distances were estimated based on the researcher's knowledge of the study area

## 3. RESULTS AND DISCUSSION

**Socio-economic and demographic characteristics of sellers**

The social, economic and demographic characteristics of the residents: sellers or household heads are age and sex composition and income status.

**Age and Sex Distribution of Waste Sellers**

Table 1 shows the age and sex distribution of waste sellers.

**Table 1**: Age and Sex Distribution of Solid Waste Sellers

| Age cohort (Years) | Male | Female | Total | Percentage |
|---|---|---|---|---|
| Less than 20 | 17 | 4 | 21 | 8.4 |
| 21 - 30 | 27 | 19 | 46 | 18.4 |
| 31 - 40 | 32 | 13 | 45 | 18.0 |
| 41 - 50 | 39 | 10 | 49 | 19.6 |
| 51 -60 | 26 | 7 | 33 | 13.2 |
| 61- 65 | 34 | 12 | 46 | 18.4 |
| Above 65 | 8 | 2 | 10 | 4.0 |
| **Total** | **183** | **67** | **250** | **100.0** |

Source: Fieldwork, 2021

Table 1 shows that 219 sellers of solid waste items, representing 87.6 per cent of the sampled population of 250 solid waste sellers were between the age of 20 and 60 years. Out of this number, 46 sellers or 18.4 per cent were in the 21 – 30years age cohort. Those between the ages of 31 – 40years and 41 – 50years were 45 sellers (18.0%) and 49 sellers (19.6%) respectively. While 33 sellers or 13.2 per cent were between 51-60 years, 21 sellers representing 8.4 per cent were below 20 years old. Only 10 sellers or 4.0 % were above 60 years. In addition, majority of 183 sellers representing 73.2% were males in contrast to 67sellers or 26.8% who were females. This finding is in line with the National Population Commission (NPC) documented Household statistics of 2000, which indicated that 83 per cent of households in Nigeria are headed by males while females headed only 17 per cent.

On the other hand, all the sampled chart-pushers or solid waste buyers were males between 17 and 32 years. Perhaps, the rationale for their relatively young age is due to the nature of jobs which involves hand pushing of charts over long distances.

**Income Status of Sellers**

Income status of household heads involved in the disposal of solid waste by selling is divided into three categories; namely, low, middle and high. Though some respondents were reluctant to estimate what they earned in a month, those who get less than fifty thousand naira (₦ 50,000.00) in a month claimed they are in the low-income class. While respondents who get more than one hundred thousand Naira (₦ 100,000.00) feel that they are in the high-income level. By implication, those who earned between fifty thousand Naira and one hundred thousand can be regarded as belonging to the middle-income group. The income status of household heads involved in the practice of solid waste selling is shown in Figure 2.



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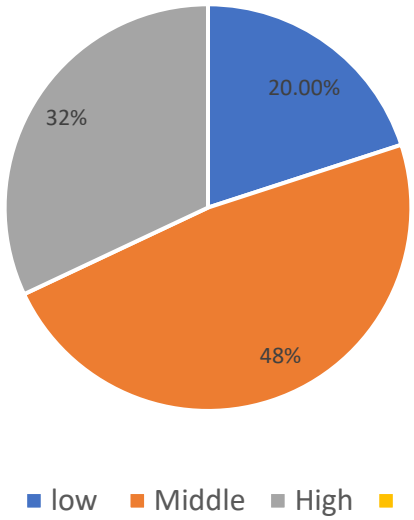
Figure 2: Income Status of Household Heads



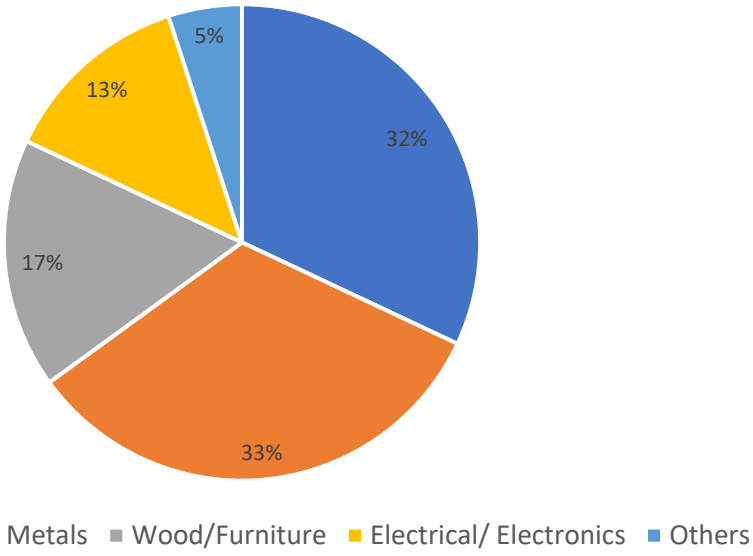

Source: Fieldwork, 2021

Figure 2 shows that 50 household heads representing 20.0 percent are in the low-income status. While 80 household heads or 32% are in the middle group, a majority of 120 household heads or 48.0% are in the high-income group.

**Typology of solid waste**

The types of solid wastes traded on in the study area are non-degradable materials such as iron and iron/steel and aluminum, metals, which constitute 33% of the total of solid waste. Others include plastics (32%), wood and furniture (17%), electrical and electronics wastes (13%), and others such as bottles, wires, ceramics bones from animals, etc. constitute 5% as indicated in Figure 3.

Figure 3: Types of Solid Waste




Source: Fieldwork, 2021



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**Distance traversed by buyers of waste**

Itinerant chart-pushers traverse distances to purchase solid waste items.

**Table 2**: Distance traversed by buyers of solid waste items

| Distance (Km) | Frequency | Percentage |
|---|---|---|
| Less than 2 | 4 | 8.0 |
| 2-4 | 3 | 6.0 |
| 4-6 | 7 | 14 |
| 6-8 | 8 | 16.0 |
| 8-10 | 6 | 12.0 |
| 10-12 | 11 | 22.0 |
| 12-14 | 7 | 14.0 |
| More than 14 | 4 | 8.0 |
| **Total** | **50** | **100.0** |

Mean Distance=9.3

Source: Fieldwork, 2021

Table 2 reveals that 4 respondents or buyers representing 8.0 % of the total sampled population of 50 buyers moved less than 2km to buy goods. While 3 respondents or 6.0% moved between 2.0 – 4km, 7 respondents or 14.0% move between 4 – 6 km. The distance between 6km to 8km and 8km -10km accounted for 8 respondents or16.0 % and 6 respondents or 12.0 % respectively. The remaining 21 respondents representing 42.0% moved more than 10km to purchase the items. Of this number, 11 respondents or 22.0% moved between 12-14km and 4 respondents (8.0%) traversed more than 14km to buy items. Due to the long distance traversed by some of the chart-pushers sometimes go beyond 14km to buy solid waste items, some of them use motor-cycle to drag the charts. The average distance moved by the itinerant solid waste buyers is 9.3Km.

**Volume of Solid waste**

The volume of solid waste purchased daily by chart pushers from sellers in the study area is presented in Table 3.

**Table 3**: Daily Volume of Solid Waste Purchased.

| Daily Chart loads | Frequency | Percentage |
|---|---|---|
| 1 | 4 | 8.0 |
| 2 | 2 | 4.0 |
| 3 | 5 | 10.0 |
| 4 | 7 | 14.0 |
| 5 | 10 | 20.0 |
| 6 | 8 | 16.0 |
| 7 | 5 | 10.0 |
| 8 | 9 | 18.0 |
| **Total** | **50** | **100.0** |

Source: Field work, 2021

Table 3 shows that a total of 50 chart-pushers were sampled for the study and the average quantity of solid waste purchased daily. Table 2 reveals that 4 respondents or buyers representing 8.0 % of the total sampled population of 50 buyers usually purchase one (1) chart-load of solid waste. While 2 respondents or 4.0% bought 2 chart-loads, 5 respondents or 10.0% bought 3 chart-loads. The volume of items bought increased steadily from 4chart-loads usually bought by 7 respondents or 14.0%, 5 chart-loads by 10 respondents, representing 20 percent. While 8 respondents or 16% bought 6 chart-loads, 5 respondents or 10% bought 7 chart-loads daily. Nine (9) respondents or 18.0% bought about 8 chart-loads daily.



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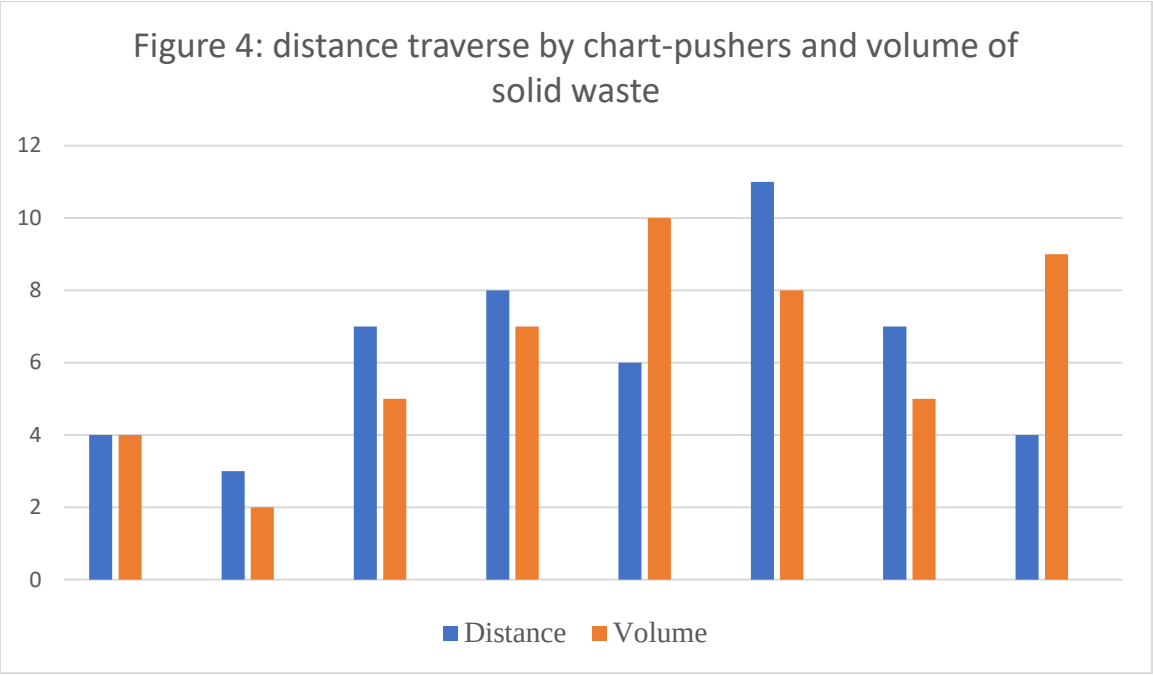


Source: Fieldwork, 2021

Figure 4 is a juxtaposition of both variables, distance traverse by chart-pushers and volume of solid waste items purchased.

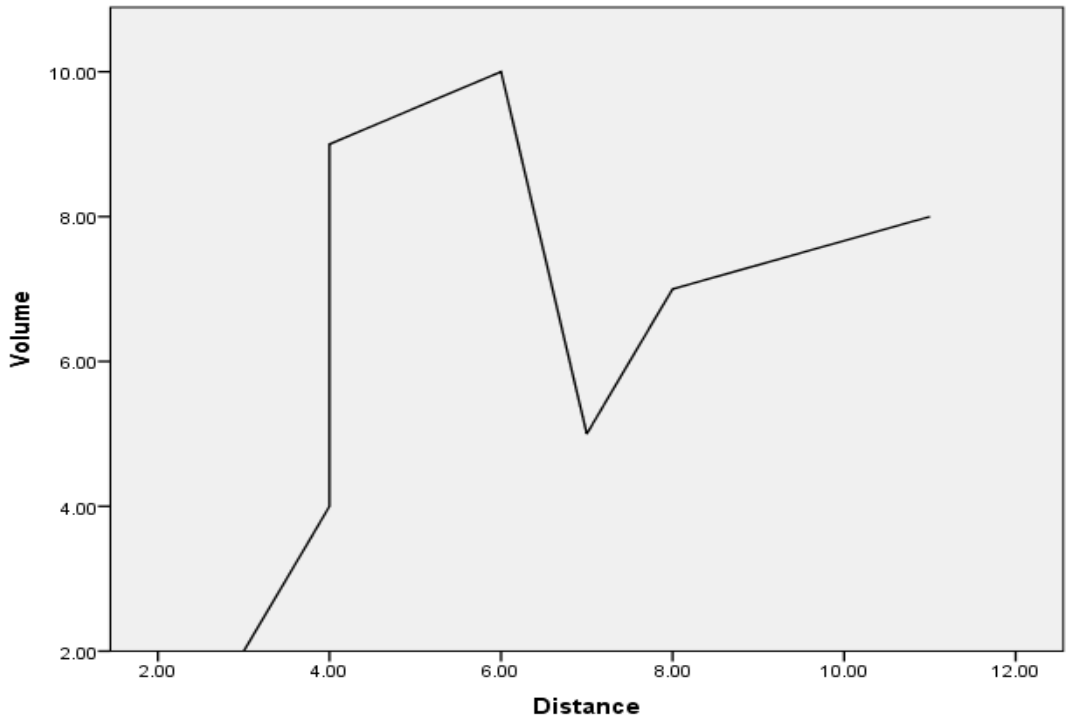


**Figure 5**: Graphical Representation of the Relationship between Distance and Volume

Furthermore, the hypothesis that the volume of solid waste purchased is directly related to distances traversed by buyers to buy trade items was tested, using the Pearson Correlation Analysis. The Correlation Coefficient (r) is 0.394, and is significant at $p< 0.05$ level of confidence as indicated in Table 4 and graphically presented in Figure 5. Thus, it can therefore be concluded that volume is positively and directly related to distance.

**Table 5:** Correlations Analysis

| | | Distance | Volume |
|---|---|---|---|
| Distance | Pearson Correlation | 1 | .394 |
| | Sig. (2-tailed) | | .334 |
| | N | 8 | 8 |
| Volume | Pearson Correlation | .394 | 1 |
| | Sig. (2-tailed) | .334 | |
| | N | 8 | 8 |

## 4. CONCLUSION

The paper brings to fore the practice of waste trading as an emerging strategy of solid waste disposal by households in the study area. It analysed the two components of the practice, namely, the human and physical aspects, by considering the socio-economic and demographic attributes of the human component and the typology, volume of solid waste and distance traversed by itinerant buyers. The study made use of descriptive and Pearson Correlation analysis. The study indicated that a variety of non-degradable solid waste items are traded on: iron/steel, metals and aluminum (33%), plastics (32%), wood and furniture (17%), electrical and electronics wastes (13%), others (5%). In addition, there was positive and direct relationship between distance traversed by buyers and volume of waste items purchased. Thus, the sale of solid waste items by households helps reduce the quantity of waste taken to dumpsite and also provide money for upkeep of households. Against this backdrop, the recommends that enabling laws should be enacted to regulate the practice of waste trading. In addition, soft loans should be made available for solid waste buyers to enhance the practice.

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**Declaration of conflicting interests**

The authors declare that there are no conflicts of interests.

**Data and materials availability**

All data associated with this study are present in the paper.

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