

## SOLID WASTE MANAGEMENT PRACTICES IN HOUSING ESTATES OF ONDO STATE, NIGERIA

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### Abstract

The study appraised solid waste management practices in Fagun residential estate Ondo, Nigeria. This is with a view to providing information that will enhance environmental friendly waste management practices in Nigeria. For collection of data, questionnaire was designed and randomly administered to 126 households residing in the study area. Findings established that majority (81.0%) of the respondents attended tertiary institutions, 18.3% have secondary/primary school qualifications while the remaining 4.0% of the respondents were not educated. Findings showed that 38.9% of the respondents make use of waste trucks, 34.9% of the respondents' practice burning/incineration method while just 0.8% dumps their waste on the vacant land. Findings revealed that the largest solid waste generated was rotten food with a mean of 4.67 and lowest solid waste generated was ashes and sticks with mean of 1.43. Findings revealed that private solid waste management service is the highest waste disposal provider in the Estate, having accounted for 82.5% of the service providers in the Estate. More effective involvement of the private sector and greater integration of the informal sector are recommended.

**Keywords:** Solid waste, management, practices, environment, Ondo

### Introduction

Solid Waste Management (SWM) is a globally challenging issue especially in developing countries, due to its adverse environmental effects. Mankind naturally depended on the environment to sustain life but solid waste is one of the three major environmental problems (other major environmental issue include flooding and desertification)" in Nigeria (Adogu, Uwakwe, Egenti, Okwuoha and Nkwocha, 2016). Many other developing and even the developed countries are equally threatened by this challenge. However, there is also the compost heaps where the refuse is left to degrade by aerobic microorganism and its used as fertilizer, then the resource recovery, a process of recovering energy and reusable materials from solid waste before decomposition or landfill (United States Environmental Protection Agency, 2012, Onibokun, 1999, World Bank, 1992). The resource was further to be utilized by the principle of 3Rs (reduce, reuse and recycle) Chaz Miller (2002). In considerable percentage of residential estate in Nigeria waste is deposited on either the roads, or roadsides, unapproved dumpsites, in waterways drainage system, or in open sites, which adversely affect environmental friendliness (Kadafu, 2017).

According to the United Nations Conference on Human Settlement report (2017), one third to one-half of solid waste generated within most cities in low and middle income countries, were

not collected. They usually ended up as illegal dumps on streets, open spaces, and waste lands (UNEP-IETC, 1996, RiziJr, 2001, USEPA, 2002). "The rapidly growing rates of waste generation, high cost of waste disposal, depletion of landfill space and the problem of obtaining new disposal sites which often resulted in open dumping" were unresolved issues (Afon, 2007). It has become necessity due to the problem of waste management to have an overview to examine the current state and challenges in this regard. Abuja Environmental Protection Board (Wahab, 2012) has the sole responsibility of solid waste management in some residential estate in the Federal Capital Territory (Dauda and Osita, 2003; Elelumu, 2016).

Solid waste management (SWM) refers to the collection, transfer, treatment, recycling, resources recovery and disposal of solid waste in an environment. The goals of solid waste management are to promote the quality of the urban environment, generate employment and income, and protect environmental health and support the efficiency and productivity of the economy. According to Agunwamba, Egbunie and Ogbwueleka (2003) "the volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to" parallel this growth". The main purpose of solid waste management is to minimize the adverse effects of solid waste on the environment. Its processes involved are collection, disposal and utilization of solid waste. Gathering of solid waste includes collection of the waste, transporting it to a centralized area, and then transporting it to the site for disposition (Ogbwueleka, 2003).

The collected waste is then sorted into harmful and non-harmful materials, before the terminal disposal of the solid wastes, it is processed to reclaim the disposable materials and to enhance the effectiveness of the solid waste disposal system. The key processing technologies are compaction, incineration, and manual division. The suitable solid waste disposal procedure has to be chosen, keeping in view the objectives of a wholesome environment and not constituting a health menace. It should not cause harmful environmental effects or result in horrible sight, odor and noise.

Solid waste management has appeared as one of the most difficulty facing state and local government environmental protection agencies in Nigeria. The volume of solid waste produced in urban areas of industrialized nations is greater than in developing nations; still municipal solid waste management remains insufficient in the latter. Solid waste in developing countries is at variance with that of developed nations. Most developing nations, Nigeria, inclusive have solid waste management challenges different from those found in developed nations in areas of composition, density, political, and economic framework, waste amount, access to waste for collection, awareness and attitude. However, wastes are heavier, wetter and more corrosive in developing cities than in developed cities (Ogbwueleka, 2009; World Health Organization, 2012)).

According to Akpu, Robert and Abbas (2005) the environment is also affected in that if solid wastes are not treated properly, decomposition and putrefaction may take place, causing land and water pollution when the waste products percolate down into the underground water bodies. The organic solid waste during decomposition may generate obnoxious odours". Archana (2009) stated that solid waste management is a major responsibility of State and Local Government, and environmental agencies. The agencies are responsible for handling, employing and disposing of solid waste generated. The State agencies source funds from subventions for state governments and internally generated revenue through sanitary levy and stringent regulations with weighty punishments for offenders guilty of unlawful dumping and littering of refuse along streets and residential zones (Hoornweget, Thomas and Otten, 1999, WHO, 2007, Zubugg, 2003). But despite all the efforts and initiatives, the management of waste continues to pose different challenges.

Therefore, this study seeks to assess the best way solid waste management practice can be carried-out in Fagun residential estate of Ondo towards providing a better way of solid waste collection, and disposal, as well as proposing an institutional framework that will help the government agency to attain a better solid waste management structure in Nigeria.

### **Study Area**

Ondo is one of the major urban centres in Ondo state. The town is located on latitude  $7^{\circ}6'10.0180''N$  and longitude  $4^{\circ}50'30.0984''E$ . The town is bounded to the north by Oluji/Okeigbo local government, to the east by Idanre local government, to the west and south by Odigbo local government. The population projection of the town stood at 389,900 during the 2006 population census. Ondo falls within the tropical wet and dry climate with a short period of dry season. Consequently, rainfall in Ondo is seasonal in character with well-marked wet and dry seasons (Yoade, Adeyemi and Onifade, 2018).

The dry period comes between November and February, while the wet season lasts for 8 months; from March to October; the mean annual rainfall is about 1561mm, the annual mean temperature is  $27^{\circ}C$ , with a maximum of  $30^{\circ}C$ . Ondo topography is made up of generally fluctuating hills of granite outcrop of igneous source, and is marked by few dome-shaped hills. These hills were found to be developed over the basement complex of metamorphic rocks with their summits ranging between 250 and 500 meters above sea level (Akintola 1982). The town has no considerable river; rather it is drain into many streams with fairly broad flood plains. The most important of these streams are Luwa, Lisaluwa, and Mode. The town falls within the moist/wet lowland forest, i.e. it has thick forested vegetation, but due to human activities, most of these original forests have been replaced with secondary re-growth such as post extraction secondary forests and post-abandoned secondary forests.

### **Methodology**

Data for the study were obtained from both primary and secondary sources. For collection of primary data, the set of questionnaires was distributed to the respondents that are drawn from the head of the household in the study area. The population for this study consists of all the residents of Fagun Residential area of Ondo. Therefore, the total of 1263 buildings unit of Fagun residential estate forms the basis for sampling this study. Systematic random sampling was used to select the sample. Every twentieth building (10%) was selected after the first building had been randomly selected. Thus, a total of 126 copies of questionnaires were administered.

A total of 126 household heads were selected for questionnaire administration. Data collected included but was not limited to the resident's socio-economic characteristics, types of waste frequently generated, methods of waste disposal and agencies involved in waste management of the residential estate. Close ended questionnaires were designed for this study. They were structured in a way to reveal solid waste management in the residential area of Fagun Estate, Ondo, Nigeria. Data collected included but was not limited to the resident's socio-economic characteristics, types of waste frequently generated, methods of waste disposal and agencies involved in Waste management of the residential estate. In the process of examining the questionnaires, the researcher interpreted the question to those who are not literate and helped them in-filling their questionnaires based on their responses.

Tables were used in presenting the data for the purpose of simplicity and clarity.

This is mathematically expressed as:

$$SRV = \sum_{i=1}^5 x_i y_i \dots\dots\dots (1)$$

Where:

SRV= Summation of Rating value;

$x_i$ = number of respondents to rating  $i$ ;

$y_i$ = the weight assigned to a value ( $i=1, 2, 3, 4, 5$ ).

The index for each likely cause thus takes a value of between 1 and 5. The nearer the value to 1, the higher is the significant on waste management.

$$SL = \frac{SRV}{\sum_{i=1}^5 x_i y_i} \dots\dots\dots (2)$$

Where: SL = Significant Level

Also, data for qualitative method in this study were collected through In-dept. Interviews (IDIs). The Community Development Association leaders were targeted for the interview. Information on the addresses of Community Development Association leaders were obtained from the local government (Ondo West Local Government) councils in the study area. In other words, those leaders that were contacted and interviewed in this study were those who formally registered with the local government in the study area. Sources of secondary data included journals, conference proceedings, unpublished thesis and books. Data collected were analyzed using Statistical Package for the Social Sciences, version 17. Also, both descriptive (tables, pictures, charts, cross tab, agreement index) and Likert scales were used to analyze the data collected.

## Results and Discussion

### Socio-economic background

The gender distribution of the respondents in this study area is contained in table I. Findings revealed that 34.1 % of respondents are male while 65.9% were female. This implied that women engaged more than their male counterparts in the cooking and housekeeping activities and this was reflected in the result of the analysis. The table revealed the age distribution of the respondents with the highest being those between the ages of 45 years and above amounting to 54.8% and those between the ages of 18-25 amounting to 13.6%. The summary of data collected and analyzed on the marital status of the residents was presented in table I. Findings established that Singles have 14.3%, Married 82.5%, Divorced 0.8%, Widowed 0.8% and Separated with 1.6%. Still on table 1, majority (81.0%) of the respondents attended tertiary institutions, 18.3% have secondary/primary school qualifications while the remaining 4.0% of the respondents were not educated. The implication of this is that more of the educated elites resides this part of Ondo city more in residential estate (low density area) than other zones of the town. This could be attributed to their social status as well as the fact that they were high income earners in the study area.

The findings revealed the type of houses which were found in the study area. Findings established that 31.0% were bungalows, 24.6% were duplex, 27.0% were flat storey buildings and 17.5% were

flat bungalows in the study area. The result of the analysis was not surprising as majority of the dwellers of that estate were high income earners therefore most of the buildings in the study area were products of new technologies and designs. The table 1 showed that 48.9% earned between one hundred to one hundred and fifty thousand naira on monthly basis. Next to this are those who earn over two hundred thousand naira. This income group accounted for 23.0% of the respondents while 3.2% of the Fagun residents earn between fifty and a hundred thousand naira on a monthly basis. This means that the estate was inhabited by middle and high income earners in the country. For example, minimum price for a plot of land in that estate will not cost less than a million naira which low income earners might not be able to afford. The findings revealed the type of ownership of the house that respondents have. Majority (69.8%) of the houses were occupied by owners while 28.6% of the respondents were tenants in the study area. According to a Yoruba tradition, building a house is a form of status symbol in the society and it a sign of prestige among one's contemporary. Therefore, majority of the buildings in the study area were built by the respondents and amazingly many of them were residing outside the Ondo town (Table I).

**Table I. Socio-Economic Characteristics of Respondents**

| Socio-Economic Characteristics | Number | Percentage |
|--------------------------------|--------|------------|
| Level of Education             |        |            |
| Not educated                   | 1      | 4.0        |
| Primary/Secondary school       | 23     | 18.3       |
| Tertiary school                | 102    | 81.0       |
| Age                            |        |            |
| 18-25                          | 5      | 13.6       |
| 26-35                          | 15     | 11.9       |
| 36-45                          | 37     | 29.4       |
| 45 and above                   | 69     | 54.8       |
| Type of Building               |        |            |
| Bungalow                       | 39     | 31.0       |
| Duplex                         | 31     | 24.6       |
| Flat Storey                    | 34     | 27.0       |
| Flat Bungalow                  | 22     | 17.5       |
| Ownership                      |        |            |
| Owner Occupier                 | 88     | 69.8       |
| Rented                         | 36     | 28.6       |
| No Response                    | 2      | 1.6        |
| Gender                         |        |            |
| Male                           | 43     | 34.1       |
| Female                         | 83     | 65.9       |
| Marital Status                 |        |            |
| Single                         | 18     | 14.3       |
| Married                        | 104    | 82.5       |
| Divorced                       | 1      | .8         |
| Separated                      | 1      | .8         |
| Widow                          | 2      | 1.6        |

| Income            |    |      |
|-------------------|----|------|
| 50,001-100,000    | 4  | 3.2  |
| 100,001-150,000   | 7  | 5.6  |
| 150,001-200,000   | 85 | 67.5 |
| 200,001 and above | 29 | 23.0 |

Source: Field Survey, 2017

### **Methods of Storage and Disposal**

Findings showed that 38.9% of the respondents make use of waste trucks, 34.9% of the respondents' practice burning/incineration method while just 0.8% dumps their waste on the vacant land. The reason for this development is that majority of the residents were educated and were concerned about their environment. Likewise, they are very careful in disposing their waste not anyhow, that is why there was a low percentage of respondents who disposed their waste by the road side (Table II).

**Table II. Methods of Storage and Disposal**

| Variables                   | Frequency  | Percentage   |
|-----------------------------|------------|--------------|
| Burning/ Incineration       | 44         | 34.9         |
| Waste trucks                | 49         | 38.9         |
| Designated building         | 5          | 4.0          |
| Private solid waste manager | 5          | 4.0          |
| Dump in drainage            | 6          | 4.8          |
| Vacant land                 | 1          | .8           |
| Barrow/cart pushers         | 12         | 9.5          |
| Burying                     | 2          | 1.6          |
| Nearby bush                 | 2          | 1.6          |
| In stream/river             | -          | -            |
| On the road                 | -          | -            |
| <b>Total</b>                | <b>126</b> | <b>100.0</b> |

Source: Field Survey, 2017

### **Pattern of waste disposal**

Findings revealed that 58.3% of the respondents made use of housekeepers to dispose their waste; 15.9% made use of children; 15.1% are men while 10.8% are women. The reason for a high number of respondents engaging the services of house help was that the estate is predominated by affluence/wealthy in the society therefore those housekeepers assist them in cooking and in the general upkeep of the house. The result of this analysis indicated that some households share duties in their respective houses, this may be true as some families engaged their wards in the various duties carried out at their house and some occupant of some houses might not be resident in town and in such situation housekeepers perform such duties. Findings also revealed that 78.6% of the respondents did not segregate their waste materials while the remaining 21.4% of the respondents sorted out their waste materials. On how frequently they disposed their waste, 82.7% of the respondents disposed their waste on a weekly basis; 12.7% of the respondents disposed their waste twice in a week while 2.4% of the respondents disposed their waste on a daily basis.

The frequency of waste collection is very important to the safety of the environment. Results showed that 82.5% disposed waste once in a week, 12.7% disposed waste every three days while 4.8% disposed waste everyday. Information contained in Table III showed that the most prominent duration of waste storage before disposal is between 5-7 days. This could be linked to the fact that the waste disposal operators do collect waste items on a weekly basis. Respondents who claimed to store and dispose their waste items at a longer duration could be those who do not generate much waste items or those that are not always available during their visits (Table III). The predominant of waste disposal was 74.6% while the least was street and drainage (4.0%).

**Table III. Pattern of Solid Waste Disposal**

| <b>Variables</b>                             | <b>Frequency</b> | <b>Percentage</b> |
|----------------------------------------------|------------------|-------------------|
| <b>Persons that dispose solid waste</b>      |                  |                   |
| House keeper                                 | 74               | 58.3              |
| Children                                     | 19               | 15.9              |
| Wife                                         | 13               | 10.3              |
| Husband                                      | 20               | 15.1              |
| <b>Sorting of solid waste</b>                |                  |                   |
| Yes                                          | 99               | 78.6              |
| No                                           | 27               | 21.4              |
| <b>Frequency of waste disposal in a week</b> |                  |                   |
| Every day                                    | 6                | 4.8               |
| Every alternate day                          | 16               | 12.7              |
| Once in a week                               | 104              | 82.5              |
| <b>Facilities used for disposal</b>          |                  |                   |
| Government facilities                        | 19               | 15.1              |
| Private contractor                           | 94               | 74.6              |
| Streets and drainage                         | 5                | 4.0               |
| Others                                       | 8                | 6.3               |
| <b>Total</b>                                 | <b>126</b>       | <b>100.0</b>      |

Source: Field Survey, 2017

### **Waste Storage**

The findings from the survey showed that various storage receptacles were utilized in the study area. These include covered refuse bin, metal container/drum, plastic container, jerry can, abandoned buckets, paper cartons and nylon/polythene bag. Information contained in the Table above showed that the waste storage receptacle mostly used in the area is the covered refuse bins representing 42.1%, 14.3% for metal drum, 10.3% for plastic container, 9.5% for jerry can, 26.2% for abandoned bucket, 15.0% for paper cartons and 20.6% for nylon polythene bag. The use of covered bins would reduce the pollution and health risk attached to waste storage systems. Flies and other harmful insects are often attracted to waste bins if they are not covered (Table IV).

**Table IV. Waste Storage**

| Materials           | Low          |               |
|---------------------|--------------|---------------|
|                     | Number       | Percent (%)   |
| Covered refuse bin  | 53           | 42.1          |
| Metal container     | 18           | 14.3          |
| Plastic container   | 13           | 10.3          |
| Jerry can           | 12           | 9.5           |
| Bucket              | 33           | 26.2          |
| Paper cartons       | 19           | 15.0          |
| Nylon/polythene bag | 26           | 20.6          |
| <b>Total</b>        | <b>**174</b> | <b>100.00</b> |

**Note:** \*\*Higher than total respondents because of multiple responses

### Challenges of Disposing Waste

Findings revealed that irregular solid waste collection by waste management trucks, ranked topmost with 46.8%; 36.5% of the respondents stated that non-availability of collection center while 4.0% of the respondents believed to be poor attitude on the part of the inhabitants of the area (Table IV).

**Table V. Challenges of Disposing Waste**

| Variables                      | Frequency | Percentage |
|--------------------------------|-----------|------------|
| Non-availability of collection | 46        | 36.5       |
| Irregular waste collection     | 59        | 46.8       |
| Poor attitude                  | 5         | 4.0        |
| Improper disposal of waste     | 16        | 12.7       |
| Total                          | 126       | 100        |

Source: Field Survey, 2017

### Composition of Waste Generated

In order to determine management of solid waste in Fagun Estate, Ondo, Nigeria, respondents were provided with a list of likely causes identified in the literature. They were further instructed to kindly indicate type of waste generated in the study area. Respondents were to express their opinion using one of the three Likert scales of very significant (VS) 'significant' (S); 'Indifferent' (I), 'Insignificant' (IS) and "very insignificant" (VI). The analyses of the ratings indicated by the respondents from the Liker's scales adopted evolved into an index called "Significance Level" (SL). To arrive at SL, weight value of 1, 2, 3, 4 and 5 were respectively attached to very significant 'significant'; 'Indifferent', 'Insignificant' and "very insignificant". The index for each factor was arrived at by dividing the Summation of Rating Value (SRV) by the total number of responses. The SRV for each factor was obtained through the addition of the product of the number of respondents to each factor and the respective weight value attached to each rating.

Presented in Table V, is the summary of the waste composition in Fagun Residential Estate. Findings revealed that, there were different solid waste types in the Estate. The largest solid waste generated is rotten food, with the mean frequency ratio of 4.67. The implication is that Fagun Estate is a purely residential area and therefore cooking. Accumulation of rotten food form larger parts of waste generated because food is cooked everyday. Next to this, are nylon waste materials with a mean frequency value of 4.60. Other significant waste types generated in the study area based on their mean frequency values include: paper 4.82, leather materials 3.95, rags and old

clothes 3.95, sand and dust 3.76, etc. The least generated waste are ashes and sticks with an average rate of 1.43.

**Table VI. Level of Agreement**

| Level of Agreement (% N=126) |          |          |          |          |           |            |      |
|------------------------------|----------|----------|----------|----------|-----------|------------|------|
| Types of waste generated     | VIF (%)  | I (%)    | N (%)    | F (%)    | VF (%)    | Mean score | Rank |
| Nylon                        | 1(.8)    | 5(4.0)   | 3(2.4)   | 25(19.8) | 92(73.0)  | 4.6032     | 2    |
| Paper                        | 6(4.8)   | 5(4.0)   | 6(4.8)   | 3(2.4)   | 106(84.1) | 4.5714     | 3    |
| Tin/container                | 45(35.7) | 28(22.2) | 32(25.4) | 20(15.9) | 1(.8)     | 2.2381     | 13   |
| Rotten food                  | 0(0)     | 0(0)     | 5(4.0)   | 31(24.6) | 90(71.4)  | 4.6746     | 1    |
| Leader materials             | 10(7.9)  | 23(18.3) | 1(.8)    | 30(23.8) | 62(49.2)  | 3.9603     | 4    |
| Plastic                      | 45(35.7) | 23(18.3) | 40(31.7) | 8(6.3)   | 10(7.9)   | 2.4048     | 11   |
| Sand and dust                | 25(19.8) | 1(.8)    | 10(7.9)  | 32(25.4) | 58(10.3)  | 3.7698     | 6    |
| Bottles and glass            | 58(46.0) | 23(18.3) | 12(9.5)  | 20(15.9) | 13(10.3)  | 2.3413     | 12   |
| Rags and old clothes         | 11(8.7)  | 6(4.8)   | 11(8.7)  | 48(38.1) | 50(39.7)  | 3.9524     | 5    |
| Home appliances              | 47(37.3) | 50(39.7) | 6(4.8)   | 10(7.9)  | 13(10.3)  | 2.1429     | 15   |
| Dead leaves and grass        | 6(4.8)   | 5(4.0)   | 70(55.6) | 33(26.2) | 12(9.5)   | 3.3175     | 8    |
| Animal dung and wastes       | 5(4.0)   | 21(16.7) | 61(48.4) | 6(4.8)   | 33(26.2)  | 3.3254     | 7    |
| Aluminum                     | 40(31.7) | 10(7.9)  | 51(40.5) | 11(8.7)  | 14(11.1)  | 2.5952     | 10   |
| Spray can and metal corks    | 5(4.0)   | 23(18.3) | 66(52.4) | 11(8.7)  | 21(16.7)  | 3.1587     | 9    |
| Dead insects and wastes      | 25(19.8) | 70(55.6) | 10(7.9)  | 11(8.7)  | 10(7.9)   | 2.2143     | 14   |
| Ashes and sticks             | 78(62.0) | 39(40.0) | 6(4.8)   | 2(1.6)   | 1(.8)     | 1.4324     | 16   |

Source: Field Survey, 2017

### **Agencies Responsible For Managing Waste in the Estate**

From the summary presented in Table VI, findings revealed that private solid waste management service is the highest waste disposal provider in the Estate, having accounted for 82.5% of the service providers in the Estate. Next to this is non-Governmental agencies which accounted for 7.9% of all the waste service providers. Furthermore, local government and landlord union were also not left out in waste disposal activities in the Estate. While local government activities accounted for 7.1%, the proportion of landlord union activities in waste disposal is 2.4%. Findings therefore, show that the activities of landlord union are the least of the waste disposal activities in the Estate. It could be observed in the study area that the environment is very neat and serene enough for good living conditions. This could be attributed to the attitude of the inhabitants of the study area because they are very sensitive to the environmental situation of the area. This is demonstrated in the way they engaged the services of private solid waste management to dispose their waste.

**Table VI. Waste Disposal Facilities and Facilities Provider Cross tabulation**

|                         |           | Facility Provider |                         |                                |                | Total |
|-------------------------|-----------|-------------------|-------------------------|--------------------------------|----------------|-------|
|                         |           | Local Govt        | Non-Governmental Agency | Private Solid Waste Management | Landlord Union |       |
| Waste disposal facility | Frequency | 9                 | 10                      | 104                            | 3              | 126   |
|                         | %         | 7.2               | 7.9                     | 82.5                           | 2.4            | 100   |

Source: Field Survey, 2017

However, In-Dept. Interview (IDI) report on pattern of solid waste disposal revealed majority of the respondents did not sort their waste before they dispose their waste materials. This is because no discussant reported to have separate waste storage facilities in their area.

Nearly all the discussants in the study reported that they used private contractor for the disposal of their waste materials. An IDI discussant in the study area, who happens to be High Chief in Ondo Kingdom, corroborated this. He said that “state government did not provide necessary facilities for waste disposal’ making them to engaged private contractor in this respect.” Nearly all of the discussants in the study area were also of this opinion.

On frequency of waste disposal in the study area, IDI reported that they dispose their waste once in a week in the area. Similarly, few among the discussant affirmed that they disposed their waste materials on a daily basis in study area.

On challenges of disposing waste, middle aged woman who was among the interviewed discussant said that irregular waste collection id one of the major challenges confronting them in the study area. She stated that since they rely majorly on private contractor, they may decide to come any day of the week not necessarily at a regular interval. An extract from an in-depth interview with the community leader corroborated this. According to him;

“It was the state government that initiated central collection of solid waste in the area and therefore all cost and expenses were paid by them. Along this line, when they were not forth coming, we have to engage private contractors for the disposal of the solid waste materials.”

On a specific note, lack of coordination and expertise on waste management issues by the environmental agencies and other organs of Government promote inefficiency. This could be why Agunwamba, Egbunie and Ogbwueleka (2003), Afon (2007) and Adogu, Uwakwe, Egenti, Okwuoha and Nkwocha (2016) argued that effective and efficient management of waste is more than an individual issue, all stakeholders must be involved.

## **Conclusion**

The study assessed solid waste management practices in housing estate in Nigeria and is general towards proposing an institutional framework that could improve the waste management situation. This study thus provides an in-depth understanding of the dynamics of SWM practices

and has established factors underpinning the attitudes of the residents towards waste. The study has also evaluated the factors that could enhance the SWM practices of the residents, revealing their interrelationship, driving and dependency powers.

### **Recommendations**

Based on the findings of the study, the following recommendations are suggested which could help in achieving a satisfactory solid waste management in housing estate of Nigeria. All stakeholders should be involved in the process. Governments at all levels (Federal, State and Local) are encouraged to provide waste storage and disposal facilities to the neighborhood for proper disposal of waste materials. Also, there should be periodic collection of waste at the regular interval. Residents are advised to dispose their waste regularly not necessarily for them to wait till the end of a week before they dispose their waste. The public should be educated on danger of burning solid waste materials as it contributed to global warming which results to climate change. More effective involvement of the private sector and greater integration of the informal sector are recommended. Strict enforcement of laws should be ensured. Administrative penalties for minor violations should be taken seriously. The laws on sanitation should be enacted in such a way that every occupier is required to monitor and ensure that their house and surroundings are clean.

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