# OPERATIONAL FACTORS AFFECTING PUBLIC-PRIVATE PARTNERSHIP (PPP) IN SUSTAINABLE SOLID WASTE MANAGEMENT IN LAGOS METROPOLIS

**Ilechukwu, V.U.**and**Aminu, T.O.**
Dept of Urban and Regional Planning
University of Lagos
**Correspondence**: vicilechuks124@yahoo.com

**Abstract**
This study examines the extent to which household characteristics, attitudes, lack of remuneration and behavioural factors have affected the effectiveness and sustainability in solid waste management by the public private partnership (PPP) operators. Using Multi-stage sampling technique, structured questionnaires were administered on 274 households in low, medium and high population density areas. Descriptive and inferential statistics were used to analyse the data. The study revealed that the most challenging factors are the household use of polythene bags or sacks (38.38%) instead of the conventional wastes containers and none or poor remittance of the fees (49.20%) by service users, which affects the frequency of waste collection. The Chi-square results confirm that there is significant difference between the frequency of waste collection and effectiveness in waste management (waste storage and payment of service fees) [$X2\ (12) = 293.38$, $p < 0.05$] by the PPP operators. The conclusion is that the use of polythene bags or sacks and non-remittance of service fees are the critical factors affecting the efficient and effective operation of PPP in solid waste management. Therefore, conventional waste storage containers and adequate remittance of fees by the households are recommended to improve the operations of PPP for a sustainable solid waste management.

**Key words:** Operational Factors, Public Private Partnership, Sustainability, Solid waste management, Lagos metropolis

## Background and Statement of Problem

Millennium Development Goals (MDGs) will soon be replaced with similar development paradigm, known as Sustainable Development Goals (SDGs), which aim at integrating six essential elements of dignity, people, prosperity, planet, justice and partnership to overcome the various development challenges in Africa. One of such challenges is inadequate solid waste management. Partnership is considered a veritable tool for achieving sustainable development. The combined impact of population growth, rapid urbanization, technological development and the increase in living standards has led to increase in the global generation of waste and it has created numerous challenges for the government, its agents and the authorities in charge of solid waste management. The volume of waste being generated daily is significantly increasing in the cities of developing countries, while the capacity and effectiveness of municipalities in providing municipal solid waste services remains undesirably low, (UN-HABITAT 2003, Medina, 2010).

From a logistical perspective, local authorities are responsible for the collection, management and disposal of household waste either by establishing contracts with companies to provide the services or by providing those services themselves. Owing to the inability of the public sector to provide adequate waste management system, some of the most influential

organizations such as World Bank and United Nations Environmental Program (UNEP) have recommended private sector involvement in the waste sector. This framework is known as Public-Private Partnership. The system has recorded success in the US, Canada, Hong Kong, Morocco, Ecuador, Ghana and other places (Cointreau-Levine, 2000) and its on-going in various places in Nigeria including, Lagos, Ibadan, Onitsha, and a few other places (Ogunwolere, 2000). With a daily influx of over 2000 people generating about 2 tonnes solid waste, Lagos definitely faces overwhelming environmental problems (Ekpete & Macbeda, 2014), which the public sector alone cannot solve.

Public private partnerships (PPPs) have been identified as an efficient instruments to promote solid waste management at the municipal level (Nyachhyon, 2006). The public-private sector partnership helps to leverage the strength of both parties in managing waste in the state and through this partnership, licensed organizations were empowered to collect and manage refuse in order to complement the efforts of the government. The role and intervention of the private sector in municipal solid waste management is growing rapidly in the country but nonetheless, there are still some shortfalls which are evident from our day to day interaction with our environment.

Effective management of solid waste is to ensure that wastes are being collected and disposed at the right time to avoid it constituting nuisance, becoming an eyesore and posing health and environmental threat. Proper management of solid waste is critical to the health and well-being of urban residents (World Bank, 2003). This is what the public sector has not been able to achieve and it is a major problem especially for the vulnerable population groups. Although effective collection system not only depend on the authorities in charge, it also depends on the cooperation of households and individuals in various sectors of the city in providing containers for storing refuse in accordance with the regulation and regularly placing the materials for collection (Afon, 2007).

Past studies have identified some of the challenges experienced by the PPP operators which have had negative impacts on their service delivery and effectiveness. For example, Louigueur (2007) reported that the solid waste management services are not carried out properly with the deficiencies ascribed to poor road infrastructures such as bad road condition and poor or no accessibility. Similarly, in most cities of developing countries a significant percentage of the population especially the low income groups does not have access to waste collection service (Cointreau, 2007; Khatib, 2010; UNHABITAT 2003 & Zurbrugg 2003). Furthermore, one other key challenge is that some PSP (PPP??) operators do not have the necessary equipment to handle the volume of waste being generated (Michael, 2010). More wastes are being produced and the available PPPs do not have the capacity to collect the growing volume of waste as a result of inadequate facilities and also poor strategic plan. This implies that the PPP has failed to effectively collect waste from households. It is against this failure that the problem of the study is to examine the extent to which household characteristics, attitudes, behavioural factors and lack of remuneration has affected the effectiveness in waste management by the PSP operators. The aim is to examine the factors that affect the operations of public private participation in solid waste management in Lagos state.

**Literature Review**

The body of literature and knowledge about the administrative, technical, and institutional facet of waste management and the incorporation of the public-private sector in the

management of waste is in abundant. Rodgers, (2011) contends that waste management is a systematic control of generation, storage, collection, transportation, separation, processing, recovery and disposal of solid waste. According to Faccio, Persona and Zanin (2011), urban waste collection has been an exclusive municipal service, which involves huge expenditures and difficult operational problems because it is expensive to operate in terms of investment costs, operational costs and environmental costs. Public private partnership is a long or medium term arrangement between the public and private sectors whereby public sector transfers part of its responsibilities to the private sector (World Bank, 2011).

The public-private participation is a good solution to the solid waste management. It gives benefits to both the public and the private sectors in terms of dynamism, finance, knowledge of technologies, managerial efficiency, and entrepreneurial spirit combined with the social responsibility, environmental awareness, local knowledge and job generation concerns of the public sector(Ahmed & Ali, 2004). On the other hand, UNESCAP argued that public private partnership itself is not a solution option for the service delivery problems but rather a viable project implementation mechanism for a desired solution option (UNESCAP, 2011).

Studies have identified factors such as lack of equipment, poor road infrastructure and income density type, institutional arrangement, that affect the operations of PPP, ignoring household characteristics, attitudes, lack of remuneration and behavioural factors. Jayaratne (2010) noted that Colombo Municipal Council, in Sri Lanka has 38 compactor trucks, 50 tractor and trailers, 323 loaders and handcarts and several waste compactors, bull dozers, tippers and skip hoist trucks but Colombo municipality face problems to collect waste effectively in entire city due to the fact that most waste collection vehicles are well past their useful life and are in need of repair or replacement. But after collaboration with the private sector, municipalities were able to collect more waste because the private sector invests more money and acquire improved technologies and share resources such as vehicles.

Louigueur (2007) have reported that the solid waste management services are not carried out properly with the deficiencies ascribed to poor road infrastructures such as bad road condition and poor or no accessibility. Similarly, in most cities of developing countries a significant percentage of the population especially the low income groups does not have access to waste collection service (Cointreau, 2007; Khatib, 2010; UNHABITAT 2003 & Zurbrugg 2003).

Furthemore, Louigueur, (2007) examined a single case in CESPA in Tangier, Morocco. It was also observed that residents in high income areas are better served than those in poorer districts. Louigueur concluded that CESPA failed to provide a homogenous solid waste service and the effectiveness in delivering its service is rather inconstant over the whole duration of the contract. Evidently, not all households are being serviced by the operators especially in the low income or squatter settlements (Rahul & Chari 2010).

Agyepong (2011) reported barriers to private sector participation in waste management in Ghana to include regulation framework, public attitude, rapid urbanization and poor planning, capacity of human resources, finance, weak research support and politics. The report recommended that increase participation of the policy and supervisory roles of public service, the need for improved legal and regulatory instruments, introduction of incentive schemes such as subsidies, confessional loan and tax incentives, recognition of waste as a great economic resource, reform to land acquisition and urban planning, and public education to improve solid waste management.

Mohammed (2012) reported that in many developing countries, over the few decades partnership is taking more significant role in infrastructure development and providing services regarding solid waste management while government ownership has declined. The report revealed that, if there is no good supportive environment, then the partner has difficulty to manage the waste leading to failure in the project.

Clear and well-defined institutional framework is important for solid waste management due to the complexity of the waste management system and the involvement of many actors (Da Zhu et al. 2008). Obirih-Opareh & Post, (2002, p.100) recognized that "the institutional arrangement that has materialized in a particular area depends on numerous factors, including wealth, physical characteristics, strength of community organization, and prevailing policy of the local authorities" Furthermore, "an institutional arrangement might be viewed as financially workable if it can sustain itself" (Obirih-Opareh & Post, 2002, p.100). According to Ikiara, *et al* (2004), partnerships between local authorities and other agents (the private sector, NGOs and communities) to facilitate sharing of solid waste management responsibilities and financial burden, operate in an environment of open competition, with little or no cooperation from the municipal authority

Arising from the review, it is obvious that issues of household attitudes and behaviour as well as remuneration fees affecting PPP operations are ignored. Hence, the need to examine the extent to which the operations of PPP in solid waste management are affected by these factors.

**The Study Area and Research Methodology**

The study area is Lagos Metropolis with focus on Eti Osa, Surulere and Alimosho local government areas (see Figure 1). These areas were chosen based on density classification. Eti Osa local government is a low density area while Surulere and Alimosho are medium and high density areas respectively. Eti Osa L.G.A has population of 1,215,531 people while Surulere and Alimosho L.G.As have population of 1,574,929 and 2,574,450 respectively.

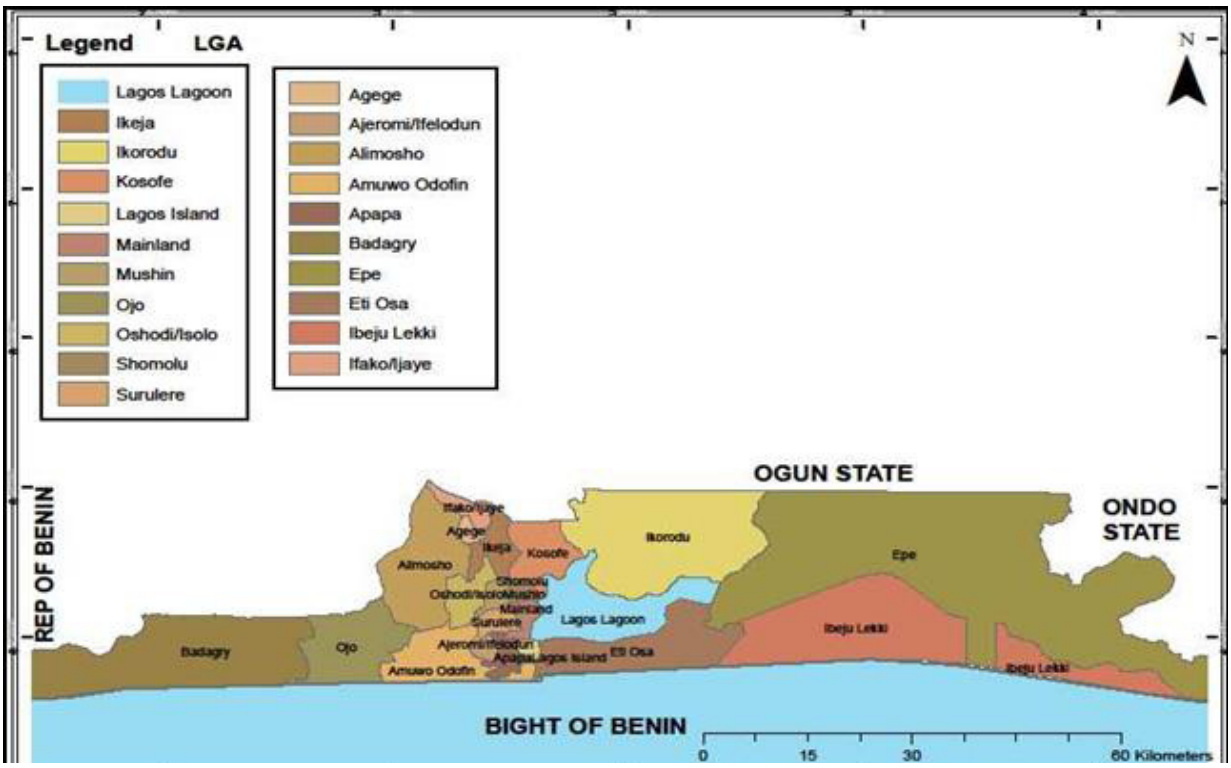


Fig. 1: Lagos State Local Government Areas including the Study Areas. Source: LASU Cartography Department, 2014

Waste management in Lagos is the responsibility of the municipal authority. The state generates an estimate of 12,000 tonnes of waste on a daily basis with LAWMA charged with the responsibility of its management, through the private sector partnership scheme (Oresanya, 2014). LAWMA's mandate is to handle public waste collection, disposal and clearance of backlog of waste while domestic and commercial waste collection and disposal are handled by the accredited PSP operators. The dominant means of waste collection include the house to house, communal depots, kerbsides collection, bell system, carting system, etc. but still major streets and corners in Lagos are littered with wastes. These have been attributed to poor road infrastructure, lack of equipment and poor institutional framework. However, in addition to these factors, the contention of this study is that household characteristics, attitude, behaviour and none or poor remittance of service fees also affect the operations of PPP in the waste management and hence the littering of the wastes. This is what the study intend to investigate using this research methodology.

The study adopted a household survey approach drawing on sustainability concept and the fact that sorting of wastes is very resourceful. Using a multi-stage sampling technique, Lagos metropolis was first classified into low, medium and high population density Local Government areas and one Local Government area from each density zone selected based on population size. Therefore, Eti Osa, Surulere and Alimosho L.G.As were selected out of the 16 L.G.As in Lagos metropolis. Major wards in each of this chosen L.G.As were selected in the second stage by simple random sampling and thus 5 wards each in Eti Osa and Surulere as well as 13 wards in Alimosho were selected. In the third stage, streets were selected in the chosen wards based on their grades and hence 44, 66 and 164 streets were chosen in Eti Osa,

Surulere and Alimosho L.G.As respectively. Finally, in every chosen street, household each is randomly selected for the administration of questionnaire (see Table 1).

A structured questionnaire was administered on 274 households determined by Cochran formula, to collect data on their socio-economic characteristics, waste collection and disposal, service fees as well as the overall performance of the service providers. In addition, interviews were conducted with the PPP operators as well as LAWMAN for responses on the subject matter, specifically on factors affecting their operations

**Table 1: Sampling Procedure and Sample size Distribution**

| Density Type | Selected L.G.As | Total Households | Sampled Households | Selected wards | Selected streets | Questionnaire per street | Total questionnaire administered |
|---|---|---|---|---|---|---|---|
| Low | Eti Osa | 67,607 | 44 | 5 | 44 | 1 | 44 |
| Medium | Surulere | 101,780 | 66 | 5 | 66 | 1 | 66 |
| High | Alimosho | 257,445 | 164 | 13 | 164 | 1 | 164 |
| **Total** | | **426,832** | **274** | **23** | **274** | | **274** |

Source 1: Lagos Bureau of Statistics, 2012
Source 2: Lagos State Waste Management Authority, 2013
Source 3: Authors' survey, 2014

Descriptive statistical tools such as frequency distribution and percentages were used to describe the variables in the tables while inferential tool like the Chi-square test was used to measure the differences and associations in the variables.

**Data Analysis and Results**

Data were collected on the socio-economic characteristics of the households, utilisation of PSP services, truck facilities and adequacy, waste storage and disposal methods, frequency of waste collection, waste collection fees and remittance, effectiveness of PSP; and analyzed using both descriptive and inferential tools in order to reveal the problems affecting PPP in solid waste management in Lagos metropolis.

The major findings on the socio-economic characteristics show that the respondents are mostly female (55.80%), married (70.40%) with secondary education (50.00%), self-employed (64.20%) that earn between 0 – 30,000 naira per month (See Table 2). The relevance of these findings is mainly because of the domestic roles of women in the households and a reliable source of data collection on waste storage and disposal methods, collection fees as well as the frequency of waste collection by the PSP operators, which would have influence on their attitudes and behaviour. Particularly, the low earnings per month are issues on regular and prompt payment of the services provided by the operators.

**Table 2: Socio-economic Characteristics of the Households (n = 274)**

| Characteristics | | Density Classification | | | Total |
|---|---|---|---|---|---|
| **Gender** | | **High Density** | **Medium Density** | **Low Density** | |
| Male | Frequency | 58 | 37 | 26 | 121 |
| | % of Total | 21.20 | 13.50 | 9.50 | 44.20 |
| Female | Frequency | 106 | 29 | 18 | 153 |
| | % of Total | 38.70 | 10.60 | 6.60 | 55.80 |

| | | | | | |
|---|---|---|---|---|---|
| **Marital Status** | | | | | |
| Single | Frequency | 36 | 26 | 17 | 79 |
| | % of Total | 13.10 | 9.50 | 6.20 | 28.80 |
| Married | Frequency | 127 | 39 | 27 | 193 |
| | % of Total | 46.40 | 14.20 | 9.90 | 70.40 |
| Separated | Frequency | 0 | 1 | 0 | 1 |
| | % of Total | 0.00 | 0.40 | 0.00 | 0.40 |
| Widow(er) | Frequency | 1 | 0 | 0 | 1 |
| | % of Total | 0.40 | 0.00 | 0.00 | 0.40 |
| **Education** | | | | | |
| Primary | Frequency | 6 | 1 | 0 | 7 |
| | % of Total | 2.20 | 0.40 | 0.00 | 2.60 |
| Secondary | Frequency | 104 | 25 | 8 | 137 |
| | % of Total | 38.00 | 9.10 | 2.90 | 50.00 |
| Tertiary | Frequency | 52 | 38 | 36 | 126 |
| | % of Total | 19.00 | 13.90 | 13.10 | 46.00 |
| None | Frequency | 2 | 2 | 0 | 4 |
| | % of Total | 0.70 | 0.70 | 0.00 | 1.40 |
| **Employment** | | | | | |
| Civil servant | Frequency | 4 | 4 | 0 | 8 |
| | % of Total | 1.50 | 1.50 | 0.00 | 2.90 |
| Private sector | Frequency | 13 | 17 | 26 | 56 |
| | % of Total | 4.80 | 6.20 | 9.50 | 20.50 |
| Self employed | Frequency | 134 | 27 | 15 | 176 |
| | % of Total | 48.90 | 9.90 | 5.50 | 64.20 |
| Retired | Frequency | 4 | 2 | 1 | 7 |
| | % of Total | 1.50 | 0.70 | 0.40 | 2.60 |
| Unemployed | Frequency | 9 | 16 | 2 | 27 |
| | % of Total | 3.30 | 5.80 | 0.70 | 9.90 |
| **Income per month(Naira)** | | | | | |
| 0 – 30,000 | Frequency | 127 | 29 | 5 | 161 |
| | % of Total | 46.40 | 10.60 | 1.80 | 58.80 |
| 30,001–60,000 | Frequency | 26 | 8 | 4 | 38 |
| | % of Total | 9.50 | 2.90 | 1.50 | 13.90 |
| 60,001–90.000 | Frequency | 8 | 13 | 2 | 23 |
| | % of Total | 2.90 | 4.70 | 0.70 | 8.40 |
| 90,001- | Frequency | 3 | 3 | 4 | 10 |
| 120,000 | % of Total | 1.10 | 1.10 | 1.50 | 3.60 |
| Above 120,000 | Frequency | 0 | 13 | 29 | 42 |
| | % of Total | 0.00 | 4.70 | 10.60 | 15.30 |

Source: Field survey, 2014

On the utilisation of the PSP's services for waste disposal, 73.7% of the respondents make use of the services of the PSP operators to dispose their households' wastes while 25.5% do not utilise PSP services. Only 0.70% does not have any idea of services provided by PSP operators as shown in Table 3. The rationale behind the non-usage of the PSP could either be as a result of the bad roads or due to non-remittance of fee by the residents. The increase in the use is an indication of awareness of availability of PSP services in solid waste

management. This is confirmed by the average range of 3 – 4 trucks available that serve each of the density areas, which has been considered adequate (90%) by the operators. However, the more the number of trucks available, the greater would be the efficiency of service

**Table 3: Utilization of PSP Services**

| Use of PSP services | | Density Classification | | | Total |
|---|---|---|---|---|---|
| | | High Density | Low Density | Medium Density | |
| No idea | Frequency | 1 | 0 | 1 | 2 |
| | % of Total | 0.40 | 0.00 | 0.40 | 0.70 |
| Utilizes PSP | Frequency | 103 | 44 | 55 | 202 |
| services | % of Total | 37.60 | 16.10 | 20.10 | 73.70 |
| Does not utilize PSP | Frequency | 60 | 0 | 10 | 70 |
| services | % of Total | 21.90 | 0.00 | 3.60 | 25.50 |
| Total | Frequency | 164 | 44 | 66 | 274 |
| | % of Total | 59.90 | 16.10 | 24.10 | 100.00 |

Source: Field survey, 2014

To ensure ease of waste collection by the PSP operators, an appropriate means of waste storage should be ensured by the use of a waste container (with lid) which is seen as the most sanitary means of storing waste. Residents have adopted various ways of temporary storage of waste in the study area. Table 4 shows the different storage system adopted by the respondents, which revealed that 15.30% of the respondents use the LAWMA waste containers, 56.30% use polythene bags/sacks, 9.1% use buckets and 18.6% use open drums while 0.7% uses other means of waste storage which includes a dedicated space within the compound. The use of polythene bags and other means without cover lids help in the littering of wastes, thus compelling the operators not to collect the littered wastes, thereby deteriorating the environment. Despite these challenges, 74.10% of the wastes are disposed by PSP operators, 19.30% by Cart pushers while 4.70% and 1.90% are disposed by burning and at dump sites by the households.

**Table 4: Methods of Wastes Storage**

| Method of Storage | | Density Classification | | | Total |
|---|---|---|---|---|---|
| | | High Density | Medium Density | Low Density | |
| LAWMA | Frequency | 9 | 20 | 13 | 42 |
| container | % of Total | 3.30 | 7.30 | 4.70 | 15.30 |
| Polythene | Frequency | 126 | 22 | 6 | 154 |
| bags/Sacks | % of Total | 45.90 | 8.20 | 2.2 | 56.30 |
| Bucket | Frequency | 12 | 8 | 5 | 25 |
| | % of Total | 4.40 | 2.90 | 1.80 | 9.10 |
| Open Drums | Frequency | 16 | 15 | 20 | 51 |
| | % of Total | 5.80 | 5.50 | 7.30 | 18.60 |
| Others | Frequency | 1 | 1 | 0 | 2 |
| | % of Total | 0.40 | 0.40 | 0.00 | 0.70 |
| Total | Frequency | 164 | 66 | 44 | 274 |
| | % of Total | 59.90 | 24.10 | 16.10 | 100.00 |

Source: Field survey, 2014

The frequency of waste collection is central to having a sanitary environment. Table 5 shows that the PSP operators mainly collect the wastes weekly (38.00%) or twice monthly (31.40%) from the households. When this is compared, it is likely the responses are those that utilize PSP services as shown in Table 3. About 25.9% of the respondents gave no response to the frequency of waste collection by the PSP operators and by implication these are those who do not utilize PSP services, which have consequences for environmental hygiene. No specific date of waste collection (3.60%) was observed and has implications on the level of satisfaction derived from the PSP services and in the effectiveness of PSP in waste management in the study area.

**Table 5: Frequency of Waste Collection**

| **Frequency of waste collection** | | **Density Classification** | | | **Total** |
|---|---|---|---|---|---|
| | | **High Density** | **Medium Density** | **Low Density** | |
| No Response | Frequency | 61 | 10 | 0 | 71 |
| | % of Total | 22.30 | 3.60 | 0.00 | 25.90 |
| Twice a week | Frequency | 0 | 3 | 0 | 3 |
| | % of Total | 0.00 | 1.10 | 0.00 | 1.10 |
| Weekly | Frequency | 30 | 43 | 31 | 104 |
| | % of Total | 10.90 | 15.70 | 11.30 | 38.00 |
| Twice a month | Frequency | 66 | 7 | 13 | 86 |
| | % of Total | 24.10 | 2.60 | 4.70 | 31.40 |
| No specific date | Frequency | 7 | 3 | 0 | 10 |
| | % of Total | 2.60 | 1.10 | 0.00 | 3.60 |
| Total | Frequency | 164 | 66 | 44 | 274 |
| | % of Total | 59.90 | 24.10 | 16.10 | 100.00 |

Source: Field survey, 2014

Related to the frequency of waste collection and satisfaction is the collection fees. There is no uniform fees paid across the density areas but the survey shows that the households pay between less than 200 naira and above 1,000 naira per month as shown in Table 6. The variations in the amount paid shows that 20.80% of the households pay between 0 – 200 naira, 15.70% pay above 1,000 naira and 14.60% pay between 800 – 1,000 naira. While 12.00%, 6.20% and 2.20% pay between 400 – 600, 200 – 400 and 600 – 880 naira per month, 28.50% of the households that rely on other means of disposal do not pay anything. Despite these variations, the operators claim that only 30% of the households pay promptly while 70% do not and this is a major challenge in regular collection of the wastes.

**Table 6: PSP Collection Fees**

| **Amount of money paid (naira)** | **Density Classification** | | | **Total** |
|---|---|---|---|---|
| | **High Density** | **Medium Density** | **Low Density** | |
| Not applicable | Frequency | 73 | 5 | 0 | 78 |
| | % of Total | 26.60 | 1.80 | 0.00 | 28.50 |
| 0 – 200 | Frequency | 53 | 4 | 0 | 57 |
| | % of Total | 19.30 | 1.50 | 0.00 | 20.80 |
| 201 – 400 | Frequency | 15 | 2 | 0 | 17 |
| | % of Total | 5.50 | 0.70 | 0.00 | 6.20 |
| 401 – 600 | Frequency | 11 | 16 | 6 | 33 |
| | % of Total | 4.00 | 5.80 | 2.20 | 12.00 |
| 601 – 800 | Frequency | 2 | 4 | 0 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| | % of Total | 0.70 | 1.50 | 0.00 | 2.20 |
| 801 – 1,000 | Frequency | 4 | 8 | 28 | 40 |
| | % of Total | 1.50 | 2.90 | 10.20 | 14.60 |
| Above 1,000 | Frequency | 6 | 27 | 10 | 43 |
| | % of Total | 2.20 | 9.90 | 3.60 | 15.70 |
| Total | Frequency | 164 | 66 | 44 | 274 |
| | % of Total | 59.90 | 24.10 | 16.10 | 100.00 |

Source: Field survey, 2014

The collection fees including their remittance and the waste storage methods are examined along with the frequency of waste collection (Table 7) to corroborate the level of satisfaction and effectiveness responses of PPP in waste management. An examination of methods of waste storage and frequency of waste collection shows that wastes from 12.00% out of 15.30 % of households that use LAWMA containers are collected on weekly basis while wastes from 22.20% out of 56.30% of households that use polythene bags/sacks are collected twice a month. In addition, wastes from open drums or buckets are either collected weekly or twice a month and this has health challenges as well as difficulty for the operators to empty wastes from such storages into their trucks.

**Table 7: Waste Storage Method, Service Fees and Frequency of waste collection (n= 274)**

| **Variables** | | **Frequency of waste collection** | | | | | **Total** |
|---|---|---|---|---|---|---|---|
| **Waste storage method** | | **None** | **Twice a wk** | **Weekly** | **Twice a month** | **No date** | |
| LAWMA | Frequency | 0 | 2 | 33 | 6 | 1 | 42 |
| container | % of total | 0.00 | 0.70 | 12.00 | 2.20 | 0.40 | 15.30 |
| Polythene | Frequency | 56 | 1 | 30 | 61 | 6 | 154 |
| bags/sacks | % of total | 20.30 | 0.40 | 11.10 | 22.20 | 2.20 | 56.30 |
| Buckets | Frequency | 7 | 0 | 7 | 11 | 0 | 25 |
| | % of total | 2.60 | 0.00 | 2.60 | 4.00 | 0.00 | 9.10 |
| Open Drum | Frequency | 6 | 0 | 34 | 8 | 3 | 51 |
| | % of total | 2.20 | 0.00 | 12.40 | 2.90 | 1.10 | 18.60 |
| Others | Frequency | 2 | 0 | 0 | 0 | 0 | 2 |
| | % of total | 0.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 |
| **Service Fees paid (Naira)** | | | | | | | |
| None | Frequency | 63 | 0 | 5 | 9 | 1 | 78 |
| | % of total | 23.00 | 0.00 | 1.80 | 3.30 | 0.40 | 28.50 |
| 0 – 200 | Frequency | 0 | 0 | 19 | 36 | 2 | 57 |
| | % of total | 0.00 | 0.00 | 6.90 | 13.10 | 0.70 | 20.80 |
| 201 – 400 | Frequency | 1 | 0 | 4 | 8 | 4 | 17 |
| | % of total | 0.40 | 0.00 | 1.50 | 2.90 | 1.50 | 6.20 |
| 401 – 600 | Frequency | 1 | 2 | 16 | 12 | 2 | 33 |
| | % of total | 0.40 | 0.70 | 5.8 | 4.40 | 0.70 | 12.00 |
| 601 – 800 | Frequency | 2 | 0 | 2 | 1 | 1 | 6 |
| | % of total | 0.70 | 0.00 | 0.70 | 0.40 | 0.40 | 2.20 |
| 801 – 1,000 | Frequency | 2 | 1 | 24 | 13 | 0 | 40 |
| | % of total | 0.70 | 0.40 | 8.80 | 4.70 | 0.00 | 14.60 |
| Above 1,000 | Frequency | 2 | 0 | 34 | 7 | 0 | 43 |
| | % of total | 0.70 | 0.00 | 12.40 | 2.60 | 0.00 | 15.70 |

Source: Field survey, 2014

Frequency of waste collection is tied to prompt payment of fees in respective of variations in the amount paid. No waste collection by the PPP operators in areas that do not pay service fees. The dominant fee paid is between 0 – 200 naira per month (20.80%) and waste collection is twice a month in 13.10% of the households. But collection is weekly in 12.40%

**Table 8: Level of Satisfaction**

| Satisfaction level | | Density Classification | | | Total |
|---|---|---|---|---|---|
| | | High Density | Medium Density | Low Density | |
| Not applicable | Frequency | 61 | 8 | 0 | 69 |
| | % of Total | 22.30 | 2.90 | 0.00 | 25.20 |
| Very satisfied | Frequency | 17 | 15 | 24 | 56 |
| | % of Total | 6.20 | 5.50 | 8.80 | 20.40 |
| Satisfied | Frequency | 42 | 24 | 20 | 86 |
| | % of Total | 15.30 | 8.80 | 7.30 | 31.40 |
| Not satisfied | Frequency | 43 | 15 | 0 | 58 |
| | % of Total | 15.70 | 5.50 | 0.00 | 21.20 |
| Indifferent | Frequency | 1 | 4 | 0 | 5 |
| | % of Total | 0.40 | 1.50 | 0.00 | 1.80 |
| Total | Frequency | 164 | 66 | 44 | 274 |
| | % of Total | 59.90 | 24.10 | 16.10 | 100.00 |

bags and pay between 0 – 200 naira per month. So, there is possibility of wastes littering in the environment and reluctance of the operators for regular collection.

The responses to level of satisfaction is classified into very satisfied, satisfied, not satisfied and indifferent as presented in Table 8. In the classification, the satisfaction level is fair especially in the households that use LAWMA container for waste storage and regularly pay the service fees that motivate the frequency of waste collection. On this note, the assessment shows that 20.40% of the households are very satisfied while 31.40% are satisfied. However, 21.20% are not satisfied and 1.80% is indifferent due to irregularity in collection.

Arising from this assessment, 51% of the households rated the waste collectors as being effective but maintained that the households to avoid accumulation of wastes, which in turn would breed infectious insects, attracts rodents, makes the environment insanitary, constitute eyesore and could spread diseases, should do waste collection frequently with provision of more containers.

The analysis in Table 7 and the responses of satisfaction level and effectiveness of PPP in waste management is then subjected to Chi-square analysis to measure the differences and associations in the satisfaction and effectiveness, with intention to explain the problems affecting PPP in waste management. Thus, the Chi-square is used to test the hypothesis that there is no significant difference between the frequency of waste collection and effectiveness of waste management in terms of waste storage and payment of service fees. The result of the test is presented in Table 9.

The chi-square tests output indicates that 25 cells (62.5%) have expected count less than 5. This means that the assumption has not been violated as all the expected cell sizes are greater than 5, and in this case greater than .07. The Pearson chi-square value is 293.383 with associated significant level of .003. To be significant the sig. value needs to be .05 or smaller.

**Table 9: Chi-Square Tests**

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 293.383[a] | 12 | .003 |
| Likelihood Ratio | 283.019 | 12 | .002 |
| Linear-by-Linear Association | 47.559 | 1 | .200 |
| N of Valid Cases | 274 | | |

a 25 cells (62.5%) have expected count less than 5. The minimum expected count is .07.

In this case the value of .003 is smaller than the alpha value of .05, so the conclusion is that the result is significant and therefore the hypothesis is rejected. This means that there is significant difference between the frequency of waste collection and the methods of waste storage and service fees paid for an effective waste management. For instance, table 7 has shown that frequency of waste collection is longer (twice a month) in households that use polythene bags/sacks (22.20%) and pay between 0 – 200 naira per month (13.10%), but the frequency is weekly because the households use LAWMA container (12.0%) and pay above 1,000 naira per month (12.40%). Therefore, the better the storage facilities and higher the fees, the more frequent is the waste collection and effectiveness of waste management. This further implies that with an increase in the frequency of waste collection and improvement in storage facilities and service fees, there would be corresponding increase in effectiveness of the PSP operators to ensure a sustainable solid waste management.

**Discussion and Conclusion**

The findings of the study are compared with past studies on factors affecting the PPP operations in solid waste management. These studies emphasized poor road infrastructures, lack of equipment and poor institutional framework as the dominant factors. However, the findings of this study also revealed that households' socio-economic characteristics, utilisation of PSP services, truck facilities and adequacy, waste storage and disposal methods, waste collection fees and remittance, affect frequency of waste collection and effectiveness of PSP in solid waste management. The respondents are predominantly women that are self-employed and earn between 0 – 30,000 naira per month. This by implication affect the amount of money paid for the services and frequency of waste collection as observed whereby people with higher income and living in low density areas pay about 1,000 naira, wastes are regularly collected while in high density areas where low income earners pay 200 naira per month, wastes are not regularly collected. This confirms the argument of Cointreau (2007), Khatib (2010), UNHABITAT (2003) and Zurbrugg (2003) that in most cities of developing countries a significant percentage of the population especially the low income groups does not have access to waste collection service, probably due to poor remittance of service fees.

This issue of variations in PPP service operation in the study areas has also been acknowledged in the past studies. For instance, Louigueur, (2007) examined a single case in CESPA in Tangier, Morocco and observed that residents in high income areas are better served than those in poorer districts. He concluded that CESPA failed to provide a

homogenous solid waste service and the effectiveness in delivering its service is rather inconstant over the whole duration of the contract. In support of this observation, Rahul and Chari (2010) noted that the operators especially in the low income or squatter settlements are servicing not all households.

There is increase awareness of the availability of PSP services in the study areas, especially whereby an average range of 3 – 4 trucks facilities serve each density areas, which the operators claim is adequate. However, Michael (2010) has noted that the challenge is that some PSP operators do not have the necessary equipment to handle the volume of waste being generated and therefore concluded that the PPPs do not have the capacity to collect the growing volume of waste because of inadequate facilities and poor strategic plan in most developing countries. In addition to the inadequate facilities of the operators, the other key challenge is waste storage methods by the households. The survey observed that 56.30% of the households use polythene bags/sacks for waste storage and this has been noticed to not only littering the environment but contribute to road/streets blockage, making it impossible for trucks/vehicles to pass. Therefore, inaccessibility of the trucks has been identified as a factor affecting the operation of PPP in solid waste management. For example, Louigueur (2007) reported that the solid waste management services are not carried out properly with the deficiencies ascribed to poor road infrastructures such as bad road condition and poor or no accessibility.

About 51% of the households rated the waste collectors as being effective but maintained that the households to avoid accumulation of wastes, the PPP operators should do waste collection frequently with provision of more containers and standardization of service fees. This requires institutional arrangement of support from the authority concerned, the operators and the households. Obirih-Opareh and Post, (2002) recognized that the institutional arrangement that has materialized in a particular area depends on numerous factors, including wealth, physical characteristics, strength of community organization, and prevailing policy of the local authorities. In addition, Agyepong (2011) reported barriers to private sector participation in waste management in Ghana to include regulation framework, public attitude, rapid urbanization and poor planning, capacity of human resources, finance, weak research support and politics.

Arising from these discussions, it is worthy to note that apart from factors of poor road infrastructures, lack of equipments and poor institutional framework, households characteristics especially income, waste storage methods, remittance of service fees are also challenges facing PPP operation in solid waste management. The conclusion is that use of polythene bags or sacks and non-remittance of service fees are the critical factors affecting the efficient and effective operation of PPP in solid waste management in the study areas. Therefore, conventional waste storage containers and adequate remittance of fees by the households are recommended to improve the operations of PPP for a sustainable solid waste management.

## References

Afon, A. O. (2007). Informal sector initiative in the primary sub-system of urban solid waste management system in Lagos. *Habitat International*, 31, 193-204.

Agyopng J.S. (2011). Barriers in Private Sector Participation in Sustainable Waste Management Experiences of Private Operators and Waste Service Providers in Ghana.

Zoomlion Ghana Limited Presentation at the UN on Building Partnership for Moving Towards Zero Waste.

Ahmed, S. A., Ali, Syed M. (2006). People as partners: facilitating people's participation in public–private partnerships for solid waste management. *Habitat International* 30 (2006) 781–796

Biz Onlive Limited (2014). www.bizonlive.com

Cointreau-Levine, S. (2000). Private sector participation in municipal solid waste management: Part ii : Guidance note, st Gallen: Skat, 2000

Cointreau-Levine, S. (2007). The growing complexities and challenges of solid waste management in developing countries. The World Bank

Da Zhu et al. (2008). Improving Municipal Solid Waste Management in India: A sourcebook *for policy makers and practitioners*. The international bank for reconstruction and development / The World Bank.

Ekpete, B. O. & Macbeda, M. (2014). Implementing green waste management in a sustainable city of Lagos, Nigeria, FIG Congress 2014. Engaging the Challenges-Enhancing the Relevance. Kuala Lumpur, Malaysia.

*Faccio M, Persona A & Zanin, G. (2011). Waste collection multi-objective model with real time traceability data. Waste Management 31(12): 2391– 2405.*

Ikaria et al, (2004), *Collection, transformation and disposal of urban solid waste in Nairobi.* www.unep.org/PDF/kenya_waste_management_sector/chapter3. pdf.

Khatib, I. A. (2010). Municipal solid waste management in developing countries. Future challenges and possible opportunities. Palestine polytechnic university. Hebron, Palestine.

Louigueur, D. (2007). Private sector participation in integrated sustainable solid waste management in low- and middle income countries. Dissertation of the University of St. Gallen,

Medina, M. (2010). Solid wastes, poverty and the environment in developing country cities: Challenges and opportunities. United Nations University, World institute for development economics research.

Michael A. (2010). Problems of Domestic Waste Management in Nigeria: any Repressors? Lecturer, Department of Private and Property Law, Faculty of Law, University of Benin.

Mohammed N.F.M (2012).Public-Private Partnership (PPP) in Solid Waste Management in Developing Countries with special attentionto Sri Lanka.Master's thesis in Geography, Norwegian University of Science and Technology,Trondheim, p17

Nyachhyon, B. (2006). Prospects and constraints of public private partnership for urban waste management. Policy paper 15, Kathmandu, Nepal: SCAEF, Economic policy network, Asian 2004development bank, 59 p.

Obirih-Opareh & Post. (2002). Quality assessment of public and private modes of solid waste collection in Accra, Ghana. *Habitat International* 26 (2002) 95–112.

Ogunwolere B. (2000). Private sector participation in solid waste management in Akure, Ondo state.

Oresanya, O. (2010). Interview with Paul Sanusi on the challenges facing the agency in making Lagos state the cleanest in the country, war against the cart pushers. Published on June 2, 2010 by pm news.

Oresanya, O. (2014). Article by Olasunkanmi A. on July 29, 2014. http://www.vanguardngr.com /2014/07/lagos-generates-12000-tonnes-garbage-daily/#sthash.uJVrQBB4.dpuf. Access on 15th January, 2015

Rahul S. & Chari K. R. (2010). Socio-economic issues in waste management by informal sector in India. Birla Institute of Management Technology, India.

Rogdgers, M. (2011). Fundamentals of development administration, London, S.K. Publishers.

UN habitat, (2003). The challenges of slums. Global report on human settlement. London: Earthscan.

UN habitat, (2003). The challenges of slums. Global report on human settlement. London: Earthscan.

UNESCAP, (2011). A guidebook on public private partnership in infrastructure. Economic and social commission for Asia and the pacific.

World Bank, (2003). Thailand Environmental Monitor 2003: A joint publication of the Pollution Control Department, Royal Thai Government. The World Bank, US Asia Environmental Partnership

World Bank, (2011). Http://ppp.worldbank.org/public-privatepartnership/overview/what-are-public-private-partnerships accessed 16th of May 2013.

Zurbrugg, C. 2003. Solid waste management in developing countries, Sandec/Eawag, department of water and sanitation in developing countries at the Swiss federal institute of aquatic science and technology (Eawag).

Zurbrugg, C., (2003). Urban solid waste management in low-income countries of Asia, how to cope with the garbage crisis, available in the website: http;// www.sandec.ch