

Private sector participation in domestic waste management in informal settlements in Lagos, Nigeria

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Abstract

Lagos is one of the fastest growing cities in Africa, which is grappling with the challenges of poorly managed urbanisation. With an estimated population of about 17.5 million, solid waste management is one of the most pressing environmental challenges currently faced in the city. It is estimated that more than 9071847.4kg of urban waste is generated every day in the city. The city lacks the capacity to deal with such magnitude of waste. Consequently, the city has involved the private sector (private sector participation) in its waste management drive. This article examines the effectiveness of this public–private sector collaboration model in waste management in informal settlements in Lagos using empirical data. Major findings of the article include the irregularity of waste collection owing to a poor road network, an inadequate transport infrastructure and the desire to maximise profit, as well as poor waste handling and disposal methods by the private sector participation operators who are not chosen based on competence and capacity to perform. Another major finding is the lack of cooperation from residents evidenced in non-payment of bills and poor packaging of wastes, resulting in wastes being littered. The article concludes on the need to restructure the scheme through proper sensitisation of residents, selection of operators with demonstrable delivery capacity and provision of a well-maintained road network to facilitate access of operators to settlements.

Keywords

Waste management, informal settlements, private sector participation, operator, Nigeria

Background to the study

Over the years, governments of several countries have experimented with different strategies that will enable them to tackle waste management issues in their domains, while tapping into the enormous potentials offered. The problem is, however, often compounded in informal settlements; this is often because of the informal status of such settlements. By their very nature, informal settlements fall outside the regulatory control of government. As such, they are rarely served by government in the provision of basic infrastructure and services, even though these are services governments ought to provide for all their people. Reasons for such neglect are not farfetched. First, current data on informal settlements with which to plan for infrastructural services provision are rarely available. Even where attempts are made to generate data, they soon become obsolete and unrealistic owing to the rapidly evolving nature of such settlements and the slow bureaucratic nature of government programmes. A second reason is the lack of resources and capacity to serve all groups by government. Informal settlements are usually accorded low priority because of their generally low status and lack of voice. In the face of competition for resources therefore, they often lose out. Third, precarious location of these settlements at city periphery and hard-to-reach sites coupled with their haphazard evolutionary patterns make it difficult for them to be provided with relevant

services like waste collection. A fourth reason is the perceived low value of waste generated from such settlements.

In addition, as a result of the poor economic status of the residents, it is believed that they are more frugal and prudent in managing their resources. They are thus expected to have done in-house sorting and conversion of use, thereby reducing the quantity and salvage value of waste they generate. Literature has also shown that the composition of wastes from such settlements tilt heavily towards food waste in content; albeit there is often need to dispose of an increasingly large quantity of wastes generated in these settlement. The disposal of refuse from such areas has not been without its challenges.

For instance, Herrle et al. (2005) identified the factors that have limited efficient waste management in informal settlements to include lack of recognition of these settlements by responsible public sector institutions; limited capacities of public waste management services; limited willingness and capacity of residents to

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Table 1. Strategies adopted in managing waste disposal (2007).

Economic group	Predominant zones	Strategy	Service charge per month (N)
High	South East (V. I, Ikoyi)	Franchising	1500–2000
High-medium	North Central (Ikeja GRA)	Concession/franchising	1500–2000
Medium	South Central (Surulere)	Concession/franchising	1500–1800
Low-medium	North East (Somolu)	Contracting/franchising	1000–1500
Low	West (Ajegunle, Alimosho, Ojo)	Contracting/open collection/pre-collection	1000–1500

Adapted from Babawale (2013) and Agboje et al. (2014).

pay user charges for refuse collection; difficult accessibility in these settlements as a result of narrow streets that are often in bad condition and few incentives for private informal refuse collection owing to limited recycling possibilities.

In Nigeria, Lagos State is one of the states showing leadership in ensuring effective waste management. Lagos is one of the fastest growing cities in Nigeria, with an estimated population of about 18 million, growing at an annual rate of 6%–8% (Olubori, 2011). Ojo and Bowen (2014) also reported that per capita daily waste generation in Lagos increased from 0.21 kg in 2000 to 0.5 kg in 2008. It is expected to reach 0.7 kg in the next few years (Lagos State Waste Management Authority, 2014). Currently, the city generates about 10,000t of waste daily and has acquired the notoriety of being the dirtiest city in Nigeria (Kofoworola, 2007). Managing the huge quantity of wastes generated by this population is a major challenge to the city. In 1977 the Lagos State Refuse Board was established. It was later renamed Lagos State Waste Disposal Board in 1980. The actual operations of the Board at inception were contracted to a foreign firm fully paid by the government, since waste management was seen as a social service (Longe et al., 2009). Initial gains made were lost to rising costs attributed to increase in population, corruption and administrative inefficiencies (Ojo and Bowen, 2014).

In 1991 it metamorphosed into a commercialised autonomous outfit – the Lagos State Waste Management Authority (LAWMA) – tasked with the responsibility of managing all domestic, commercial, institutional and industrial wastes, including clearing of primary and tertiary drains in the state. Activities of LAWMA were felt more in high-brow neighbourhoods, while the more informal private sector cart pushers catered for other neighbourhoods. In 1997 however, government formally integrated the private sector into its waste management process. Under this arrangement, approved private sector participation (PSP) operators were assigned specific neighbourhoods and expected to deal directly with communities in terms of negotiating services charges and frequency of service. No funds accrued to the state though local government authorities. The major constraint of this strategy was non-payment by residents.

The scheme was modified in 2004 for greater efficiency. The service charge was on a flat-fee basis and residents were expected to pay to appointed billing firms through designated banks. Cart pushers were also outlawed (Akiyode and Sojini, 2006). This was because of their alleged indiscriminate dumping

of refuse in unauthorised places. Babawale (2013) has also enumerated challenges encountered to include lack of access to collection points by trucks, delay in collection, non-payment by residents, frequent breakdown of vehicles, delay in bill distribution, irregular reconciliation of payments, long truck turn-around time and non-enforcement of penalties on defaulters. The scheme was further reviewed in 2007 to take cognisance of neighbourhood status in strategy and billing. The scheme divided the state into high, high-medium, medium, low-medium and low income areas, specifying the strategies to be used for refuse collection and the recommended bills for each of the areas. This is as shown in Table 1.

As at September 2014, 346 PSP operators were operating in the state (Lagos State Waste Management Authority, 2014). These operators were assigned to different areas of the state. Methods of waste collection include bell-ringing and door-to-door (Odewumi, 2013). Review shows remarkable improvement in domestic waste management in the state, as evidenced in improved service delivery; improved health of Lagosians; improved aesthetics; cleaner, safer and healthier environment; improved air quality and environmental sustainability; and increased investment opportunities offered by recycling. Unfortunately, distribution of these benefits appears to be lopsided. The informal settlements of the state appear to be inadequately catered for. In September 2014 alone, LAWMA received a total of 502 complaints relating to service delivery and 112 complaints on wrong billing and bill reconciliation. This has informed this article, which reviewed the waste management operations of PSP operators in informal settlements in Lagos, Nigeria.

Four questions are answered in this study in the context of Ayobo, an informal settlement in Lagos, Nigeria. How prevalent is patronage of PSP operators as a means of solid waste management in the study area? Does patronisation of PSP operators vary with the income, education and occupation of the respondents? What roles are played by the private sector in solid waste management in informal settlements? How have PSP operators performed in disposing of solid wastes in the surveyed area? This has become necessary in light of the need for the assessment of the effectiveness of strategies used in solid waste management, which have been designed to cater even for areas that may not have been planned for at the onset of government programmes owing to their emergent nature. This is because such settlements

Table 2. Mode of waste disposal.

	Variable	Frequency (No)	Percentage (%)
Mode of waste disposal	No response	21	2.0
	PSP operator	734	69.6
	burning	246	23.3
	burying	21	2.0
	tossed	20	1.9
	others	13	1.2

PSP: private sector participation.

are fast growing in countries all over the world. In addition, PSP is a strategy all over the world to compliment government efforts in infrastructure and services provision. It is therefore expedient to evaluate this strategy in all areas in which it has been used, including solid waste management. The Ayobo community in Lagos, Nigeria, was adopted as the study area. This article contributes to on-going discussions on waste management by focusing on solid waste management in informal settlements. It is hoped that the outcome of this article will assist in extending waste management services to informal settlements where they are direly needed.

Research method

This article draws data from a study that investigated housing tenure in Ayobo, Lagos, Nigeria. Secondary data were gathered through extensive review of relevant scholarly literature and documentations including reports from the Lagos Waste Management Agency. Primary data were obtained through both qualitative and quantitative methods. A cross-sectional survey was carried out in the study area. The goal was to investigate how waste is disposed by the residents, with particular focus on the role played by the PSP operators. Available maps and reconnaissance visits were first used in identifying houses that were occupied. A systematic sampling procedure was then used, in which every 8th house was sampled. A sample size of 1200 was arrived at, however, 1055 questionnaires were retrieved. Respondents were household heads or their representatives. Trained field assistants were used in administering the questionnaires as there was need for translation of the questionnaire into local dialect in several cases. Questionnaires were used to obtain data on the personal characteristics of residents, constituents of solid wastes generated, mode of waste disposal and the number households in the dwelling. Qualitative data were obtained through interview of representatives of the three major stakeholders, namely residents, PSP operators and officials of LAWMA. The interviews of the residents elicited information on the constituents of solid waste, views of performances of PSPs, cost of waste disposal, frequency of waste collection and how uncollected waste is treated. PSP operators were also interviewed on their roles in the management of waste, their resources and the operational challenges they encounter. Representatives of LAWMA were interviewed on the performances of the PSP operators. This is to provide insight on

the roles played by the private sector in the management of solid waste in the informal settlement. While quantitative data were analysed using SPSS version 17, qualitative data were content-analysed to extract emerging themes.

Findings and discussions

We asked the residents of the study area how they dispose of their domestic wastes. This was to assess the prevalence of patronage of PSP operators in relation to other modes of waste disposal. Results presented in Table 2 revealed that majority of respondents did patronise PSP operators. This appears to be in accordance of Lagos State waste management policy, which mandates all residents to use only PSP operators for domestic waste disposal. Nonetheless, data revealed that an appreciable proportion of respondents (28.4%) still use other non-prescribed methods for waste disposal. This suggests that there are strong reservations about the use of PSP operators in the area. This was further investigated through interviews. It was found that, although there is a consensus that involvement of PSP operators has improved the overall hygiene and cleanliness in Lagos, these benefits have been rather marginal in the area. The main reason identified from the interviews is that the collection trucks do not come regularly to pick up wastes from the neighbourhood. Without regards to the frequency of refuse collection however, the residents were billed N500 each month, which was to be paid at the bank. This was irrespective of the number of households in each building. The PSP operators requested evidence of payment for the previous month before collecting the waste. Although this amount is lower than recommended for low-income area, it appears to be a concession, as accessibility in the area of study is hindered by bad roads, which influenced the regularity of waste pick up. In the study areas, waste is scheduled for collection only once in a week, as against more accessible areas, where waste is collected more than once a week.

Data obtained through interviews and observations gave insight into processes of solid wastes generation and management by households. Specifically, when asked to itemise the constituents of their solid wastes, the residents stated that households generate solid wastes through a variety of household activities. These wastes include wastes from food preparation (assorted vegetables, bones, etc.); packaging for household items including electronics, gadgets and processed food; bags and storage,

including nylon and paper bags, plastic containers and foil. Others included discarded fashion items, like clothing, bags, shoes, jewellery and accessories; paper (old newspapers, magazines, books, etc.); furniture; house cleaning and compound wastes. The content of these wastes include organic matter, metals, wood, glass, plastics, nylon and fabrics. Respondents were also asked how they sort the wastes, if they do this at all and how they store the waste before disposal. Discussions revealed that waste sorting is not practised. All those interviewed claimed that food preparation activities generate the largest quantity of wastes. Reasons adduced for this is the frequency of food preparation (three times per day) and the use of raw and unprocessed ingredients. However, there seemed to be a consensus that over the years, consumption patterns of households is shifting towards processed food items and packaged products, which is gradually reducing the organic component of domestic solid wastes. It was found that households would normally store waste for a day or two in buckets or bags located in convenient points within the compound. These are emptied into bigger containers, like broken drums or jute bags, positioned outside the compound and from where they are loaded into collection trucks.

The roles of the PSP operators were investigated through the use of interviews. PSP operators were fully engaged for domestic solid waste management using cart pushers in areas their trucks cannot reach. There are three PSP operators covering Ayobo. Two of them were surveyed in the study. Lab Cleaning Services was appointed as an operator in 2009. With 16 staff, it covers waste collection in 225 streets in the Ayobo area. The second operator, J F Cashman Nig. Ltd, was appointed in 2011 and currently has 13 staff that covers 80 streets. Both firms have two 5-t compaction trucks each for their operations. This finding suggests that this informal settlement was not neglected by the government in terms of waste collection. It therefore appears that PSP may have led to the success of waste collection in this informal settlement. Their performance, as assessed by their regulator, tends to corroborate the perception of residents that, although Lab Cleaning Services appears to have performed better than J F Cashman Nig. Ltd, compared with other operators, they have not performed well. Reasons deduced from Table 3 and confirmed during interviews include poor equipment management, inefficiency, low revenue generation and insufficient experience of staff owing to high turn-over of casual labour used in servicing these communities. The casualisation of labour is occasioned by the resource base of the operators.

Representatives of the firms were interviewed to identify the operational challenges they had hitherto encountered with waste collection from the neighbourhood. They identified high operational costs as a major challenge hampering their operations. They explained that by the time they service their loans from government and meet other operational needs, they have little or nothing left as profit. Consequently, they experience difficulty in purchasing new equipment. They revealed that the trucks they use are also expensive to maintain. Sometimes their operations are stalled owing to breakdown of the trucks. Since they have a

Table 3. PSP performance evaluation matrix.

Operator	Date of commencement of operation	Capacity	Revenue	Trip count	Equipment mgt	Debt mgt	Efficiency	Business strategy	Experience	Attendance	Total
Lab Cleaning Services	February 2009	10	3	6	4	10	6	6	2	6	53
J F Cashman Nig. Ltd	January 2011	5	1	4	4	10	5	2	1	4	36

Source: LAWMA, 2014.

Table 4. Personal characteristics of respondents.

	Variable	Frequency (No)	Percentage (%)
Education	No response	34	3.2
	No formal education	47	4.5
	Primary	200	19.0
	Secondary	347	32.9
	Ordinary National Diploma	263	24.9
	First Degree	127	12.0
	Post graduate	37	3.5
Employment structure	No response	23	2.2
	Retired	229	21.7
	Self-employed	534	50.6
	Wage earner	158	15.0
	Unemployed	63	6.0
	Others	48	4.5
Income (N)	No response	132	12.5
	None	9	0.9
	>18,000	307	29.1
	18,001–40,000	358	33.9
	40,001–100,000	182	17.3
	100,001–250,000	67	6.4
	>250,000	58	5.5

very limited number, they are unable to meet up with obligations to customers at such times. A major cause of break down is the poor condition of the roads, which sometimes hinders access. This was earlier adduced to by Herrle et al. (2005). The high operational costs in part explain why they rely on casual workers with a relatively high rate of turn-over. Another problem with casual workers is their lack of sustained interest and commitment to the organisation. Operators also noted residents' unwillingness to pay for their services, poor bagging and storage of wastes and non-sorting of wastes as other factors militating against their efficient service delivery.

One inference that may be drawn from the above is that the PSP operations in the informal settlement as it is, entails the collection of domestic wastes from residents for disposal at designated places. They are not involved in the processing of these wastes. The incentives the private operators would have derived (Herrle et al., 2005) by recycling the waste is therefore denied them. Another inference is that residents may adopt other means of waste management because of inadequacies of the PSP system. Some other factors may however determine the type of mode the residents use in managing their domestic wastes.

For instance, literature suggests that the method of waste disposal will vary with the levels of education and income of residents. Table 4 reveals that respondents are predominantly self-employed, with mostly low and intermediate educational levels, which reflect in their low and medium income earnings.

The relationship between respondents' profiles and the mode of waste disposal was investigated using the chi square test. The results show that the mode of waste disposal varied significantly with the levels of education of the respondents (chi square $\lambda = 162.3$, degree of freedom $df = 24$, $p = 0.00$). The results show that many of the respondents who had no formal education or had

intermediate education at the primary and secondary levels (83% and 72%, respectively) patronised the PSP operators, while only about half of the respondents who had more formal education used this option. It is surprising that a large percentage (37.0%–43.3%) burnt their wastes. This probably suggests that although persons in this category can be considered as highly educated in formal terms, they adopt their own methods instead of waiting for operators. It may also be that by virtue of the level of understanding that these categories of respondents had, they could not allow their domestic waste to accumulate to avoid epidemics. This is in light of the fact that refuse heaps may result from waiting for the collectors, as noted by Özbay (2015).

It was also found that there was a significant relationship between the levels of income of the residents and the mode of solid waste collection ($\lambda = 84.8$, $df = 20$, $p = 0.00$). A cross tabulation of the two variables shows an interesting trend. Most of those on a low income, with less than 40,000 Nigerian Naira per month, and most residents that earned above 100,000 Nigerian Naira (76.2% and greater), paid the PSP operators to collect their wastes. However, about half of the respondents (45.6%) that earned between 40,000 and 100,000 Nigerian Naira buried, burnt or tossed their wastes into fields, rivers and vacant plots. Interviews reveal that those on a low income were mostly tenants, whose landlords did not permit to dispose of wastes any other way. A number of persons that earned 40,000 and 100,000 Nigerian Naira, however, were owners of their houses, which mostly were at the early stages of incremental housing. These landlords still had spaces within their plots to dispose and burn their wastes. In addition, their families being the only ones on the plots, they did not think they were inconveniencing others by their practices. As noted earlier, the bills often given by PSP operators is a major reason these residents find other ways of

disposing their wastes. It would, however, appear that the low-income tenants did not have any choice but to patronise the PSP operators. In addition, it was discovered that all tenants in a particular building are sometimes made to contribute towards paying the flat rate for PSP operators, which often reduces the burden on individual households.

In addition to income and level of education, there was a significant relationship between the occupation of the respondents and the modes of waste disposal adopted ($\lambda=178.9$, $df=36$, $p=0.00$). One would have expected that persons that are in professional fields would engage recommended avenues in disposing their wastes; the results however show the contrary. About half (42.9% and above) of the residents who were either civil servants or professionals in various fields burnt, buried or tossed their solid wastes. This was also a reflection of their tenure status. What this suggests is that the cost of disposing waste may be a determinant of the engagement of PSP operators in the informal settlement, where public waste disposal trucks do not cover. The only exception to this is when the tenure arrangement does not permit the use of other modes.

The size of the households also significantly influenced the modes of waste disposal adopted by the respondents ($\lambda=146.5$, $df=16$, $p=0.00$). More residents with more than four persons in the household (83.3% and above) engaged PSP operators than those with smaller household sizes. This may be a function of the amount way waste generated with larger household sizes. This is probably an indication that residents only burnt, tossed or buried wastes, when it is not much. They may be compelled to want to move waste far from them if the volume is larger.

The above suggests that the role of the PSP in the informal settlements is limited to collection and transportation of domestic wastes to designated locations. Their operation however, is limited by the satisfaction with regularity of collection of wastes as determined by the levels of education of the respondents. In addition, tenure, which is a function of income and occupation of residents, also influences the use of the PSP system of disposing waste. Those who owned their houses had a greater tendency to want to deploy other means of managing their wastes, especially within their compounds. However, with tenants, they tend to engage the PSP operators. This appears to be a function of the volume of waste.

It was confirmed during interviews that collection trucks on the average were more regular in collecting wastes from the more consolidated parts of the neighbourhood, which are more accessible than from the more remote parts. The interviews also reveal that the quantity of organic waste was not excessive. This could be attributed to the appreciable proportion of households disposing of wastes via other means. These households will naturally be more prompt in waste disposal. In addition, domestic animals like goats, dogs and chickens are known to feed on wastes deposited outside, although they scatter the wastes and litter the environment in the process. Thus the quantity of waste that may be left to decompose is reduced.

One of the challenges that respondents identified in the patronisation of PSP operators for waste disposal is the fact that bills have to be paid at the bank. Many of the respondents suggested that such a sum can be paid directly to the operators, without the additional stress of going to a bank. In addition, many of the respondents believe that waste management should be a social service, which the government should provide free for its people. This is in the light of the fact that residents consider the commercialisation of waste collection from neighbourhoods as the government's lack of consideration for the hardship experienced by its people. They are thus often unwilling to pay for solid waste disposal, which they believe should be the responsibility of the government. This probably corroborates the observation by Herrle et al. (2005), who highlighted the non-recognition of informal settlements by the Government as a major hindrance to solid waste management. This is because the formal areas of Lagos have designated refuse collection areas, from where trucks pick up such refuse, without any charge to the residents of the areas. As earlier noted however, the obvious deficiencies of the public waste disposal organisations have informed the need to involve the private sector operators, who provide services for a fee.

Moreover, the consensus is that the current billing method, which does not take into consideration salient demographic characteristics like household size and number of households per dwelling, is very arbitrary. This is aside the fact that residents are billed for periods, even when collection trucks failed to come. Some of those who have defaulted in payments explained that bills sometimes came late and sometimes did not reflect previous payments made. On a number of occasions, it was learnt, that this has resulted in heated arguments between residents and staff of the operators who insist on seeing evidence of up-to-date payments before collecting waste. It would therefore appear that the unwillingness of residents to pay was not just a function of the unavailability of public waste disposal trucks, but a mix of bureaucratic bottlenecks and flat rate billing, irrespective of services rendered.

Owing to these challenges, residents in the study area explored alternatives. In line with the findings of Özbay (2015), uncollected wastes in the study area are buried, burnt or tossed. One would however note that the burning option appeared to be more favoured. The reason for this is not clear in light of the risk of air pollution. Interviews however, suggest that those who engage in this practice believe that when they burn their domestic waste at a corner of their plots, they reduce the menace the waste would have constituted. First, the volume of the waste is reduced and second, the risk of odour is eliminated. It is also interesting to note that some of the residents bury these wastes. This may be consequent on the fact that a large proportion of domestic wastes are organic (Nkwachukwu et al., 2010) and residents believe that they will easily decompose in the ground, eliminating the risk of odour and adding to the fertility of the soil in those areas.

Confronted with issues highlighted by the residents and PSP operators, interviews with LAWMA officials reveal that the

agency has been reviewing its operations in order to achieve greater efficiency. Apart from creating operational loans, it also creates access to compactor trucks to operators either through ownership or lease. On the issue of PSP operators' epileptic service, the agency revealed that they offer back-up services whereby the agency can offer relief. It was also learnt that the organisation's services are biased in favour of areas that contribute to the State's revenue generation drive through tax payments, etc. It was also gathered that the agency is introducing low-emission refuse collection trucks with a reduced fuel consumption by 30%.

Conclusions and recommendations

In this study, PSP as a strategy for domestic solid waste management has been assessed. This was carried out in the context of Ayobo, an informal settlement in Lagos, Nigeria. It was concluded that the PSP operation has ensured that the informal settlement in the study has been serviced in terms of waste collection, although the PSP operators were mostly involved in the collection of these wastes and subsequent disposal to designated places. It was found that although the majority of the respondents patronised PSP operators in disposing their domestic wastes, their effectiveness was questioned. The main issues raised by the residents were related to billing and frequency of waste collection. This has led to the adoption of other modes of waste disposal, especially by land owners who have single-family properties at the incremental stages. The PSP operators, for their own part, identified low revenue generation occasioned by residents' unwillingness to pay, high operational costs, poor road networks and a high rate of turn-over of casual labour. The major factors that seemed to influence the patronisation of PSP operators by residents of the informal settlement in the study were the tenure status of the respondents and the size of the household, which may determine the volume of waste generated by each household. The implications of these findings are twofold. The first is that it may be possible for the State government to improve the rate of success of the PSP operations by addressing issues raised by the respondents. One way is to introduce a flexible payment plan that takes into consideration the volume of waste being collected and the frequency of waste collection. Another way is to reintroduce the cart pushers for low accessibility areas, who may now be compelled to work with refuse trucks, to address the issue of indiscriminate dumping of refuse. Another implication of the findings of this study is that the potential benefits that PSP operators may gain from reusable/recyclable components of the waste they collect has not been explored. This has been because the wastes they collect are not sorted by residents. It is, therefore, recommended that the State Government explores and educates residents on waste sorting techniques, particularly from homes so as to reap the benefits that this technique. This may further encourage the PSP

operators as reusable/recyclable waste materials may be sold to organisations that carry out those activities, thereby improving their gains from the process.

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References

- Agboje IA, Adeoti A and Irhivben BO (2014) Performance assessment of solid waste management following private partnership operations in Lagos State. *Nigeria Journal of Waste Management* 1: 1–8. DOI: 10.1155/2014/868072. Published online April 17, 2014.
- Akiyode OO and Sojinu OS (2006) Assessment of Private Sector Participation (PSP) in solid waste management practices in Nigeria (Case Study of Lagos State, Nigeria). In: *Proceedings of the 21st international conference on solid waste technology and management*. Philadelphia, PA, 26–29 March. Available at https://www.researchgate.net/publication/209060403_Assessment_of_Private_Sector_Participation_PSP_in_Solid_Waste_Management_Practices_in_Nigeria_Case_Study_of_Lagos_State_Nigeria (accessed 24 January 2015).
- Babawale A (2013) Lagos Waste Management Programme. Available at: http://future-megacities.org/fileadmin/documents/konferenzen/Megacities_in_Action_2013/WS5_Aduroshakin.pdf (accessed 24 May 2013).
- Herrle P, Jachnow A, Samol F, et al. (2005) *Improvement of sanitation and solid waste management in urban poor settlements*. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.
- Kofoworola OF (2007) Recovery and recycling practices in municipal solid waste management in Lagos, Nigeria. *Waste Management* 27: 1139–1143.
- Lagos State Waste Management Authority (2014) Waste Management Progress Report for the Month of September 2014. Available at <http://www.lawma.gov.ng/DataBank/report/wmsreport/2014/Waste%20Management%20Progress%20Report%20September%202014.pdf> (accessed 15 January 2015).
- Longe EO, Longe OO and Ukpobor EF (2009) People's perception on households solid waste management in Ojo Local Government Area in Nigeria. *Iranian Journal of Environmental Health Science and Engineering* 6: 209–216.
- Nkwachukwu OI, Chidi NI and Charles KO (2010) Issues of roadside disposal habit of municipal solid waste, environmental impacts and implementation of sound management practices in developing country "Nigeria". *International Journal of Environmental Science and Development* 1: 409–418.
- Odewumi SG (2013) Appraisal of storage and collection strategies of municipal solid waste in Lagos State. *IOSR Journal of Humanities and Social Science* 10(5): 61–67.
- Ojo GO and Bowen DM (2014) Environmental and economic analysis of solid waste management alternatives for Lagos municipality, Nigeria. *Journal of Sustainable Development in Africa* 16: 114–144.
- Olubori JO (2011) *Cities and adaptation to climate change - solid waste management in Lagos State*. Paper presented at the Resilient Cities 2011 Congress Bonn, Germany. Available at: http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2011/Presentations/C/C5_and_D5_Olubori.pdf (accessed 11 January 2015).
- Özbay I (2015) Evaluation of municipal solid waste management practices for an industrialized city. *Polish Journal of Environmental Studies* 24: 637–644.