

Willingness to Pay For Improved Environmental Quality among Residents Living in Close Proximity to Landfills in Lagos Metropolis, Nigeria

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Abstract

Landfills constitute a significant risk to human health and the environment. Even though the location of landfills in urban areas is beneficial in that they provide the most efficient and safe means of disposal of wastes generated, the perceived environmental costs, health-related hazards, social and economic impacts associated with landfills are often confined to the immediate zone of influence of landfills. This paper examines the willingness to pay for improved environmental quality among people living close to the two functional landfills (Olushosun and Abule Egba) in Lagos metropolis. A structured questionnaire was the main instrument used in the collection of data for the study. The sample size consists of 930 heads of households in the two locations used for the study (488 in Olushosun and 442 in Abule-Egba). Three important facts emerged from this study. First, the presence of the landfills and its associated environmental impacts is an important factor contributing to respondents' willingness to pay for any environmental improvement in their neighbourhood. Second, the proportion of respondents willing to pay decreased consistently as distance increases away from the landfills in the two locations. Lastly, respondents are generally not willing to pay high amount for environmental amelioration.

Keywords: Landfill; Risk; Environment; Contingent Valuation; Lagos.

Introduction

Public consensus has long held that landfills are not a favourable usage of land (Mitchell, 1980; Smith and Desvougues, 1986; Carter, 1989, Mitchell and Carson, 1980; Adeola, 2000; Martynaiak et al, 2007). As a noxious facility, a landfill is generally perceived as risky because of the inherent negative externalities associated with it. Several implications flow from the organisation and operation of noxious facilities, especially landfills, within cities in developing countries as most of them are operated in essentially residential neighbourhoods (Arimah and Adinnu, 1995; Olokesusi, 1995, Cuong, 2003). Aside from the possible landuse compatibility problem that may arise from siting noxious facilities, certain other environmental, social and economic consequences also flow from this. This environmental disamenity could be serious especially in a purely residential setting. Thus, major landuse issues in solid waste management have been most frequently associated with the stigma of having a major solid waste facility in the neighbourhood (Olokesusi, 1995, Couch and Roll-Smith, 1994). In developed countries, designation of a projected-site for a new landfill often engenders so much community opposition. This is because of the obvious negative externalities such as unsightliness, odour, vermin and insect proliferation, spread of litter,

smoke and noise from heavy machinery at site. These may substantially reduce the standard of living of the local community (Wilson, 1974; Hockman *et al*, 1976). In most instances, the negative externalities outweigh the benefits.

Even though the location of landfills in urban areas is beneficial in that they provide the most efficient and safe means of disposal of wastes generated in urban areas, the perceived environmental costs, both health-related hazards, social and economic impacts associated with the landfills are often confined to the immediate zone of influence of the landfills and extends up to few kilometers (Arimah and Adinu, 1995). Not much is however known about individual and community level impacts around existing facilities. This is one in a series of papers that investigate individual and community level impacts around landfills in Lagos. Specifically, this paper examines the willingness to pay for improved environmental quality (contingent Valuation) among people living around the two functional landfills (Olushosun and Abule Egba) in Lagos metropolis.

Conceptual Framework and Literature Review

There are two major economic models that address elements of the psychological and behavioural processes that generate psychosocial and economic impacts as a result

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of perceived risks of noxious facilities (Nieves et al, 1992; Nieves, 1993). One, contingent valuation, provides an ex ante measure of impacts based on survey responses to a hypothetical situation, such as a noxious facility at a given distance from the respondent's residence. The other, hedonic price model, is an ex post measure that can be used to estimate the value of location characteristics, such as noxious facility proximity, that affect local wages and, primarily, land/house prices/values.

The economic theory have developed techniques of evaluation of items (within the environment) such as noise, odour, aesthetics, etc which in some way affects an individual's enjoyment of life or utility (Lake *et al*, 1998). Economists argue that we can measure the value of a desirable item by looking at how much an individual is willing to pay for it (Turner *et al*, 1994). For instance, individuals do not purchase lower levels of road noise or views without roads. Therefore economists have sought to value such 'goods' by looking at individual's purchases of other items which secure lower noise levels or reduced views of roads. Such a technique is known as hedonic pricing (Freeman 1997; Hufschmidt *et al*, 1983) and has frequently been applied via the property market. Here, controlling for known determinant of property prices, the remaining variation in prices can be related to focus variables, thus providing information on the value of these variables.

The contingent valuation method depends upon individual responses to contingent situations posited in artificial or experimental markets (Mitchel and Carson, 1989). In a contingent valuation method, respondents preference are solicited through a survey technique to state their willingness to pay (WTP) for a benefit gained from an improvement in environmental quality (in this study an improvement in quality of landfill practices) or for a loss caused by degradation of environmental quality (in this case, reduced property value and health risks).

As Randall *et al* (1983) noted in their review of contingent valuation methods, because the respondent is asked to evaluate a hypothetical situation, precise specification is required of the environmental change, the organizational framework controlling it, and the mechanisms for any monetary transfers. Brookshire and Crocker (1981), Smith and

Desvougues (1986; 1987) indicate that the degree to which the impact estimates developed by contingent valuation methods correspond to actual impact is dependent on the accuracy and imaginability of the information provided to survey respondents. Though caution is needed in applying this method, the hypothetical nature of contingent market valuation is also the main reason for its value, in that it provides a method of ex ante evaluation of noxious facility impacts.

While contingent valuation studies have been used to value a variety of environmental resources and changes in their quantity or quality, few have involved a noxious facility site. In one such survey, Smith and Desvougues (1986) obtained bids for residential area changes in risk levels associated with a hypothetical hazardous waste landfill. The respondents were willing to pay more to reduce risk by a given amount than they were to avoid an equal increase in risk level. The authors attribute this finding to a property rights effect -- a belief on the part of the respondents that they are entitled to the status quo and should not have to pay to limit risk increases (see also Randall *et al*, 1983). As a result, when people feel that their rights are violated by the environmental change being evaluated, contingent valuation may not be a reliable measure of impacts.

Research Design

Both secondary and primary data were utilized for this study. The secondary data included those on landfills from Lagos Waste Management Authority (LAWMA) and valuation data from Lagos State Valuation Office (LSVO). Data collected from LAWMA include information on the locational characteristics of the sites such as the geographic and topographic data, while the data collected from LSVO were the number of properties within three kilometers of the landfill sites.

A structured questionnaire was the main instrument used in the collection of the primary data. Since socio economic characteristics are associated with people's perception of impact of facilities (Campbell 1983), a number of socio economic variables of the respondents were examined in this study. They are age of household heads, marital status, income, number of persons in the household, education, occupation, length of stay in the area and in the house, type of

building occupied by household, and the tenural status of the household (owner occupier or rented), among others. Educational achievement was particularly important as a surrogate for income, or socio economic status (Greenberg *et al*, 1995).

The sample size consists of 930 heads of households in the two locations (488 in Olushosun and 442 in Abule-Egba). The sample constitutes 3% of the total 3, 4021 properties within three-kilometer radius of the two landfill sites. The distance was stratified into three concentric zones round the two sites; 1km and less (Zone 1), 1.1-2km (zone 2) and 2.1-3km (zone 3). The statistical analysis of data involved basic descriptive univariate statistics (frequency counts, percentages, means, and standard deviation), reliability tests (Alpha). In addition, inferential statistics (chi-square) was used to provide more explanations on the data.

The study area for this research is the Lagos metropolis. However, specific areas where the landfills areas are located are concentrated upon. There are presently three landfills in Lagos namely, the Olushosun, Abule Egba and Solous landfills. Only Olushosun and Abule Egba landfills were chosen for this study. Apart from the fact that these two landfills are the most utilized, their contrasting geographical location in medium and high density residential areas respectively and their differences in sizes and operations all combined to justify the choice of the two landfills.

The choice of the study area is justified on many grounds. For instance, the waste handling patterns and underlying attitudes of the urban population influences the functioning of municipal solid waste management systems, and these factors are, themselves, conditioned by the people's social and cultural context (Schubleller, 1996). Without any shade of doubt, solid waste is currently one of the biggest environmental problems commonly experienced in the Lagos metropolis, as in many other Nigerian urban centers (Nnabugwu, 2001). There has been a constant upswing in the annual volume of solid waste generated in various cities and towns in the country. Lagos is however in the lead in the amount of solid waste generated yearly in the country (Saka, 1997).

Discussion of Results **Socio-economic characteristics of respondents**

Result of the analysis shows that the mean age of the household heads was 44.94 and 45.20 years in Olushosun and Abule Egba landfills sites respectively. One fact that emerged from the analysis is that more than 90% of the respondents were aged 30 years and above in the two locations. For instance, those who are 30 years and below were only 16.7% for Olushosun and 9.6% for Abule-Egba. This implies that almost all the respondents were adults who could speak authoritatively on behalf of their family members. Furthermore, the mean number of persons in the household was 5.62 and 6.40 respectively for Olushosun and Abule-Egba. This indicates that the households in the study area are fairly large due mainly to the fact that most of the houses in the study area are rooming apartments. The implication of this for impact studies is that more people are exposed or are at a risk of suffering from negative impact generated by the landfills.

The mean lengths of stay in the area for the locations were 7.19 and 7.65 years respectively for the two locations. The mean values of socio-economic survey of the study area are presented in Table 1.

Furthermore, the result of the analysis reveals that males constitute the highest proportion of the total number of respondents in both locations (78.0% and 83.1% in Olushosun and Abule-Egba respectively). Those with higher education constitute more than half of the total number of respondents the two locations. For instance, in Olushosun site, those with secondary education and above constitute 83.3% of the total number of respondents. For Abule-Egba it was 79%. This fairly high level of literacy among the respondents is considered as being good for this type of study considering the fact that knowledge plays a significant role in impact studies.

Close to two-thirds of the total number of respondents were tenants in Olushosun. For Abule-Egba, it was lower. Results show that 68.9% were tenants in Olushosun, while in Abule-Egba it was 56.8%. The large number of renters in the two locations has some implications for impact study. First, it reduces community cohesion in the sense that local attachment will be low. In situations where we

have a facility that generate negative impact, renters may find it easier to relocate to other locations that are risk free than homeowners. Secondly, the willingness to pay for environmental quality (contingent valuation) in areas that host locally unwanted landuses (LULUs) has been found to be lower among renters than home owners in previous studies (Sims and Baumann, 1983; Nieves *et al*, 1992).

Major environmental concerns about landfills in the study area

One of the major reasons for opposition to siting of landfills is the perceived environmental hazards or contaminations that are associated with them. This fear becomes heightened when these landfills are located, in essentially residential neighbourhoods. From the initial (pre-field) oral interview conducted among residents of both sites, the major environmental issues involved in the location and operation of the landfills were revealed by residents. This information coupled with the review of literature on major environmental issues in landfill operation, informed the design of the questionnaire. The descriptive statistics for the major environmental concerns of respondents are presented in Table 2.

As revealed in Table 2, noise, aesthetics odour and water pollution are the most frequently mentioned environmental problems associated with the location of the landfills. For Abule-Egba site, noise, aesthetics, visibility are the major environmental problems mentioned. Not all the environmental problems showed a marked variation among the different zones. However, odour, visibility, flies and rodents, air pollution, dirt and insect and cockroaches showed a decrease in concern from zone 1 to zone 3. This implies that concerns about these problems are higher among residents closer to the landfill site. Traffic obstruction is particularly found to be a serious problem in Abule Egba landfill site because the landfill is located by the major roadside. The illegal dumping of wastes, coupled with the activities of cart pushers have seriously led to traffic problem within the area. Oftentimes, motorists have to contest for the narrow lane left for vehicles. This often led to traffic hold up during most part of the day.

Oral interview of the residents closer to the landfill and personal observation during the fieldwork revealed that odour is a major problem with landfill operations. This is especially true in Abule-Egba where the

dumping of wastes into the landfill is very much uncontrolled. This problem becomes more worrisome considering the fact that the landfill is located in a high-density residential area. This is the basis for the anxiety over the health problems that residents perceive the landfill could cause.

Relationship between landfill location and willingness to pay for improved environmental quality

In a contingent valuation method, respondents' preferences are often solicited through a survey technique to state their willingness to pay (WTP) for the benefit gained from an improvement in environmental quality (in this study an improvement in quality of landfill practices) or for a loss caused by degradation of environmental quality (in this case, reduced property value and health risks).

Therefore, respondents were asked to indicate their willingness to pay for an improved environmental quality in their neighbourhood. The basis of this question is the fact that their present neighbourhood already has an environmental contaminant (the presence of the landfills). The analysis of response to this question is presented Table 3. It revealed that the presence of the landfill may be associated with willingness to pay for improved environmental quality. The proportion of those willing to pay clearly shows a decline from zone 1 to zone 3 in Olushosun (26.5%, 21.4% and 16.8%). A chi-square test indicates that there is a significant difference in willingness to pay for improved environmental quality in Olushosun. For Abule – Egba, there is also a decline in willingness to pay from zones 1 to 3 (29.5%, 21.0% and 20.5%). The result of the chi-square analysis however shows that the difference in WTP among the zones in this location is not significant. This could be due to the fact that there is no much variation in the socio-economic characteristics among the respondents in the respective locations.

Contingent valuation also emphasizes the specific amount of money people would be willing to pay for improvement in environmental quality. Therefore, apart from wanting to know whether people will be willing to pay for improvement in environmental quality, the research sought to know the specific amount respondents will be willing to pay. About 143 did not respond to this question in Olushosun and in Abule-Egba.

These non-responses were therefore treated as missing cases in the analysis. Table 4 presents the analysis of the various amounts respondents would be willing to pay monthly. The result presented in Table 4 shows that respondents are not generally willing to pay much for actions to improve environmental quality. Also, the amount people are willing to pay also decreased from zone 1 to zone 3 in the two locations. Two facts emerged from the analysis. Firstly, as discussed earlier, the location of the landfill is very much associated with willingness to pay for improved environmental quality. This reflected in the result of the analysis as the proportion of respondents willing to pay decreased consistently from zone 1 to zone 3 in the two locations. Secondly, people are not generally willing to pay high amount for environmental amelioration especially in developing countries where income per capita is low and poverty is rampant.

A further analysis was carried out to examine the influence of socio-economic status and the factor of the landfill presence on WTP. The essence of this is to see whether the effect of the landfill presence could be more important in the willingness to pay for improved environmental quality. For this analysis, a linear regression model was used, where the dependent variable is WTP, while the independent variables include age, level of education, sex, marital status, occupation, household size, distance to the landfill, length of stay in the area and status of tenure. The R obtained for Olushosun and Abule Egba are 0.38 and 0.27 respectively while the R^2 for both sites are 7.5% and 1.5% respectively for both sites. These values are indeed very low. However, results of the analysis of variance for the two sites show that these values are significant (F values = 8.38 and 3.49 respectively for the two sites). For these two

models, the Beta coefficient reveals, for Olushosun site, that distance from landfill is the most important variable affecting WTP (0.18). The T -test value for this co-efficient is also highly significant. Apart from the landfill factors sex, marital status and occupation respectively also have more weight than the remaining variables used in the model. Their values are not significant. For Abule-Egba, occupation is the most important factor (0.21) followed by landfill (0.12). The t -values for beta co-efficient are also significant.

Conclusion

This paper examined the willingness to pay for improved environmental quality among people living around the two functional landfills (Olushosun and Abule Egba) in Lagos metropolis using the contingent valuation method. Three important facts emerged from the outcome of this study. First, the presence of the landfills and its associated environment impacts is an important factor contributing to respondents' willingness to pay for any environmental improvement in their neighbourhood. Second, the proportion of respondents willing to pay decreased consistently as distance increases away from the landfills in the two locations. This could be attributed to the fact that since people living farther away from the landfill may not feel much of the impacts of the landfill, they may not see any reason to want to pay for environmental improvement in this particular case. Lastly, respondents are generally not willing to pay high amount for environmental amelioration as revealed in previous studies especially in developing countries where per capita income is low. These findings may however be subjected to further research in the sense that other environmental and even social factors may also affect people's willingness to pay for environmental improvement in large urban areas, especially in Nigeria.

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Table 1: Mean Values of Socio-Economic Survey of the Study Area

Mean values of Socio-Economic characteristics	Olushosun		Abule Egba	
	Mean	SD	Mean	SD
Age of Respondent	44.94	13.69	45.20	12.91
Length of stay in the Area	7.19	5.77	7.65	6.24
Length of stay in the House	7.18	6.19	6.98	6.19
No of persons in the Household	5.62	3.11	6.40	3.24

Source: Author's Analysis

Table 2: Descriptive Statistics for Major Environmental Concerns about Landfills

Environmental concerns		Olushosun			Abule-Egba		
		Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Odour	Mean	3.83	3.89	3.26	2.96	2.86	2.15
	Std. Dev	1.46	1.48	1.49	1.58	1.43	1.55
Noise	Mean	3.43	3.33	3.42	3.64	3.74	3.78
	Std. Dev	1.38	1.55	1.41	1.42	1.37	1.30
Visibility	Mean	2.93	2.85	2.73	2.97	3.29	3.07
	Std. Dev	1.46	1.45	1.37	1.55	1.34	1.52
Aesthetics	Mean	3.30	3.52	3.29	3.72	3.75	3.56
	Std. Dev	1.36	1.47	1.46	3.31	1.27	1.26
Traffic obstruction	Mean	2.38	2.58	2.83	3.47	3.41	1.54
Flies & rodents	Std. Dev	1.38	1.46	1.22	2.31	1.38	1.51
	Mean	2.78	2.58	3.19	1.42	2.91	2.72
Air pollution	Std. Dev	1.40	1.34	1.29	2.31	1.43	1.46
	Mean	2.79	2.57	2.36	1.40	2.74	2.44
Water pollution	Std. Dev	1.35	1.40	1.32	2.96	1.46	1.44
	Mean	3.35	3.21	3.45	1.42	3.26	3.18
Dirt	Std. Dev	1.31	1.35	1.43	2.63	1.36	1.39
	Mean	2.96	2.85	3.26	1.52	2.78	2.66
Insect and cockroaches	Std. Dev	1.44	1.40	1.32	1.52	1.50	1.46
	Mean	2.74	2.52	3.13	2.80	2.54	2.18
Others	Std. Dev	1.30	1.34	1.25	1.33	1.34	1.29
	Mean	2.85	2.75	2.87	2.62	2.70	2.63
	Std. Dev	1.25	1.23	1.10	1.17	1.14	1.12

Source: Author's Analysis

Table 3: Willingness to Pay for Improved Environmental Quality

	Olushosun			Abule Egba		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Yes	115(26.5)	93(21.4)	73(16.8)	119(29.5)	85(21.0)	83(20.5)
No	26(6.0)	59(13.6)	68(35.3)	43(10.8)	31(7.7)	43(10.6)
Total	141(32.5)	152(35.0)	141(32.5)	162(40.1)	116(28.7)	126(31.2)
	$X^2=2871, P=0.000$			$X^2=2.38, P=0.305$		

Source: Author's Analysis

Table 4: Amounts Respondents are willing to Pay

Amount	Olushosun			Abule Egba		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Less than N100	58(19.0)	49(16.1)	26(8.5)	72(24.7)	33(11.3)	47(16.2)
N101-N300	42(13.8)	40(13.1)	39(12.8)	31(10.7)	36(12.4)	20(6.9)
N301-N500	19(6.2)	12(3.9)	5(1.6)	16(5.5)	9(3.1)	8(2.7)
>N500	6(2.0)	3(1.0)	6(2.0)	6(2.1)	10(3.4)	3(1.0)
Total	125(41.0)	104(34.1)	76(24.9)	125(43.0)	88(30.2)	78(26.8)
	$X^2=11.09, P=0.086$			$X^2=15.43, P=0.017$		

Source: Author's Analysis

Note: 1US\$ = #115