

## DEPRESSIONARY EFFECT OF PROXIMITY OF RESIDENTIAL PROPERTIES TO WASTE DISPOSAL SITES IN NIGERIA

(A Case Study of Solous Landfill Site)

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### Abstract

*It is important to know if and to which extent proximity to waste disposal sites or treatment plants depresses residential property values for many reasons. Whether as a measure of the impact of the sites on health and general welfare of the resident, or to ascertain the degree of monetary depression that would be suffered by property investors or even for future planning, it is imperative to know how these sites impact on the lives of the residents. Past studies have researched these impacts using a variety of hedonic models and Marginal Implicit Pricing, however, this study takes a special focus on the resident's perspective based on the linear proximity to waste disposal sites. 260 questionnaires were distributed to residents within 1km to the site and Estate Surveyors in the area. The correlation between respondent's profile and opinions are analyzed and it revealed that the site has major impacts on the residents perceived quality of life, security and total outlook of the area. It also showed that there is a negative correlation between the distance from landfill and the perceived quality of life of residents.*

**Key words:** Landfill, Property value, Health and safety, Residential property, Solous

### Introduction

The location of a property has a great influence on its value especially in urban areas. Physical location refers to the position of one site relative to that of another. The term physical location is often used interchangeably with proximity and accessibility (Fanning and Stephen, 1994). Location influences on the value of residential property may arise from any number of sources, such as accessibility to shopping centre, educational and leisure facilities.

In Nigeria, the urban environment is characterized by a proliferation of squatter settlements, a breakdown of waste disposal, air pollution, water pollution, inadequate water and power supply and squalid condition of environmental sanitation. Increased urbanization and expanded use of disposable products in the past decade have generated greater demand for landfill space (Arimah 1996).

The effects of landfills and other solid waste facilities on nearby residential properties cannot be easily generalized; however, while some academic research and other evidence indicate that residential property values are not necessarily adversely affected by close proximity to such facilities, a

study by Nelson *et al.* (1992), found that property values were depressed within 3.2 km of the landfill studied by a value gradient of about 6.2% per kilometer.

Proximity to landfills and hazardous waste sites can severely affect property values. Any property close to an active landfill might probably be devalued depending on how close the property lies to the site, whether the site is still active, and (if not active) if the waste has been properly encapsulated or removed, or by the presence or lack of other amenities. For example, if an active landfill is declared "closed" and proper measures are taken to ensure that there is no risk of contamination from the waste therein, the value of a nearby property may rise from the low value it had from being located near an active waste site. Devalued property may further regain some of its previous value if the former waste site is improved or developed commercially.

The immediate influence of environmental characteristics is manifested in the form of a pull and push effects of the neighborhood on the prospective house buyers. Under this situation, environmental considerations in most cases outweigh other factors in the choice of where to live (Bello and Bello 2008). The issue here is how the Nigerian real

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estate market is reflecting the significance of environmental factors as major determinants of property values.

The question of what effects solid waste facilities and landfills has on residents' health and property values have long been a subject of debate (Bouvier *et al.*, 2000). From past studies, the effects of landfills and other solid waste facilities on nearby residential properties cannot be easily generalized; some academic research are from the school of thought that residential property values are not necessarily adversely affected by close proximity to such facilities, while from another school of thought, some researchers are also of the opinion that it has little or no effects on the health of the people living close to the landfill site.

A landfill is property set aside for the purpose of safe disposal of solid waste, either municipal (trash such as would come from homes) or hazardous (toxic chemicals, etc.). "Hazardous waste" refers to any material that may pose an unreasonable risk to health, safety, or property – especially those materials that are toxic, corrosive, reactive, or ignitable, Propex (2005).

Several studies articulated by Ready (2005) have attempted to estimate the empirical relationships between residential property values and proximity to a landfill or set of landfills and have found that houses located near a landfill sell for lower prices than similar houses located farther away.

However, some landfill studies show no statistical relationship between proximity and house price (Gamble *et al.*, 1982; Bouvier *et al.*, 2000; Zeiss and Atwater 1989). Solid waste industry representatives have pointed to these studies as evidence that landfills need not have negative impacts on nearby property values (Parker, 2003). In one of the first studies of this type (Havlicek *et al.*, 1971) in Akinjare *et al.*, (2010) found an increment house pricing by \$0.61 per foot of distance from landfills in Fort Wayne, Indiana. Almost 2 decades later, a study by Alan *et al.*, (1992) cited in Ready (2005) concluded that landfills will likely have an adverse impact upon housing values when the landfill is located within seven blocks of an expensive housing area, and that the negative impact is between 5.5% – 7.3% of the market value depending

upon the actual distance from the landfill. For less expensive, older areas the landfill effect is considerably less pronounced, ranging from 3%- 4% of the market value, and essentially nonexistent for predominantly rural area.

Whereas, Bouvier *et al.*, (2000) reviewing previous studies on the effect landfills on property values discovered that research has only been on the urban property values and thereby neglecting its effects on rural residential property values.

Jong and Paul (2003) carried out a research on landfill scale effects on property value. They showed that the regression coefficients for the distance to the landfill and location vary depending on a landfill size (or, alternately, depending on the volume of waste a landfill handles daily). The research results suggested that people perceive the nuisances or disamenities from a large landfill as being greater than those from a small landfill. The study further stated, given that a large-scale landfill may also be operational for a longer period, the results of this study suggest that residential development would be hindered more significantly by a large landfill area than a small landfill. The study concluded that the implication of a greater impact of a large landfill on property values is that a smaller landfill may be less costly in terms of total social costs associated with waste disposal, diminishing the economic advantages a large landfill possesses over a small landfill. When combined with the incentive effects of less landfill availability, small landfills may in fact be superior to large landfills overall.

Richard (2005) did a research asking if landfills always depress near property value, because there has not yet been a large-sample study that conclusively demonstrated small or nonexistent property value impacts from a landfill. The results showed that the three landfills studied differ in their impact on nearby property values. While two of the three landfills have statistically significant negative impacts on nearby property values, the smallest, least prominent landfill does not. With all the aforementioned studies and case, it can be said that property value impacts vary from landfill to landfill, and are in some cases small or nonexistent.

But as stated by Akinjare *et al.*, (2010), besides the environmental damages caused by landfills, residents living close to the landfills fear diminutionary effects of nearby landfills on their property values. Thus, this study asks the following questions;

- What is the effect of landfills on nearby residential property values?
- What are the environmental damages and health effects attached with siting landfills in a residential area?
- Is there any relationship between proximity to landfill and property value?

## **Methodology**

### **Study Area**

There are four major landfills in Lagos state namely Olusosun landfill in Ikeja Local Government Area, Abule-Egba landfill in Agege Local Government, and Solous landfill in Alimosho Local Government and Gbagada in Kosofe Local Government Area. The landfills are under the control and management of Lagos State Waste Management Authority (LAWMA).

The Solous landfill is situated at Igando in Alimosho Local Government Area of Lagos State. The landfill is located within 6°33'0N and 3°15'0E. It is on 7.8 hectares of land. It started operations in the year 1996 with a projected life span between 5 and 6 years, it is surrounded by residential, commercial and industrial set-ups. It is bounded by the North with Ayobo/Ipaja Local Government at the Oponu swamp behind Ijan, Olorunnisola and Ashipa communities to the south is Amuwo-Odofin at the Ijeododo community through Ijegun, Isheri-Osun road and boundary with Iba Local Government at the swamp behind Obadore Community and to the East is Isheri – Osun swamp up to Ikotun Egbe junction at Ikotun while to the West is Boundary of Iba Local Government area up to Ogun State boundary at Owu stream. Solous landfill receives waste from entire Lagos and the site receives an average of about 2,250m<sup>3</sup> of waste per day and about 5,271.40 tons per week.

### **Data Collection**

The concept behind collection of data is data gathering. Generally there are two types of data. Primary and secondary data; in data

collection it is important to consider the time available for the research, kinds of target audience to be surveyed, accuracy of the results required and geographical spread of the target audience to be surveyed. Hence the use of survey questionnaires was resolved on for this research. Residents living within 1km radius of the landfill were targeted for the survey.

Sample frame is the list of people or items that form the group which a sample was taken. It is the actual list of people useful for the research work or study; it is a subset of the study population. Having chosen the sample size (finite) of a study from a population (infinite), it is pertinent to know that there are various techniques that have been used in selecting the sample units that make up the sample. These techniques can be employed individually or in combination and the factors that influence the choice of techniques includes: nature and quality of the frame, availability of auxiliary information about units on the frame accuracy requirements, and the need to measure accuracy, whether detailed analysis of the sample is expected and cost/operational concerns. Sampling techniques are broadly grouped into probability and the non-probability techniques.

In the case of this study, the simple random probability sampling technique was employed. This technique is the basis of all probability sampling techniques, it operates on the principle of randomness and it gives every element of the population the chances of been chosen. Both the residential properties within 1km radius from the landfill site in the study area, the registered Estate Surveyors and Valuers' firms in Ikeja, Lagos state and the LAWMA officials will be chosen on the basis of random picking. 200 questionnaires were administered to residents and 105 questionnaires were retrieved representing 52.5% of the respondents and 95 questionnaires were not retrieved representing 47.5% of the respondents. Another set of 60 questionnaires were administered to Estate Surveyors and Valuers where 47 questionnaires were retrieved representing 78.3% of the respondents.

**Data Analyses**

The interpretation and analysis of this study are mainly descriptive and inferential analysis. The descriptive analysis includes basic profile details of the residents living within 1km radius of the site and the Estate Surveyors operating in the area. On the other hand, inferential analysis includes testing for questions answered at random and answer that were given much preference in filling them. It also tests for dependence of responses on

some parameters. This analysis involves the use of Chi – Square test, Analysis of Variance test (ANOVA) and regression analysis.

**Results and Discussion**

Table 1 shows the profile of the residents. Majority of who have been living in the area for 11 to 15 years and also a well educated resident base of 56% being higher education degree holders.

Table 1 Profile of Residents

PROFILE OF RESIDNETS (in %)					
EDUCATION %		LENGTH OF STAY %		NUMBER OF ROOMS %	
SSCE	19	0-5	80	1 bed flat	16.2
OND	8.6	6-10	16.2	2 bed flat	24.8
HND/BSc	56.2	11-15	3.8	3 bed flat	36.2
MSc/ABOVE	10.5	15-above	0	4 bed flat	18.1
OTHER	5.7			other	4.8

Table 2 also shows that majority of the Estate Surveyors surveyed are educationally qualified and experience with about 45% having more than 5 years experience in the field.

Table 2 Profile of Estate Surveyor

PROFILE OF ESTATE SURVEYORS			
EDUCATION %		YEARS OF EXPERIENCE %	
SSCE	0	0-5	55.3
OND	25.5	6-10	12.8
HND/BSC	57.5	11-15	17.0
MSc-ABOVE	17.0	16-ABOVE	14.9

**Effects of Landfill on Property Values**

In achieving one of the objectives of this study which is to examine the effect of landfill on property value in the study area, opinions of Estate Surveyors and valuers who had carried out valuation exercise on residential properties near landfill were sought. The residents as well were asked series of questions to this effect. Tables 3 and 4 shows the Estate Surveyors and Valuers opinion of landfill as a factor to be considered in ascribing values to properties of close proximity to a landfill, it will also show the residents perspective of same.

Table 3 Firms provide valuation services

Response	Frequency	Percentage
Yes	42	89.4
No	5	10.6
Total	47	100

From Table 4, the 42 respondents representing 89.4% of the Estate Surveyor and Valuer sampled provide valuation services while the remaining 5 respondents representing 10.6% do not provide valuation services.

Table 4 appraisal experience on a property close to a landfill site

Response	Frequency	Percentage
Yes	31	73.8
No	11	26.2
Total	42	100

Going further, the Estate surveyors and Valuers that provides valuation services were asked if they had carried out valuation exercise on a residential property before, the table 5 shows the response of the Estate Surveyors and Valuers that had carried out

valuation exercise on a residential property before. From the table, out of the 42 respondents that carry out valuation as one of the services they offer, 31 respondents representing 73.8% have carried out valuation exercise on residential property close to a landfill before while the remaining 26.2% of the respondents representing 11 respondents has not carried out valuation exercise on any type of property close to a landfill.

Table 5 Did you consider the landfill presence?

Response	Frequency	Percentage
Yes	21	73.8
No	10	26.2
Total	31	100

Table 5 shows that of the 31 Estate Surveyors that had been involved in valuation exercises on property near a landfill, only 21 respondents considered the presence of the landfill while the remaining respondents did not consider the presence of the landfill in ascribing value to the property.

Table 6 effect of the site on final opinion of value

Response	Frequency	Percentage
Increase	2	8.1
Decrease	17	95.5
Indifferent	2	9.5
Total	21	100

From Table 6, it is seen that of the 21 respondents that considered the presence of the landfill in ascribing value, 17 respondents stated that the final value of the property was decreased (considering the environmental hazards attached to the landfill), 2 respondents stated that the final value of the landfill was enhanced while the remaining 2 respondents stated that they were undecided about the effect of the landfill in ascribing the final value even.

Out of the estate surveyors and valuers were further asked if landfills should be a determinant of property value, the response was the same as that of those that considered the landfill presence.

### Health and Environmental Hazards Caused by the Landfill

Residents living close to a landfill site are prone to some environmental hazards and health defects. To confirm this, respondent's opinions were sought with regards to the effects of the landfill on their health and quality of life.

Table 7 Perception on quality of life of respondents

Quality of Life	Frequency	Percentage
Very Good	9	8.6
Satisfactory	21	20.0
Good	29	27.6
Poor	46	43.8
Total	105	100

Respondents were asked to rate the quality of their life they are living as regards their close proximity to the solous landfill. From Table 8, it is seen that most of the respondents rated their quality of life as 'poor' as a result of the site while only 28.6% rated it as either good or satisfactory. It can hence be deduced that a greater percentage of the residents live a poor quality of life regarding their closeness to the solous landfill site.

Table 8 Type of pollution experienced

Life quality	Frequency	Percentage
Air Pollution	75	71.4
Noise Pollution	6	5.7
Water Pollution	3	2.9
Others	2	1.9
All Pollutions	19	18.1
Total	105	100

Table 8 shows the responses of the respondents and the type of pollution they experience from the landfill site. 75 respondents which is 71.4% of the whole respondents experience air pollution, 6 respondents representing 5.7% witness noise pollution. As for water pollution, 3 respondents experience it, 2 respondents experience other types of pollution which was not stated, while the remaining 19 respondents experience all the types of pollution listed above. Going by the responses, the major type of pollution which affects or which the residents experience is Air pollution.

Table 9 Does the landfill have negative effect on your health?

	Frequency	Percentage
Yes	54	51.4
No	51	48.6
Total	105	100.0

The respondents were asked if the landfill affects their health negatively, the response shows that the landfill has negative effects on the health of 54 respondents representing 51.4%, while the remaining 51 respondents representing 48.6% believe that the landfill has positive effects on their health.

Inferential analysis was also used to investigate whether some responses from the respondents are dependent on other factors or if the responses were given at random and hence a product of choice rather than chance. The Chi Squared, ANOVA and Pearson correlation are used in this respect. These analyses are done in order to investigate;

- Firstly, if the responses were products of the respondent's choices or if they were due to chance. To confirm this, a non-parametric chi squared test is conducted.
- Secondly, the level of dependency of some responses. To ascertain this, a non-parametric Kruskal Wallis ANOVA test is done. Here the respondents' profile is used as the independent variable and the responses analyzed are used as the dependent variable.

It must be noted here that for the Chi squared and Kruskal Wallis test, the null hypothesis is that the responses were given at

random and the confidence level is set at 95%. For significance levels below  $<0.05$ , the null hypothesis is rejected as this implies that the results are valid and not at random.

**Response Interdependence**

This section focuses on the factors that contribute to the responses gotten from the respondents. The residents' profile is tested against some responses to test if it had a form of influence on the response. For each of the subsections, the significance of the tested parameters is ascertained and then their dependence in relation to the respondents profile is explored with the use of a non-parametric test called Kruskal Wallis ANOVA, which is followed by the Pearson p correlation test. The Pearson correlation tests for the relationship between responses. For ease of understanding each objectives are presented in subsections and the tables in each objectives shows the Chi squared test, Kruskal Wallis NOVA test and the Pearson correlation.

This work also examined the effects of landfill on property values in terms of distance. This section examines the residents' profile dependence on their perception on the rent passing even after any form of review is done. The chi squared test was first used to test various parameters in the questionnaire administered on residents and further tested for dependence on the residents' profile. Subsequent tables below shows the chi square, Kruskal Wallis ANOVA test of dependence and the correlation.

Table 10: Chi squared analysis

Tested parameters	Chi Square	Significance
How much do you pay for rent	67.610	0.000
Effects of landfill on the rent reviewed?	33.657	0.000
Proximity effects on rent review differences	49.400	0.000
Is proximity to landfill an added advantage in terms of reduced rent?	36.171	0.000
Would living farther from the landfill make your rent increase?	11.200	0.004

From table 10 it can be seen that respondents gave preference to all tested parameters as shown above because it has a tested parameter significance level of  $<0.05$ .

Parameters in table 10 were tested against the respondents' profile to test for dependence of parameters. In obtaining this, the Kruskal Wallis ANOVA test was used, where the

profile of the residents was applied as the independent variables and the earlier tested parameters was the dependent variable.

Table 11 KW ANOVA of dependence of 'landfill effect on property value' on Profile

Opinions on	Profile			
	Level of Education	Type of Property Occupied	Length of Stay	Distance from Landfill
Effects of landfill on the rent reviewed?	0.506	0.000	0.682	0.030
Proximity effects on rent review differences	0.469	0.000	0.600	0.004
Is proximity to landfill an added advantage in terms of reduced rent?	0.442	0.000	0.104	0.006

Table 11 shows that some of the tested parameters are independent of some of the profile. The respondents' perception of the 'Effects of landfill on rent reviewed', Proximity effects on rent review differences' and whether proximity to landfill is an added advantage in terms of reduced rent' is dependent on 'the type of property occupied'. Also the residents' perception of questions such as 'Effects of landfill on rent reviewed', Proximity effects on rent review differences'

and Is proximity to landfill an added advantage in terms of reduced rent?' are dependent on the distance from the landfill.

**Health effects of the landfill**

This section reviews the respondents' responses on how often the landfill site smells, is the site a hideout for hoodlums, pollution attracted by the site, effects of the site on health and the quality of life they live considering their proximity to the landfill site.

Table 12 Chi Squared test

Tested parameters	Chi Square	Significance
How often does the landfill site smell?	44.286	0.000
Is the site a hide out for hoodlums?	33.152	0.000
Pollution attracted by the landfill site	182.381	0.000
Effects of landfill on health	0.086	0.770
Quality of life	27.533	0.000

From table 12 it can be seen that respondents gave preference to questions on 'how often the landfill smells', 'site been a hide out for hoodlums', 'pollution attracted by the landfill' and 'quality of life' because it has a tested parameter significance level of <0.05 while responses on 'effects of landfill on health' was given at random.

most cases; however there were some cases of dependence. It shows that 'the site being an hideout for hoodlums' is dependent on 'their length of stay in the area', 'the pollution attracted by the landfill site' is dependent on their 'distance from the landfill site' also 'the quality of life they live' is dependent on 'their distance from the landfill site'.

Table 13 shows that respondent's answers are independent of their profile or background in

Table 13 KW ANOVA of dependence of landfill effect on health on Profile

Opinions on	Profile			
	Level of education	Type of property occupied	Length of stay	Distance from landfill
How often does the landfill site smell?	0.392	0.125	0.640	0.401
Is the site a hide out for hoodlums?	0.107	0.266	0.017	0.100
Pollution attracted by the landfill site	0.258	0.281	0.442	0.011
Quality of life	0.594	0.401	0.359	0.004

The parameters in Table 13 were further tested against the profiles of the respondents to establish the nature of the relationship between the respondent's profile and opinions. To achieve this, the Pearson's R correlation test was conducted. The profiles of the respondents are used as the independent variable and the valid parameters as above are used as the dependent variables. The correlation analysis shows on Table 14 that there is a negative correlation between the distance

from landfill and the perceived quality of life of the respondents. This means that the nearer the respondents, the less they perceive their quality of life to be with regards to the site. There is also a slight correlation between quality of life and length of stay, this can be explained as being so due to the fact that people who live in proximity to the site for longer have come to accept the site as a part of their lives and have found a way around it when compared to the newer residents.

Table 14 Health effect vs. Length of stay vs. Distance from landfill

	Length of stay	Distance from landfill
Is the site a hide out for hoodlums?	0.115	0.206
Pollution attracted by the landfill site	0.164	0.250
Quality of life	0.082	-0.263

**Conclusion and Recommendation**

Air pollution which is the modal problem faced by residents here operates without boundaries hence this study recommends the need for the management of the site to attach more importance to the treatment of the plant, not just for the benefits of the immediate residents but also people who may just be passing by and those in the wider surroundings. To achieve this, this work recommends the use of state of the art technologies in landfill management to minimize the hazardous discharges from the site and also to ensure that the site does not operate beyond its recommended safe limits.

The site has been identified as a hideout for miscreants and hoodlums disguising as dumpsite pickers. Aside the menace of robbers and insecurity of surrounding homes, the site smells of methane and tons of garbage, the dump is a dangerous place, very hot and incredibly smelly, due to this, it is not safe for humans without proper safety requirements to be there. This work hence recommends that unauthorized pickers should be discouraged even for their own health reasons as the methane gas from the site is hazardous to their health and that only licensed companies who meet the safety requirements of Lagos Waste Management Authority LAWMA be allowed unto the site.

This study corroborates earlier research that proximity to landfill sites depresses the value of residential properties. It is also seen that the perceived quality of life of the respondents, security and total outlook of the area is affected negatively; hence the value of residential properties around this site is more reliant on demand rather than suitability or choice.

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