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Measuring the Effect of Dumpsite on the Urban Residential Property Market in Port Harcourt Metropolis

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Abstract

This study focused on the effect of dumpsite on the residential property market. The purpose is to determine the effect of the dumpsite at Rumuolumeni on the surrounding residential community, as measured by changes in rental value of residential properties in the neighbourhood. To measure the effect, since property is a multi-dimensional product affected by several factors including environmental factors, multiple regression analysis was used to isolate the effect of the dumpsite while holding other factors constant. Structured questionnaire were administered on some landlords and tenants living in the residential building in the neighbourhood of the dumpsite under study. The result revealed that dumpsite has negative effect on property value as measured, base on distance from the dumpsite. The study showed that there is a significant variation in the rent payable for the different types of residential properties near and distant from the dumpsite at Rumuolumeni. The study also revealed that there is an increase in the time taken to let those residential properties that are in close proximity to the dumpsite which result to greater vacancy rate for the various property types close to the dumpsite. The study recommended that dumpsite should be relocated to empty lands away from residential and other land use. The study also recommended that the 4Rs of waste management approach which stands for Reduce, Reuse, Recycle and Recover should be adopted by both individuals, organizations, manufacturing companies and waste management agencies and inculcated in everyday life

Keywords: *Dumpsite, Property value, Marketability, Stigma*

Background to the Study

The proliferation of dumpsite has remained an intractable environmental sanitation problem in Nigeria. This problem has manifested in the piles of indiscriminately disposed heaps of uncovered waste and illegal dumpsite along major roads and street corners in cities and urban areas (Wokekoro and Uruesheyi, 2014). This problem is compounded by the rapid urbanization and population growth which has led to the generation of enormous quantities of solid waste often discarded by open dumping. In Port Harcourt and most fast growing cities in Nigeria like Lagos and Ibadan, it is not uncommon to see open waste dumps in close proximity to residential areas. This according to different scholars has had an adverse impact on the property values of the surrounding residential community.

The value of individual properties usually depend on the property's unique attributes, each of which creates utilities or disutility to individuals. These unique attributes can be related to those which are external and those that are internal to the property. While the external attributes can be associated with the general state of the economy, population, employment, finance, location, transportation and environmental attributes, the internal attributes relates to the specific details of the property such as size, accommodation, condition, design, age, type and plot size (Bell, R, 1999). These influences therefore form the value determinants of properties.

Property however, extends beyond shelter to include environmental attributes which relates to the quality of the neighbourhood. The environment attributes are revealed in the form of push and pull effect of the neighbourhood through negative and positive externalities. The pull effect may relate to good roads, proper drainage, schools, etc. while the push effect may be associated with air and water pollution, poor sanitation, indiscriminate dumping of waste, etc. (Bello, 2008). However, the association of properties with undesirable conditions like the presence of dumpsite can adversely impact values (Chalmers & Jackson, 1996) and tend to slow down property market transaction.

It is ironical, that Port Harcourt which used to be known as the "Garden city of Nigeria" because of her neatness have now been turned rather to a "garbage city" because of piles of refuse dotting the entire city of which the case study dumpsite are part of. Although there are only two recognised dumpsites in Port Harcourt (the one at Iwofe), other dumpsters and collection points are located in public places surrounded by residential buildings such as tenements, blocks of flats, bungalows, duplexes, etc. According to Bello (2009), such dumpsites and dumpsters have been reported to release large amount of hazardous and deleterious chemicals to the air via leachates and poisonous gases respectively. The presence of this externality and land use may create an adverse public perception (stigma) that affects the marketability and the values of properties in the neighbourhood. Thus, the intention of this study is to determine the extent to which the dumpsite at Rumuolumeni in Port Harcourt Metropolis creates stigma to its surrounding residential community.

The Study Area

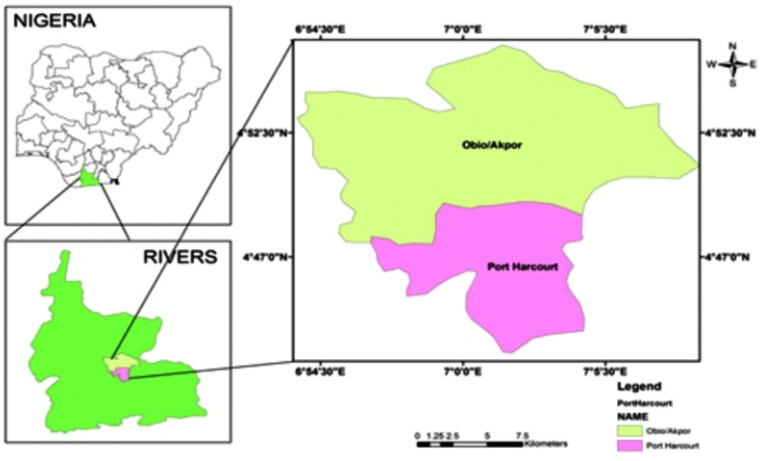
The study area is Rumuolumeni community in Port Harcourt Metropolis, Rivers State. Geographically, Rumuolumeni is situated between latitude 4.°49N and longitude 6.°58E. This latitudinal location implies that the study area lies within the tropical region with all its

climate and topographic characteristics. Rumuolumeni is bounded by Mgbuoba on the North, Rumueme on the east, and on the South by other parts of Port Harcourt The area has an estimated total land mass of 15km^2 and has a total population of 32,000 dwellers, (NPC, 2006), which forms part of the entire population of Obio/Akpor Local Government Area in Rivers State . The geology of the study area falls under that of the Niger Delta. Niger Delta is located in the continental margin of West Africa on the Gulf of Guinea.

The area is characterized by a semi-hot humid equatorial climate which is presently within the neighbourhood of 27°C to 32°C and relative humidity has graduated from 75% to 85% or more particularly during the rainy season. It is typified by a uniformly high temperature throughout the year, intense rainfall which occurs almost every month of the year, seasonally variable and energetic in downpour with increasing distance from the ocean. This often graduates to thunderstorm at its onset and cessation with variation in duration and amount between 2000mm - 3000mm in July to September.

Rumuolumeni as well as other communities in Obio/Akpor Local Government Area are part of the Port Harcourt Metropolis in Rivers state. Port Harcourt Metropolis in the Niger Delta region of Nigeria is the fourth largest urban centre of the country. With an estimated population of 1,947,000, it possesses substantial natural resource prominent among which are major oil and gas deposits in the Niger Delta region of the country, a variety of solid minerals, good agricultural land and water resources, a large labour force and a vibrant private sector. The research area in particular is the dumpsite at Iwofe road and its surrounding residential community in Rumuolumeni, Port Harcourt Metropolis.

Figure 1: Map of Port Harcourt Metropolis



Concise Review of Related Literatures

There is a plethora of literature on the impact of dumpsites and other undesirable facilities on the property market. However, most of these literatures has dwelt more on the residential property market, using distance to the undesirable facilities as a proxy for ascertaining the perceived impact. On their part, Reichert et al (1992), in a hedonic regression analysis for homes located near a Cleveland landfill in Ohio found that the estimated Marginal Implicit

Price (MIP) for distance was negative, implying homes had higher prices near the landfill. Furthermore, this estimated MIP was found to be statistically insignificant, with high sampling variability and an absence in relationship between proximity to the landfill and home prices was argued to be caused by an un-modeled heterogeneity in neighbourhood quality. By the use of a smaller and more homogeneous study area, residential properties near the landfill were found to sell for $6000-$8000 less than homes farther away.

Simolen et al, (1992) examined the impact of the Envirosafe landfill located in Oregon, Ohio on the east Toledo metropolitan area. The Envirosafe accepts a low level category of hazardous waste from a variety of sources across the United States. With their eight variable aggregate models, which generated an r2 value of 57 percent; the results indicate that sales price increased by $8141 for each additional mile from the land fill. On their part, Gamble and Downing (1982) studied the impact of a nuclear waste leak at the Feed Materials Production Facilities. The cases involved leaks of airborne and groundwater nuclear water contaminates. The subject area was defined as those properties within five miles of the FMPC site. A control area was included in the analysis. The study found that property devaluation was limited to within two miles. For residential properties directly bordering the FMPC (Feed Material Production Control), a 35 percent reduction in values was reported. For properties within one mile the reduction in property values was reported ranging from 12-20 percent.

The reasons attributed for the reduction in property values arising from contamination according to Hall (1992) are the cost of cleanup, liability to the public, stigma after clean up, loss of net income due to reduced rental rate, increased vacancies and increased expenses, financial difficulty, or inability, business disruption and increased discount rate. Thayer, (1992) compared the effect on house price of hazardous and non hazardous waste sites in Baltimore and discovered that, proximity to land fill resulted in a loss in a value approximately 35% of the loss associated with hazardous waste site based on a linear model used, the mean loss in value using all data (hazardous and non hazardous) was approximately $1, 300 per mile (linear) or $1, 700 per mile (semi log) which translates to 1.2% to 1.6% of average house price

In a more recent study, Bello (2009) carried out a study on the effects of waste dump sites on proximate property values in Lagos, Nigeria using three dump sites located at Olusosun, Abule Egba and Solous adopting 1km distance measurement to assess the effects of the dumpsite on the neighbourhoods. The research sampled 334 residents from the three waste dump sites and 107Estate Surveying and Valuation firms in metropolitan Lagos. The study was carried out to measure the effect of waste dump on property values and to develop an appropriate valuation methodology to carry out valuation of properties affected by waste dump sites. A combination of valuation methodologies was adopted such as Paired Sales Analysis, Contingent Valuation Analysis, Option Pricing Model and Hedonic Approach. The study found that there was a weak linear relationship between rental value and satisfaction of occupants in the neighbourhood of the waste dumps.

Similarly, Adewusi and Onifade (2006) focused on the effect of urban solid waste on physical environment and property transactions in Surulere Local Government Area of Lagos State. Questionnaires were randomly administered on residents and firms of estate agents to gather data on the subject matter. Data obtained were analysed using frequency tables and

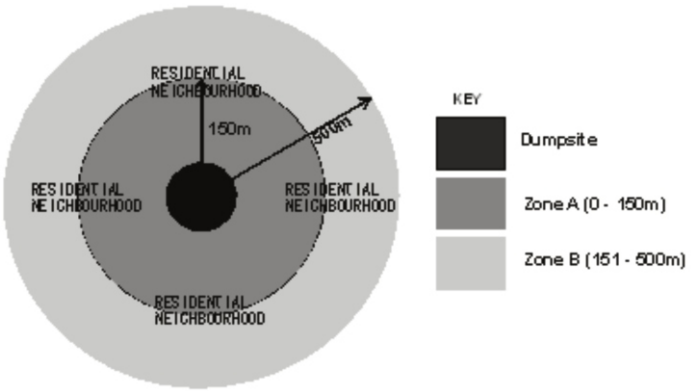
percentage ratings. The study found that rents paid on properties adjoining waste dumpsites were lower compared to similar properties further away and also, property transaction rates were very slow and unattractive as one approaches a dumpsite. However, the study did not provide any monetary explicit on the change in values.

Furthermore in another related study, Akinjare et al (2011), the price effects of landfills on residential housing in Lagos, Nigeria was determined using all four landfills in the Lagos metropolis. Using concentric rings, there was an indication that the highest property values were recorded for properties between the 601m and 900m range from the landfill. There was no threat posed by the landfill to properties beyond the 900m concentric ring. Also, the study showed that 30.2% of residential properties were situated within the 601m and 900m rings extending to 1.2km. The study failed to indicate the estimated aggregate loss in value of investor's real estate within the immediate residential scope of 1-200m from the four landfills.

Summarily, the impact of dumpsite on the property market especially the residential property cannot be overemphasized. From the foregoing, different authors have carried out studies in this area and had concluded that dumpsite in no small measure have a negative effect on residential properties. This study attempts to determine the relationship between distance from the dumpsite and residential rental market within the area. Obtainable results will form a good basis for understanding property market behaviour and consequently draw a comparison between the above study and this current one for the purpose of empirical generalisations of paramount note, however, is the simple fact that the attributes of the present study are similar to most of the principal attributes of the above study. The present study used relative distance from dumpsite as a variable to measure their effects on residential properties in Rumuolumeni.

Materials and Methods

The study involved a total population of about 504 residential properties (136 tenements, 180 block of flats, 134 bungalows and 54 duplexes) which was divided into two (2) zones of A and B. Zone A denotes residential properties in close proximity to the dumpsite (with an estimated distance of 0-150metres radius from the dumpsite) and Zone B relates to residential properties far away from the dumpsite (with an estimated distance of 151-500 meters radius). See figure 2 below:



Source: Author's Construct, 2015.

Figure 2: Showing the two zones (A and B) with respect to the distance from the dumpsite

With a sample size of about 40% of the population, the work made use of survey questionnaires and interviews which were the primary source of gathering data. These survey questionnaires were administered on tenants and landlords of residential buildings in the study area. For a better appreciation of the property market dynamics with regards to the rent and other associated issues, sets of questionnaire was administered to about 68 Estate Surveying and Valuation Firms within the Port Harcourt Metropolis. Interviews were also conducted with the staff of Rivers State.

Environmental Sanitation Authority (RSESA) and Rivers State Waste Management Agency (RIWAMA). The survey recorded an average response rate of 73% and the collated primary data were analysed using a descriptive and analytical statistics. Analytical statistics such as the multiple regression analysis and the one –sample test for variance has been adopted

Data Analysis and Findings

In order to satisfactorily determine whether there exist a significant variation in the rents across the two zones (A and B), the research hypothesis below was considered

H_0: There is no significant variation in the rent payable for residential properties near and distant from dumpsite (i.e. $0=_i d$)

H_1: There is a significant variation in the rent payable for residential properties near and distant from dumpsite (i.e. $0\neq_i d$)

Table 1: Average Rental Values of Building types for the two zones and their differences

S/N	X_1 ₦('000)	X_2 ₦('000)	Difference (d_i) ₦('000)
1	47.78	68.32	-20.54
2	260.00	350.00	-90.00
3	316.22	410.91	-94.46
4	346.43	470.00	-123.57
5	538.75	662.5	-123.75
6	674.00	806.00	-132.00
7	816.67	932	-115.33
	MEAN		-99.9825
	Standard Deviation		38.34406

Where,
X1 = the average rental values for Zone A
X2 = the average rental values for Zone B
n= Building types considered in both Zones = 7

Table one above shows the average rental values for seven residential property types - tenement, two bedroom flat, three bedroom flat, two bedroom bungalow, three bedroom

bungalow, three bedroom duplex and four bedroom duplex which are predominant in the area. The difference between the average rents for the two zones was obtained through the comparison of the average rents for the zones. This was further used to obtained the mean and standard deviations needed for the conduct of the one sample test for variance presented in table two below;

Table 2: One-Sample Test for rental variation

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
d_i	-6.899	6	.000	-99.98246	-135.4448	-64.5201

From Table 2 above, the t value of -6.899 does not lie within the upper limit and lower limit of the confidence interval (-135.4448 and -64.5201 respectively). Hence, from the SPSS analysis of the one –sample test (test on the difference d_i) shown in Table 2 above, the null hypothesis is rejected. Hence, there is a significant variation in the rent payable for residential properties near and distant from dumpsite (i.e. $d_i \neq 0$).

The result from the one sample test above shows that there is a variation in rent across the two zones. However, several factors ranging from structural, neighbourhood and environmental characteristic have contributed to it. These factors - neighbourhood, structural and environmental factors were used to develop the multiple regression analysis for the various residential property types. However, specific attention was given to the Two Bedroom Flat across the two zones and is presented in appendix 1.

From the results presented in appendix 1, the coefficient of determination ^2R in Tables 3 and 6 are 0.915 and 0.386 respectively. This implies that while the Structural, neighbourhood and environmental characteristics contribute 91.5% of the annual rental values in Zone A, they account for only 38.6% of the rental values in Zone B.

The multiple regression equation describing the relationship in Zone A (2 Bed Room Flat) between rental values and the three independent variables- structural (comprising age x_{11}, land area x_{12}, number of bathrooms/toilets x_{14} , fenced gate x_{15}, condition of building x_{16}), neighbourhood and environmental characteristics – is given as follows:

$$y = 381.092 - 0.258x_{11} - 0.039x_{12} - 4.770x_{14} - 65.703x_{20} + 92.652x_{30}$$

Considering Zone B (2 Bed Room Flat), the regression equation is given as:

$$y = 49.113 + 0.378x_{11} + 0.006x_{12} + 0.072x_{13} + 6.424x_{14} - 6.304x_{15} - 0.150x_{16} - 9.807x_{20} + 2.095x_{30}$$

The dumpsite characteristics such as air pollution, water pollution were considered as the prime environment determinant factor. While the ANOVA in Table 4 shows the significance of the regression in Zone A $p<0.05$, the ANOVA of Table 7 shows that the regression is insignificant $p>0.05$. The regression coefficients for both zones are shown in Tables 5 and 8 respectively. Interestingly only the coefficient of the Environmental characteristics, x_{30} in Zone A of Table 5 is significant, <0.05. This lends support to the fact that nearness to dumpsite affects the rental values significantly.

This result was however similar to other building types considered within the area. This supports the views of Bello (2009) and Adewusi & Onifade (2006) in their empirical studies that proximity to dumpsites is reflected in the rent paid by prospective tenants. This is because prospective tenants would want to pay less to compensate for the unfavourable environment.

From the interviews with the residents of the residential communities near and distant from the dumpsite, it was observed that the effect of the dumpsite in the study area have been generally reflected by the willingness to relocate by the respondents in the zone that is in close proximity to the dumpsite. The willingness to relocate reduced in Zone B, which is further away from the dumpsite. This shows that the effect of the dumpsite is predominant in zone A which is closest to the dumpsite.

Also, there was an increase in the time taken to let those residential properties that are in close proximity to the dumpsite. This resulted to greater vacancy rate for the different types of residential property in the zone. This is in marked contrast with zone B which is further away from the dumpsite where there is a reduction in the time taken to let the properties and invariably, a lower vacancy rate.

Furthermore, the rent paid for the different types of residential buildings in the study area is negatively affected by proximity to the dumpsite. This is as a result of the fact that prospective tenants are likely to pay less rent to compensate for the uncomfortable environment. In the same way, there is a positive correlation between rent and the quality of housing. This is a significant finding because the result would prove much more reliable since the precise distance of individual buildings to the disposal sites were used in the data analysis.

Conclusion and Recommendations

The value of a property for any use is not determined solely by the structure of the property. Other factors surrounding the property can add or subtract to its value. In the case of residential properties, the major determinants of value are structural, neighbourhood/locational and environmental characteristics. A property of the same structural appearance but contrasting neighbourhood and environmental attributes will command different values. In this study, the effect of distance of properties from dumpsite on rental values has also revealed that even in the same neighbourhood and similar properties, values will increase with distance from the dumpsite. The point is that though house is a built environment, it still has a very close connection with the natural environment therefore any negative externality on the natural environment will have a negative impact on the value of surrounding properties and vice versa. The study however recommends

1. There is the need for municipal government in Nigeria especially in Port Harcourt Metropolis to recognize solid waste management as a major problem and allocate appropriate and adequate resources to efficiently and effectively solve the problem. Besides there is need to have competent management team at the municipal level whether or not the job is contracted out.
2. There is urgent need for the dumpsite to be relocated to empty lands away from residential and other land uses. Therefore, proper remediation strategy should be adopted to ensure that the dumpsite is wholesomely removed. This would go a long way to ensure a clean environment.
3. The government through the Town Planning Authorities should stipulate a minimum building setback from any contaminated site. One would recommend a setback of about 200 meters away from the source of contamination. This policy would stand to forestall subsequent development of properties in close proximity to dumpsites.

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Appendix 1
Results of the Multiple Regression and ANOVA for Two Bedroom Flat in Zones A and B
2 Bed Room Flats in Zone A

Table 3: Model Summary for Two Bedroom Flat in Zone A

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.957[a]	.915	.809	12.54011

a. Predictors: (Constant), X30, X11, X14, X20, X12

Table 4: ANOVA [a] for Two Bedroom Flat in Zone A

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6770.983	5	1354.197	8.612	.029[b]
	Residual	629.017	4	157.254		
	Total	7400.000	9			

a. Dependent Variable: RENTA

b. Predictors: (Constant), X30, X11, X14, X20, X12

Table 5: Coefficients [a] for Two Bedroom in Zone A

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	381.092	79.433		4.798	.009
	X11	-.258	3.722	-.011	-.069	.948
	X12	-.039	.057	-.131	-.696	.525
	X14	-4.770	8.423	-.088	-.566	.601
	X20	-65.703	53.704	-.197	-1.223	.288
	X30	92.652	18.893	.943	4.904	.008

a. Dependent Variable: RENTA

2 Bed Room Flats in Zone B

Table 6: Model Summary for Two Bedroom Flat in Zone A

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.356[a]	.127	-.106	26.21087

a. Predictors: (Constant), X12B, X30, X20, X11B

Table 7: ANOVA [a] for Two Bedroom Flat in Zone A

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1494.852	4	373.713	.544	.706[b]
	Residual	10305.148	15	687.010		
	Total	11800.000	19			

a. Dependent Variable: RRENTB

b. Predictors: (Constant), X12B, X30, X20, X11B

Table 8: Coefficients [a] for Two Bedroom in Zone A

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	362.864	147.139		2.466	.026
	X30	40.548	49.724	.199	.815	.428
	X20	39.465	103.265	.104	.382	.708
	X11B	-1.561	1.914	-.225	-.816	.428
	X12B	-.021	.029	-.179	-.702	.493

a. Dependent Variable: RRENTB