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The Assessment of Land Use Changes on the Environmental Quality in some Neighbourhoodsin Port Harcourt, Nigeria

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Abstract

The research reviewed changes in Land Use Changes in some neighbourhoods in Port Harcourt and the environmental quality between 1986 and 2005. This improper use of land without following layout plan may have in turn affected the environmental quality.The objectives of this research are as follows: To assess the conformity of developments in selected neighborhoods in Port Harcourt: Diobu GRA Phase II, D- Line and Main Town to the original layout plans of these areas.To examine the factors that determines the conversion of land use in these neighbourhoods.To assess how these factors impacts on the urban environmental quality in these neighborhoods.To identify factors that makes for sustainable environmental quality on land use development in Port- Harcourt. A one part structure questionnaire was prepared and personally administered to the targeted respondents. The questionnaire was targeted at land users, respondents were randomly distributed in the study area.The technique used to derive the sample size was the random sampling method. The analytical techniques used in the presentation of data were based on descriptive and inferential statistics. The Hypothesis shows that within the three neighborhoods studied, many changes have taken place over the years. However between the neighbourhood there is relatively no real change.The three neighbourhoods studied shows that because land is in high demand and finite, most land is presently been leased out rather than been sold. The most leased out neighbourhood is D/Line with 70.58%, then Diobu GRA Phase II with 39.68% and finally Main-Town with 39.85%. One of the recommendations is that the city of Port Harcourt should not be allowed to grow by simply locating new buildings next to earlier development. Land reserves are needed in the built-up-area partly for future activities, partly for new traffic routes, for public transport and private traffic, and partly for green areas, to create breathing holes in the town.

Keywords: Assessment/ Land Use Changes/Environmental Quality/ Neighbourhoods/ Policy

I. Introduction

Land is a finite resource, thus the use to which land is put must be significant, and to justify quality of use, the effect on the environment (aesthetic, etc) and the development plans set out in the future.

In general, planned land use all over the world are categorized into types such as residential, commercial, industrial, agricultural, green land, open space, and even areas for future development and expansion.In modern cities land use plan is a general framework for development within which planning can continue in various sectors. Such a plan coordinates housing, land use proposals, infrastructure and other urban services like water, drainage, sanitation, public transport, electricity and waste disposal etc; and will to a large extent guarantee that policies and standards for controlling development are adhered to. An approved land use plan serves as a guide to check the proper use of land. It is also a program to co-ordinate land use activities geared towards orderly urban

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development. Urbanization can thereby be effectively managed, where housing, employment and public services requirements of a growing population can be met and where the quality of life can be improved (Ambrose, 1977).

The intensity of land-use changes in response to the world population growth and its consequences for the quality of life, the environment, global climate and world peace obligate in–depth studies of these transformations. Several international interdisciplinary research projects have therefore been initiated during the past two decades for this purpose, including for example the International Geosphere- Biosphere Project (IGBP, 1988) and the land use and cover changes (Lucc) program (Messerli et al, 1997).Land–use changes and their causal factors form highly complex system composed of three main subsystems (Rayner et al, 1994): socio –economic, bio-chemical and governmental. All three subsystems interact within local, regional and global hierarchies. Similarities in the trends of changes in land use and their relationships with population increases at local, regional and global scales are among the principal indicators for the level of interaction between these subsystems and for top-down influences (Messerli et al, 1997).

In Nigeria, most cities have witnessed a continuous and unprecedented population growth in the last 40 years. This has resulted in a lot of pressure on land available for development. This improper use of land without following the land use plan may have invariably affected the urban environmental quality. Port Harcourt, the capital of Rivers State, is a typical example of a city in Nigeria that initially had layout plans for many of its neighborhoods, which have not been strictly followed. This has negatively impacted on land use including allocating land for private use which originally was earmarked for public open spaces. Also the standard of housing may be compromised. This improper use of land without following layout plan may have in turn affected the environmental quality.The rapid changes and growth in industrial technology in Port-Harcourt, the rapid increase in its population and the ever increasing human migration into it are complicating the problem of maintaining it environment at a healthy level (Eke, 1993). These changes involve not only the expansion of urban uses at the suburban fringe, but also rearrangement of land uses within the developed areas of the city. The low level of liveability of many Nigerian cities attests to the poor quality of their management. Management in this connection comprises two elements – the administration of city activities, the ability to anticipate future changes in their scope and magnitude. For any Nigerian city, it is clear that the conception of urban management functions has hardly gone beyond the routine administration of the city. The consequence of this shot coming is today obvious everywhere. Faced with rapidity and magnitude of change, especially in our metropolitan areas using Port- Harcourt as a case study, the overwhelming impression everywhere is as if these centres are not being managed at all. This research will Endeavour to proffer solutions that will bring Port- Harcourt to its garden city status.

1.1 Description of Study Area

Initially the study area, which was named after the then British Secretary of State for Colonies, Lewis Harcourt, was just 30,000 acres, but with the discovery of oil in 1950, Port Harcourt expanded quickly beyond its original boundaries(presently about 470km^2). Port Harcourt is located within latitudes 6^0 58´ N to 7^0 6´ N and Longitude 4^0 40´ to 4^0 55´ E (Fig 1). The climate falls within the sub equatorial climate belt. Temperature and humidity are high throughout the year. The area is marked by two distinct seasons – the wet and the dry seasons with 70 percent of the annual rains falling between April and August, while 22 percent is spread in the three months of September to November. The driest months are from December to March. It falls almost entirely within the lowland swamp forest ecological zone and is flanked in the east, west and southern limits by mangrove swamp forest (Ayotamuno and Gobo, 2004).

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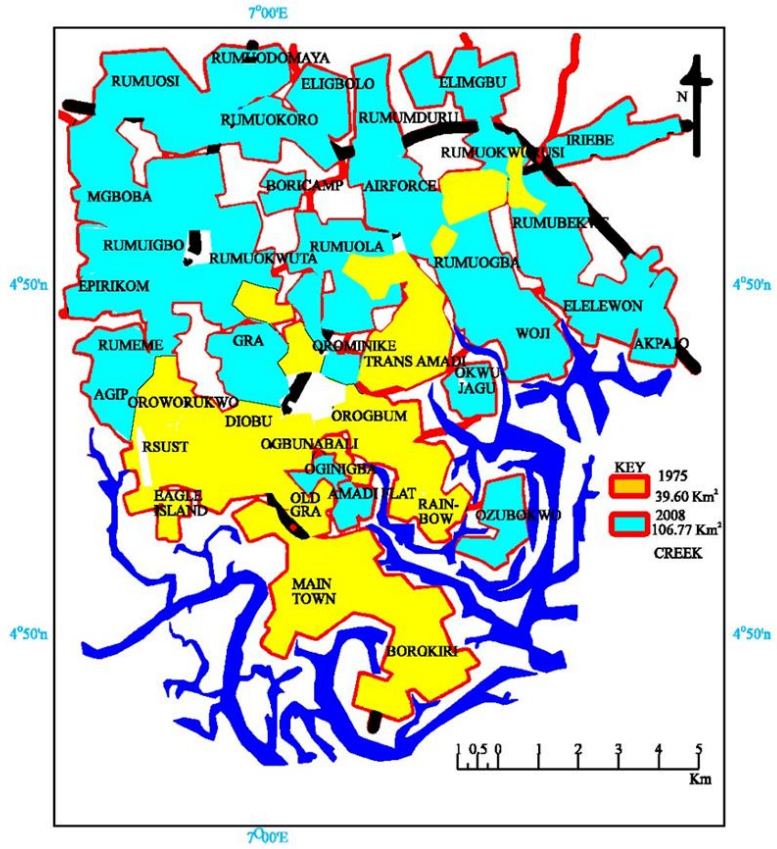

Map of Spatial Growth of Port Harcourt
Source: (Department of URP, Rivers State University)

1.3. Aim of the Study

The aim of the study is to examine the assessment of land use changes on the environmental quality in some neighbourhoods in Port Harcourt, Nigeria

1.4.Objective of Study

The objectives of this research are as follows:

1. To assess the conformity of developments in selected neighborhoods in Port Harcourt: Diobu GRA Phase II, D- Line and Main Town to the original layout plans of these areas.
2. To examine the factors that determines the conversion of land use in these neighbourhoods.
3. To assess how these factors impacts on the urban environmental quality in these neighborhoods.
4. To identify factors that makes for sustainable environmental quality on land use development in Port- Harcourt.

1.5 RESEARCH QUESTIONS

1. How does conversion of land use affect the environmental quality of residential neighborhoods in Port-Harcourt.?
2. To what extent, does land use conversion in residential neighbourhoods affect sustainable land development in Port- Harcourt?

1.6 RESEARCH HYPOTHESIS

There is no significant difference in land use in Diobu-GRA phase 11, D-line and Port-Harcourt Main town between 1986 and 2005

1.7 Scope of Study

Three main areas have been selected for the study, representing low, medium and high density neighborhoods in the Port- Harcourt metropolis. These are as follows: Diobu GRA Phase II (low density), D- Line (medium density) and Port-Harcourt -Main Town (high density).

II. Research Design

A research design to generate the data required for appraisal of land use conversion in the

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study area was put in place. The quasi-experimental design was employed in this study since the conversion of land use mainly deals with human behaviour and such variables are not under the control of the researcher (Baridam, 1985). Some descriptive techniques were adopted in areas where research variables were physically observed.

A one part structure questionnaire was prepared and personally administered to the targeted respondents. The questionnaire was targeted at land users, respondents were randomly distributed in the study area.The questionnaire was structured to contain dichotomous, multiple-choice questions, and the open ended patterns. The dichotomous questions have two options of mutually exclusive answers (Yes or No). Multiple-choice questions were designed to allow the respondents a chance to choose from a wide range of suggested possible alternative answers, or to describe answers where there is a contrary view. The open-ended questions give the respondents' opportunities to express their views in the best way they can without inhibitions. The questions were rather designed without sentiments and unambiguously for ease of understanding my respondents.

2.1The Population of Study

The population of this study is the number of houses in the selected sections of Diobu GRA Phase II, D-Line and Main –Town.

2.2 The Sample Size and Sampling Technique Used

The sample size for this study is the actual number of houses that were surveyed. The technique used to derive the sample size was the random sampling method. This is a method of selecting a sample from a population, so that each member of the population has an equal chance of being selected.

This method involved:

The total no of streets in each selected section of the neighbourhoods is as follows;

Diobu GRA Phase 11(13), D-Line 29 and Main Town 22.

30% of the streets in each of the neighbourhoods were picked as follows;

1) Listing all the streets in the neighbourhoods and assigning a number to

Them on separate pieces of paper,

11) These papers were folded, mixed-up one picked at a time and replaced back. This process was repeated, until the required sample size was selected. The result is as follows Diobu GRA Phase 11 (4) streets, D-Line 9 streets and Main Town 7 streets.

111) The number of houses on each street selected was counted, Diobu GRA Phase 11 (489) houses, D-Line 303 houses and Main Town 493 houses.

1v) 30% of the houses on each street were selected.

v) For each house picked, one household was selected

which was the landlord, caretaker or the oldest tenant.

Table 1 Streets in Diobu GRA Phase II, D-Line and Main Town

Assigned Number	Streets in Diobu-GRA Phase II D/Line & Main Town	
1	Woji Road	
2	Bodo Road	
3	Apara Road	
4	Orogbom Crescent	
5	Onne Road	
6	Dimeari Road	
7	Evo Road	
8	King Perekwule Road	
9	Ikwerre Road	
10	Oroerezimgbu Road	Diobu GRA Phase II
11	Tombia Street	
12	Aba Road	
13	Benjamin Okpara Street	

14	OlusegunObasanjo Road	
15	Aba Road	
16	ManillaPepple Street	
17	Okporo Street	
18	Kaduna Street	
19	Obito Street	
20	Kalio Street	
21	Elele Street	
22	Baade Street	
23	Ogbia Street	
24	BekweriNwosu Street	
25	Isiokpo Street	
26	Abeokuta Street	
27	Choba Street	
28	Okorodo Street	
29	Odum Street	
30	Kaima Street	D- Line
31	Oromenike Street	
32	Ogoloma Street	
33	Omoku Street	
34	Ndashi Street	
35	Abuja Road	
36	Peremabiri Street	
37	Okomoko Street	
38	Umuechem Street	
39	Ibaa Street	
40	Khana Street	
41	Iriebe Street	
42	Ndele Street	

Assigned Number	**Streets in Diobu-GRA Phase II D/Line & Main Town**	
43	King Amachree street	
44	Aggrey Road	
45	Elliot Henry Street	
46	Isaka Street	
47	Ahoada Street	
48	Rebisi Street	
49	Opobo Street	
50	Crowther Street	
51	Diobu Street	
52	Cemetery Street	MainTown
53	Banham Street	
54	Twon Street	
55	Barrack Street	
56	Sokoto Street	
57	Ilorin Street	
58	Ogu Street	
59	Degema Street	
60	Victoria Street	
61	Bende Street	
62	Niger Street	
63	Bonny Street	
64	Creek Road	

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Table 2 Number of Questionnaires Administered Per Street.

Sampled Streets	No of questionnaires Administered	Total Per Neighbourhood
Onne Road	13	
Woji Road	60	
Evo Road	27	
King Perekule	47	147
Ogbia Street	21	
Ibaa Street	4	
Okorodo Street	4	
Ndashi Street	9	
Abeokuta Street	5	
Odum Street	4	
Kalio Street	10	
BekwereNwosu Street	15	
Abuja street	19	91
Elliot Henry Street	2	
Niger Street	68	
Degema Street	3	
Rebisi Street	2	
Ilorin Street	1	
Bonny Street	71	
Crowther Street	1	148
	Grand Total	386

2.3 Types of Data and Instruments for Collection of Data

Data used in this survey are both primary and secondary data. Primary data were collected through the following source.

Primary data were obtained as follows:

a. **Personal Observation:** Direct personal observation was carried out on all the selected plots, buildings and converted open spaces. This involved estimating the percentage of plot coverage, the land use existing on plot etc.

b. **Questionnaires:** This involved the formulation, structuring and administration of structured questionnaires.

Secondary data were obtained as follows

a. Population data from the National Population Commission

b. The Greater Port-Harcourt Master plan of 1975

c. Shell Street Maps for Port-Harcourt 1986 and 2005

d. Unpublished Research Reports from the Department of Urban and Regional Planning, Rivers State University.

2.4 Analytical Techniques

The analytical techniques used in the presentation of data were based on descriptive and inferential statistics.

Descriptive statistics include the use of tables, percentages, histograms, bar charts, pie charts and cross-tabulation.

The inferential statistics used the randomized complete block design in the analysis of variance (ANOVA) **within** and **between** the results of Previous Land use, Present Land Use Activity, and Change in Land Use of the 3 study areas.

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2.4.1 Previous Land Use

The statistical model for this design is:

$$yij = \mu + \alpha i + \beta j + \varepsilon ij$$

Where i = number of rows

j = number of column

i = 1, 2, - - -, r = 3

j = 1, 2, - - -, c = 7

$$SST = \sum\sum Y_{ij}^2 = CF$$

Where $CF = \frac{T^2}{rc}$

$$SSW = \frac{\sum_{j=1}^{c} y_j^2}{r} - CF$$

$$SSB = \frac{\sum_{i=1}^{r} y_i^2}{c} - CF$$

$$SSE = SST - SSW - SSB$$

ANOVA

Source	SS	DF	MS	F
W	SSW	c – 1	$S_W^2 = \frac{SSW}{c-1}$	$F_W = \frac{S_W^2}{S_E^2}$
B	SSB	R – 1	$S_B^2 = \frac{SSB}{r-1}$	$F_B = \frac{S_2^2}{S_E^2}$
Error	SSE	(r – 1)(c – 1)	$S_E^2 \frac{SSE}{(r-1)(c-1)}$	
Total	SST	rcn – 1		

Hypotheses Tested

1. H_o': There is no significant difference **within** previous land use in the study area, i.e.

$$\alpha_1 = \alpha_2 = \alpha_3 = 0$$

H_1': There is significant difference **within** previous land use in the study area, i.e.

$\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq 0$; at least one of α_i's $\neq 0$.

2. H_o'': There is no significant difference **between** previous land use in the study area, i.e. $\beta_1 = \beta_2 = \beta_3 = 0.$

H_1'': There is significant difference **between** previous land uses in the study area, i.e.

$\beta_1 \neq \beta_2 \neq \beta_3 \neq 0$;at least one of β_i's $\neq 0$.

Conclusion <

Accept H_o if $F_{cal} < F_{tab}$

Reject H_o if $F_{cal} > F_{tab}$

2.4.2 Present Land Use Activity in the Study Area

Hypotheses tested

1 H_o': There is no significant difference **within** present land use activities in the study areas.

H_1': There is significant difference **within** present land use activities in the study areas.

2 H_o'': There is no significant difference **between** present land use activities in the study areas.

H_1'': There is significant difference **between** present land use activities in the study areas

Conclusion <

Accept H_o if $F_{cal} < F_{tab}$

Reject H_o if $F_{cal} > F_{tab}$

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2.4.3 Change in Land Use in the Study Areas
Hypotheses tested
1 H_o': There are no significant changes **within** land use in the study areas.
H_1': There are significant changes **within** land use in the study areas.
2 H_o'': There are no significant changes **between** land uses in the study areas.
H_1'': There are significant changes **between** land uses in the study areas.
Conclusion <
Accept H_o if $F_{cal}<F_{tab}$
Reject H_o if $F_{cal}>F_{tab}$

III. Results and Discussion

3.1 Land Ownership

The three neighbourhoods studied in Figure 2 shows that because land is in high demand and finite, most land is presently been leased out rather than been sold. The most leased out neighbourhood is D/Line with 70.58%, then Diobu GRA Phase II with 39.68% and finally Main-Town with 39.85%.

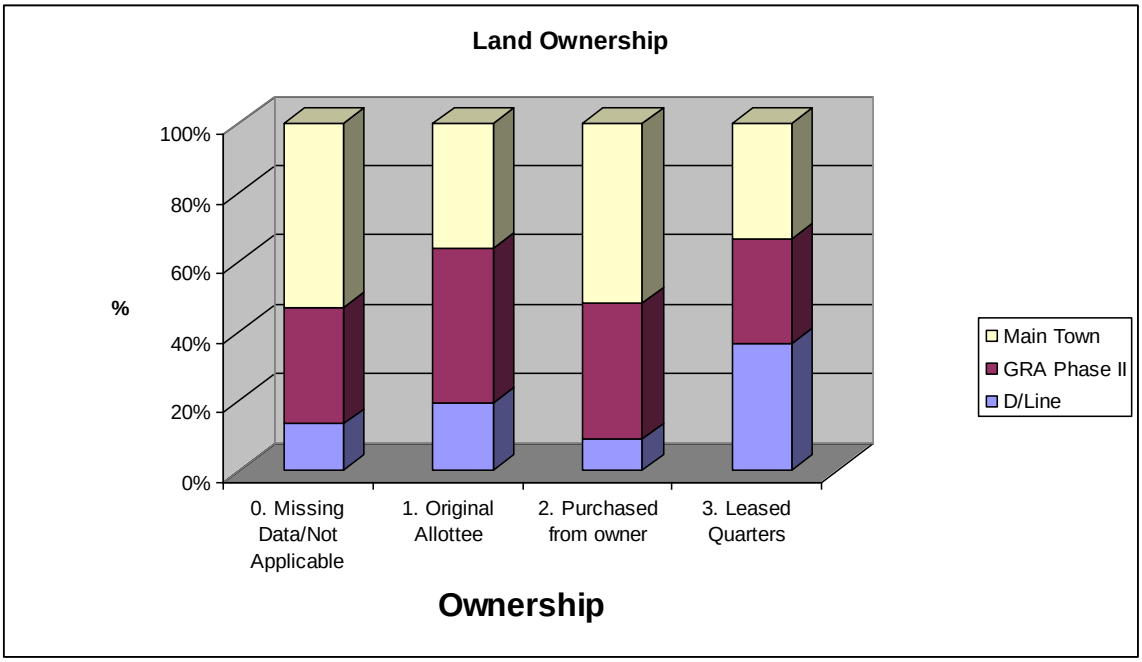

Fig. 2 Bar chart showing composite land ownership

3.1 Previous Land Use Activity

The statistical analysis of the Present land use (Table 3) may be summarized as follows:

Table 3 Previous Land Use

	0. Missing Data/Not Applicable	1. Residential	2. Commercial	3. Institutional	4. Recreational	5. Industrial	6. Others (Specify)	7.Total
GRA Phase II	12	82	15	4	1	1	11	86
D-Line	2	49	8	2	0	0	25	126
Main Town	5	119	3	6	2	0	3	136

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Total	19	250	26	12	3	1	350

A detailed computation of the statistics of Table 2 is as follows:

$$CF = \frac{T...^2}{rc} = \frac{350^2}{(3)(7)} = \frac{122500}{21} = 5833.33$$

$$SST = \sum_{i=1}^{r}\sum_{j-1}^{c} yijK^2 - CF = 24574 - 5833.33 = 18740.67$$

$$SSW = \frac{\sum_{j=1}^{c} y.j^2}{r} - CF = \frac{19^2 + 250^2 + 26^2 + 12^2 + 3^2 + 1^2 + 39^2}{(3)} - CF$$

$$SSW = 2173733 - 5833.33 = 15904.00$$

$$SSB = \frac{\sum_{i=1}^{r} yi..^2}{c} - CF = \frac{86^2 + 126^2 + 138^2}{(7)} - 5833.33$$

$$SSB = \frac{42316}{7} - 5833.33 = 6045.14 - 5833.33 = 211.81$$

$$SSE = SST - SSW - SSB$$

$$SSE = 18740.67 - 15904.00 - 211.81 = 2624.86$$

$$MSW = \frac{SSW}{c-1} = \frac{15904.00}{7-1} = \frac{15904.00}{6} = 2650.67$$

$$MSB = \frac{SSB}{r-1} = \frac{211.81}{3-1} = \frac{211.81}{2} = 105.905$$

$$MSE = \frac{SSE}{(r-1)(c-1)} = \frac{2624.86}{(3-1)(7-1)} = \frac{2524.86}{12} = 218.74$$

$$MST = \frac{SST}{rc-1} = \frac{18740.67}{(3)(7)-1} = \frac{18740.67}{20} = 937.03$$

$$F_W = \frac{MSW}{MSE} = \frac{2650.67}{218.74} = 12.118 \approx 12.12$$

$$F_B = \frac{MSB}{MSE} = \frac{105.905}{218.74} = 0.484 \approx 0.49$$

$$F_{tab} = (F\alpha, c-1, rc-1)$$

$$Within = F0.05, 6, 20 = 2.60$$

$$F_{tab} = (F\alpha, r-1, rc-1)$$

$$Between = (F0.05, 2, 2.0) = 3.49$$

Conclusions

1. F_{wcal} > F_{wtab}
12.12 > 2.60
2. F_{Bcal} < F_{Btab}
0.49 < 3.49

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1. Since F_{wcal} is greater than F_{Wtab}, we reject the null hypothesis and accept the alternative hypothesis that there is significant difference within previous land use In the study area at 5% level of significance.
2. Since F_{Bcal} is less than F_{Btab}, we accept the null hypothesis that there is no significant difference between previous land uses in the study area.

Thus, within the 3 neighborhoods studied, many changes have taken place over the years. However between the neighbourhood there is relatively no real change.

3.2 Present Land Use Activity

The statistical analysis of the Present land use (Table 4) may be summarized as follows:

Table 4 Present Land Use Activity

	0. Missing Data/Not Applicable	1. Residential	2. Commercial	3. Institutional (Church, School, Office, Hospital)	4. Recreational	5. Industrial	6. Others	
GRA Phase II	3	73	18	9	0	0	23	86
D-Line	0	35	11	5	1	0	34	126
Main Town	1	128	4	2	0	0	3	28
Total	4	236	33	16	1	0	60	350

$$CF = \frac{T...^2}{rc} = \frac{350^2}{(3)(7)} = \frac{122500}{21} = 5833.33$$

$$SST = \sum Yij^2 - CF = 25214 - 5833.33 = 19380.67$$

$$SSW = \frac{\sum Y.j^2}{r} - CF = \frac{4^2 + 236^2 + 33^2 + 16^2 + 1^2 + 60^2}{(3)} - 5833.33$$

$$SSW = \frac{60658}{3} - 5833.33 = 20219.33 - 5833.33 = 14386.00$$

$$SSB = \frac{\sum_{i=1}^{r} .yi^2}{c} - CF = \frac{86^2 + 126^2 + 138^2}{(7)} - 5833.33$$

$$SSB = \frac{42316}{7} - 5833.33 = 6045.14 - 5833.33 = 211.81$$

$$SSE = SST - SSW - SSB$$

$$SSE = 19380.67 - 14386.00 - 211.81 = 4782.86$$

$$MSW = \frac{SSW}{c-1} = \frac{14386.00}{7-1} = \frac{15904.00}{6} = 2397.67$$

$$MSB = \frac{SSB}{r-1} = \frac{211.81}{3-1} = \frac{211.81}{2} = 105.905$$

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$$MSE = \frac{SSE}{(r-1)(c-1)} = \frac{4782.86}{12} = 398.57$$

$$MST = \frac{SST}{rc-1} = \frac{19380.67}{(3)(7)-1} = \frac{19380.67}{20} = 969.03$$

$$F_W = \frac{MSW}{MSE} = \frac{2397.67}{398.57} = 6.02$$

$$F_B = \frac{MSB}{MSE} = \frac{105.905}{398.57} = 0.27$$

$$F_{Wtab} = F0.05, 6, 20 = 2.60$$

$$F_{Btab} = (F0.05, 2, 2.0) = 3.49$$

Conclusions

1 F_{wcal} > F_{wtab}

6.02 > 2.60

Since F_{wcal} is greater than F_{Wab}, we reject the null hypothesis and conclude that there is significant difference within present land use in the study areas.

2. $F_{Bcal} < F_{Btab}$

0.27 <3.49

Since F_{Bcal} is less than F_{Btab}, we accept the null hypothesis that there is no significant difference between present land uses in the study areas.

3.3 Change in Land Use

The statistical analysis of the Present land use (Table 5) may be summarized as follows:

Table 5. Change in Land Use

	0. Missing Data/Not Applicable	1. Yes	2. No	3. Uncertain	Total
GRA Phase II	4	32	66	24	86
D-Line	5	13	62	6	126
Main Town	2	6	49	81	138
Total	11	51	177	111	350

The statistical analysis for change in land use is as follows:

Hypotheses tested

1) H_o': There are no significant changes **within** land use in the study areas.

H_1': There are significant changes **within** land use in the study areas.

2) H_o'': There are no significant changes **between** land uses in the study areas.

H_1'': There are significant changes **between** land uses in the study areas.

$$CF = \frac{T...^2}{rc} = \frac{350^2}{(3)(7)} = \frac{122500}{21} = 5833.33$$

$$SST = \sum\sum yij^2 - CF = 5^2 + 13^2 + 62^2 + 6^2 + 4^2 + 32^2 + 66^2 + 24 \ + 2^2 + 6^2 + 49^2$$

$$+ 81^2 - 5833.33$$

$$SST = 19048 - 5833.33 = 13214.67$$

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$$SSW = \frac{\sum Y.j^2}{r} - CF = \frac{11^2 + 51^2 + 177^2 + 111^2}{(3)} - 5833.33$$

$$SSW = 15457.33 - 5833.33 = 9624.00$$

$$SSB = \frac{\sum_{i=1}^{r} .yi^2}{c} - CF = \frac{86^2 + 126^2 + 138^2}{(7)} - 5833.33$$

$$SSB = \frac{42316}{7} - 5833.33 = 6045.14 - 5833.33 = 211.81$$

$$SSE = SST - SSW - SSB$$

$$SSE = 13214.67 - 9624.00 - 211.81 = 3378.86$$

$$MSW = \frac{SSW}{c-1} = \frac{9624}{7-1} = \frac{9624}{6} = 1604$$

$$MSB = \frac{SSB}{r-1} = \frac{211.81}{3-1} = \frac{211.81}{2} = 105.905$$

$$MSE = \frac{SSE}{(r-1)(c-1)} = \frac{3378.86}{12} = 281.57$$

$$MST = \frac{SST}{rc-1} = \frac{13214.67}{(3)(7)-1} = \frac{13214.67}{20} = 660.73$$

$$F_W = \frac{MSW}{MSE} = \frac{1604}{281.57} = 5.70$$

$$F_B = \frac{MSB}{MSE} = \frac{105.905}{281.57} = 0.38$$

Conclusions

1 F_{wcal} > F_{wtab}

5.70 > 2.60

Since F_{wcal} is greater than F_{Wab}, we accept H_1

2. F_{Bcal} < F_{Btab}

0.27 < 3.49

Since F_{Bcal} is less than F_{Btab}, we accept H_o

This further buttresses the fact that significant change in land use took place within the neighbourhoods and not between the neighbourhoods.In conclusion, from the results of the hypothesis of the Previous Land use, Present Land Use Activity, and Change in Land Use, there is significant change in land use within each of the threeneighbourhoods; Diobu GRA Phase II, D-Line

3.4. Neighbourhood Green Open Spaces

Green open spaces are not only generally associated with outdoor recreation, but also to introduce relief from what might otherwise become uninterrupted land development. The rate of conversion of open spaces in Port Harcourt appears to be sliding into this trend. From Figure 3, most of the respondents are of the opinion that there were more green open spaces in the entire neighbourhoods more than 10years ago. This is mostly reflected, particularly, in Main Town where most of the green open spaces have were sold by Rivers State Government officials to private individuals, the same have been converted to residential and commercial buildings.

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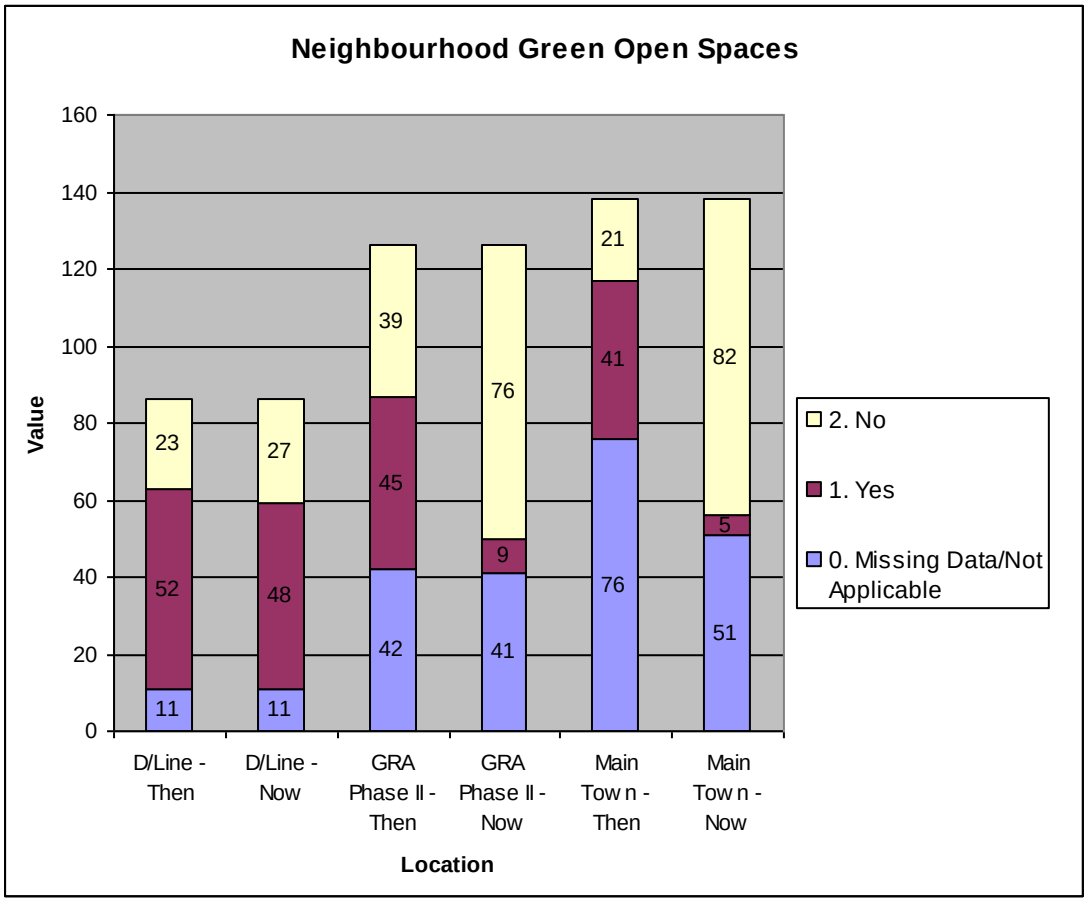

Fig 3. Neighbourhood Green Open Spaces

3.5Other Land Use

The study also identified what it described as Other Land Use in Tables 3 and 4 in which within the same plot the land is used for multiple or mixed purposes such as residential, commercial, institutional, etc. For instance, Diobu GRA Phase II increased from 8.73% to 18.25% (23). Also D-Line Other Land Use increased from (25) 29.06% to (34) 39.53%. Main Town remained at (3) 2.17 %.

From the above analyses D-line appears to have the highest Land use change in all categories studied followed by Diobu GRA Phase 11 and then Main Town. In fact from the Table it could be observed that virtually all the D/line neighborhood is nearly being turned into commercial activity area. The frontage of most buildings is converted to commercial use with the residents living directly behind. In other words, from the table only about 41% of the houses are actually used for residential purposes.

IV. Conclusion

Demand for land resulting from rapid increase in population in all the three neighborhood was related to the pressure on the land, new conflicts between competing uses including exploration for establishment of commercial places such as offices and industries. The study also identified what it described as Other Land Uses in which the same plot is used for residential, commercial, institutional, activities. Green open spaces including gardens were converted to commercial and residential places, fruit and flower trees reduced to the barest minimum, thus negatively affecting the aesthetics and indeed the sustainability of the quality of the environment.Functional recreational sites are virtually unavailable as they may have been converted to other uses. Neighbourhoods specifically planned for residential purposes are virtually been turned into commercial centres. The research discovered that the original lay out plan of the neighbourhoods in Port –Harcourt may have been distorted by individuals and corporate bodies for their own selfish interest. This in turn may have

resulted in bringing about certain obvious environmental problems in the neighbourhoods such as; Population Congestion, Human Traffic, Vehicular Traffic, Refuse Disposal, Water Supply, Aesthetic, Anti-Social Behaviour, Health Problems, Insufficient Electric power Supply.

V. Recommendations

Given the unhealthy conversion of land in the neighbourhoods studied the following recommendations are made:

1). There should be forward planning by the authorities so as to properly manage the pace of expansion and consumption of land by various developments. Where the available space exceeds the allocations made in the lay out plan, there are additional well located areas which can be reserved for long term development.

2) The city of Port Harcourt should not be allowed to grow by simply locating new buildings next to earlier development. Land reserves are needed in the built-up-area partly for future activities, partly for new traffic routes, for public transport and private traffic, and partly for green areas, to create breathing holes in the town.

3) The more central areas should not be dimensioned for more than one million inhabitants. Possible further expansion could then take place in surrounding populated areas as extensions to existing villages or the development of new communities.

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