Urban green spaces and environmental justice in Ibadan metropolis, Nigeria

A.A. Areola* and C.O. Ikporukpo
Department of Geography, University of Ibadan, Nigeria
biodunareola@yahoo.com

Abstract

This study employs the interplay of socio economic variables and the concept of environmental justice to assess the fairness of the distribution of green spaces in Ibadan metropolis in terms of sharing of their benefits and burdens. The 104 communities shown on map of the metropolis constitute the units of data collection and analysis. Data sources used include high resolution satellite imagery of Ibadan metropolis for 2015. ARCGIS software was used to extract and measure at community level the green areas. A structured questionnaire addressing the socio economic characteristics of respondents was administered. Using a projected population for 2015 at 1,783, 367, the sampling size is estimated at 3,410 at the four sample percentages of (0.1% 0.2%, 0.4% and 0.8%) respectively. Global Moran'I analysis was used to assess the distributional pattern of green areas in Ibadan metropolis. Multiple correlation and geographically weighted regression analyses are used to determine the significant socio- economic variables that explain the spatial patterns of green spaces at a $P \leq 0.05$. The degree of influence of each significant variable is mapped across the metropolis. Results show a clustered distributional pattern of green spaces for 2015 (P = 0.000000). The clustered pattern of green spaces clearly demonstrates lack of environmental justice. There are significant relationships between green spaces and some of the socio- economic variables, notably, occupation (P = 0.001) and income (P = 0.002), which means they largely explain the spatial inequalities in the distribution of green spaces and their benefits and burdens.

Keywords: Urbanization, green spaces, environmental justice, GIS, socio-economic.

Introduction

Urbanization has enormous impact on green spaces and it is not surprising that studies on urban green spaces are gaining more attention among urban researchers[1-5]. The focus of environmental justice debate is on the relationship between the socio-economic variables and environmental burdens, for instance the depletion of green spaces[6]. The United State Environmental Protection Agency defined Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, colour, sex, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies.

In recent times, environmental justice now focus on issues relating to the impacts of environmental quality, for instance, the cultural and health impacts[7]. In addition, environmental justice extends to the ability of people to access environmental benefits such as green space[6,8]. Research carried out across the African continent showed intense pressure on green spaces which has led to continuous deterioration of green areas especially in urban areas[3,9-13]. Ekanade[14] in her study investigated the urban residents' perception on trees in low, medium and high–density residential areas of Ibadan. However, most of these studies did not put into the impact of green space distribution on human groups in relation to the concept of environmental justice (i.e. the fair distribution of environmental burdens and benefits) since green spaces are not supposed to be restricted to one part of a geographical space[15-17]. The pertinent question is who then is the disadvantaged population in terms of green space distribution? These are among the issues that this research seeks to address.

Furthermore, urbanization will continue to increase at an alarming rate which in turn will result in the depletion of green spaces. For instance, pressure on residential land use among other land uses has led to the development of more and larger residential areas with little or no consideration for laws and regulations on greening. Furthermore, research has shown that the attitude of city dwellers cannot be overlooked regarding green spaces[6,10,18]. This is because human attitude in the long run will translate into either positive or negative environmental effects. Within a city, urban green spaces are distributed unevenly across space[19]. Case study research in European and US cities has shown that different immigrant communities do not have maximum access to green spaces in their areas. Comber et al[20] showed that Hindu and Sikh groups do not have full access to green spaces in the city of Leicester. Dai[10] found that in the city of Atlanta, mainly Afro Americans have restricted access to green spaces in their surroundings. However, these studies have neglected the principles of environmental justice in understanding the unevenly distribution of green spaces and the disproportionately availability to a subset of the urban population. The history of environmental justice is traced to the environmental justice movements (EJM) around 1960 in the US[21]. The movement was motivated by the environmental

pollution suffered by the low income groups and the non-whites group[21,22].

The institutionalization of environmental justice did not result in the eradication of environmental injustices. For instance, Boardman *et al.*[23] demonstrated that 75% of toxic waste in the southern United States is disposed off in black communities making up 25% of the population. Faber and Krieg[24] in their study observed that communities dominated by the colored race are nineteen times likely to be living close to contaminated zones as compared to communities with rich white people. Furthermore, Dobson[25] critically examined the relationship between sustainability and environmental justice. He observed that "the discourses of sustainability and justice may be related" but "the question of whether sustainability and justice are compatible objectives can only be resolved empirically, and the range and depth of empirical research required in resolving this question has not been done". Sustainability is about meeting needs. Justice has increasingly been recognized as one of such needs. There is no sustainability without justice.

Furthermore, the United Nations resolution 66/197 on sustainable development addresses the welfare of ethnic minorities by recognizing and supporting their identity, culture and interests.

The aim of this study therefore is to investigate the major socio-economic characteristics of the communities in Ibadan metropolis that explain the disparities in the spatial distribution of green spaces in the context of environmental justice as informed by existing literature (Table-1).

Table-1: Conceptual contribution of environmental justice in green space studies.

Conceptual Contribution of Environmental Justice to Studies on Green Spaces	Variables to Measure	Ref.
Distribution of human groups varies across a geographical space. The distribution pattern of human groups influences the distribution of environmental burdens and benefits. The differentiation in human groups will bring about hierarchical domination which will leads to a section of human groups becoming disadvantaged.	Socio-economic Variables Gender, Ethnicity Occupation, Income, Education, Religion	26, 27, 28

Study area and Methods: Study Area: Ibadan metropolis, covering an area of 129.65km^2, is located in south-western Nigeria, 128km inland northeast of Lagos and 530km southwest of Abuja, the federal capital. It lies between latitudes $3^0$3'N and $4^0$10'N and longitudes $7^0$2'E and $7^0$40'E (Figure-1). Ibadan is a major Nigerian city that was for a long time allowed to grow without a master plan. As a result there are different types of activities such as residential and commercial. The reasons for these land use patterns are not too far to seek. For instance, in recent years, the government has embarked on more versatile industrial location policy for Ibadan and has gone into the creation and laying out of industrial estates first along Abeokuta – Ibadan road but now along Lagos – Ibadan road, Akanran – Ibadan road, Oyo–Ibadan road as well as Ile-Ife Ibadan road. Ibadan is an important educational centre in the country. Besides the fact that it houses the University of Ibadan, Nigeria's premier University, it has a Polytechnic, many Teacher Training Colleges, over 100 secondary schools and more than 3000 primary schools. It also has the largest Teaching Hospital in the country in addition to numerous government and private hospitals. Furthermore, residential land use is made up of a core area, inhabited largely by the indigenous Ibadan population and early non- Ibadan Yoruba migrants and a number of newer suburbs.

Methodology

A field reconnaissance across Ibadan metropolis was carried out to ascertain the locations of existing green spaces. This was done with the aid of Google Earth pro software. Some of the questions addressed during the reconnaissance included: i. Are the green spaces concentrated in the traditional core areas (inner city) or in the modern areas (outer areas) of the metropolis? ii. Which human groups have more green spaces concentrated in their community. (Is it the high income group or is it those with formal education). iii. Are they less concentrated in the semi-modern areas or unplanned areas (slum)? iv. In which land use type (s) are the green spaces mostly concentrated? v. Who are the disadvantaged population?.

Apart from identifying existing green spaces the field reconnaissance facilitated subsequent investigations into the factors responsible for the uneven distribution of green spaces and identification of the disadvantage communities.

Research Design and Sampling Technique: This study involved mapping and measuring green spaces as well as the distribution of the various human groups (socio economic characteristics) within the study area. A high resolution satellite image (SPOT) of Ibadan for the year 2015 was obtained from a remote sensing vendor to extract and measure the green spaces.

A questionnaire survey was carried out to investigate the attributes and the spatial distribution of the various human groups. The community map of Ibadan metropolis (Figure-1) was used as base map and data and information were collected on the basis of the 104 communities or communal areas identified in the metropolis. Copies of the questionnaire were distributed by adopting a stratified random sampling technique in which Ibadan metropolis was divided based on population

density using four sample percentages (0.1% 0.2%, 0.4% and 0.8%). The total projected population for 2015 was estimated at 1,783,367 and the total number of people to be surveyed was estimated at 3,410 who were selected at regular intervals. In order to have a fair representation of the different sizes of communities, the selection of respondents was done according to the following groupings:

Group A:	Communities in Population Range 20,001 – 70,000	(0.1% sample) 38
Group B:	Communities in Population Range 10,001 – 20,0000	(0.2% sample) 31
Group C:	Communities in Population Range 5001 – 10,000	(0.4% sample) 20
Group D:	Communities in Population Range 1001 – 5000	(0.8% sample) 15
		Total: 104

Analytical tools and models: Multiple correlation and multiple regression models using SPSS version 21 were applied to determine the relationship between the occurrence of green spaces and the spatial distribution of the various human groups while geographically weighted regression was applied in mapping the distribution of the significant variables in order to assess environmental justice in the spatial pattern of the green spaces.

Indicators for assessing Environmental Justice: Indicators for assessing environmental justice were derived from data and information collected through the administration of structured questionnaire based on the community map of Ibadan metropolis (Table-2).

The multiple correlation equation is:

$$R = \frac{r2\,YX1 + r2\,YX2 - 2\,rx1Y1\,.rYX2.r\,X1X2}{1 - r2X1X2}$$

While the multiple regression equation is

$$Y. = a + b\,X1 + b2X2 + b3\,X3 \ldots + bnXn. + e$$

Where: Y is the dependent varable, that is, Y= Area extent of green spaces in square meters (m^2), a = Y intercept b1b2b3… bn= the regression plane of the three independent variables. $X1,X2,X3\ldots Xn$ = the independent variables

Results and discussion

Green Spaces Sizes and Distribution: Figure-2 shows that green spaces occur widely throughout the metropolis but with a distinct concentration in certain parts. As at 2015 areas with large expanses of green spaces were to a large extent associated with government reserved areas (GRA), institutions of higher learning and research institutes/farms.

Table-2: Socio-economic determinants for assessing environmental justice.

Indicators	Variables
Gender	Male
	Female
Age	Less than 18 years
	18-28 years
	29-38 years
	39-48 years
	49-58 years
	59 and above
Ethnicity	Yoruba
	Ibo
	Hausa
Religion	Christianity
	Islam
	Traditional
Occupation	Farming
	Artisan
	Civil/Public servant
	Trading/Business
	Student
	Self employed
Education	No Formal Education
	Primary
	Secondary
	Tertiary
	Quranic education
Income	Less than 18,000
	18-38,999
	39,000-58,999
	59-78,999
	79,000-98,999
	99,000 and above

By contrast, the green space measurements carried out (Table-3), show that majority of the communities now have small sized green spaces in the range $10,0000m^2$ to $100,000m^2$.
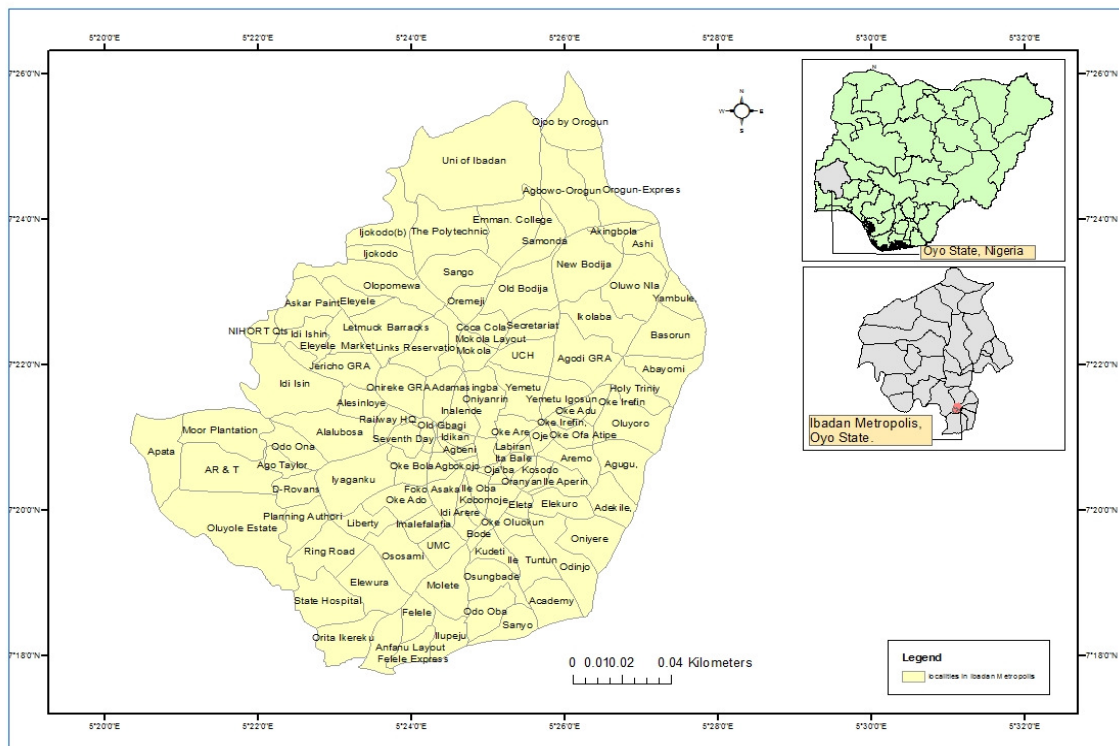
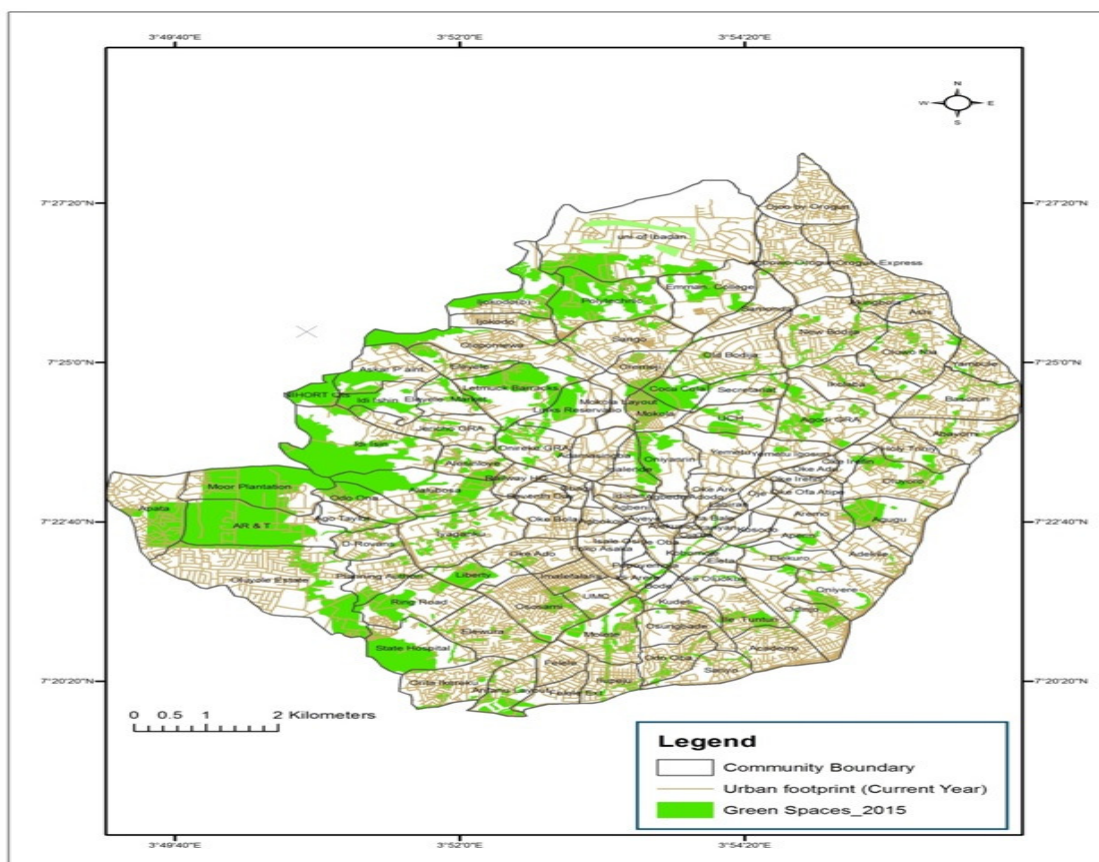**Figure-1:** Study Area: Ibadan Metropolis, Oyo State.

Figure 2: Distribution of Green Spaces in Ibadan in 2015.

Table-3: Green Space Measurement for the 104 communities in Ibadan.

Community	2015(sqm)	Community	2015(sqm)
Mokola	135900	Oke Ado	20600
Jericho GRA	112700	Ring Road	221200
Gbagi	300	ThePolytechnic	1243700
Odo Ona	441500	Akingbola	10600
Oja'ba	100	State hospital	582300
Agbowo	10400	Holy Triniy	221100
Liberty	20900	Akobo	113900
Sanyo	44800	Aremo	200
Felele	28800	Foko Asaka	100
Apata	653900	Adekile,	10500
Yemetu	50400	Kobomoje	3300
Adamasingba	900	Oloyoro	34500
Oniyanrin	125700	Odinjo	14800
Oje	400	Oluwo Nla	8700
Agbeni	100	Agodi GRA	23800
Agugu,	100	Olopomewa	391500
Oke Bola	5100	Yambule,	9600
Aperin	2400	Ososami	73200
Eleta	100	Askar Paint	295400
Molete	381600	Coca Cola	37100
Elewura	134200	Letmuck Barracks	223100
Ojoo-Orogun	2500	Secretariat	123400
Ashi	35100	Eleyele Market	69900
Ijokodo	3941	Anfanu Layout	147400
Samonda	45700	Moor Plantation	495700
Old Bodija	1100	Ile Tuntun	6600
New Bodija	30100	Popoyemoja	200
Abayomi	11300	Idi Arere	200
Onireke GRA	70200	Oke Oluokun	200
Inalende	65400	Bode	600
Elekuro	2300	Ile Oba	100
University of Ibadan	495000	Ayeye	2100
Oniyere	67100	Kosodo	300
Academy	84800	Oranyan	200
Sango	21100	Agbede Adodo	300
Oremeji	44900	Idikan	14000
Ikolaba	95400	Ilupeju	87500
Eleyele	113200	Railway HQ	20700
UCH	74300	IAR & T	1231100
Idi Isin	84300	Seventh day	300
Alesinloye	32100	Links Reservation	223100
Oke Irefin	56400	NIHORT Qts	213000
Alalubosa	112300	Osungbade	87500
UMC	2900	Planning Auth.	100200
Kudeti	8900	Imalefalafia	100
Odo Oba	92200	D-Rovans	31200
Orita Ikereku	142300	Isale Osi	200
Ago Taylor	17200	Agbokojo	200
Labiran	32100	Ita Bale	100
Iyaganku	74500	Oke Ofa Atipe	2.1700
Alekuso	3100	Oke Adu	3300
		Oke Are	200
		Basorun	45100

Global Moran I's to Test for the Dominant Pattern of Distribution of green spaces: Using the ArcGIS software, the data on green space sizes for each periodic year were subjected to Global Moran's I statistical analysis. Table-4 and Figure-3 present a summary of Global Moran's I analysis carried out for 2015, which showed a clustered pattern of distribution of green at a P value of 0.000000. This implies that given the Moran's Index value and the z- score for the respective years, there was a less than 1% likelihood that a clustered pattern could have occurred by random chance. In other words, communities with substantial green spaces were found together and communities with little or no green spaces also occurred together in space. This clearly shows an uneven distribution of green spaces in Ibadan Metropolis and this has serious implications for environmental justice as shown later in this discussion.

Table-4: Global Moran's I Summary 2015.

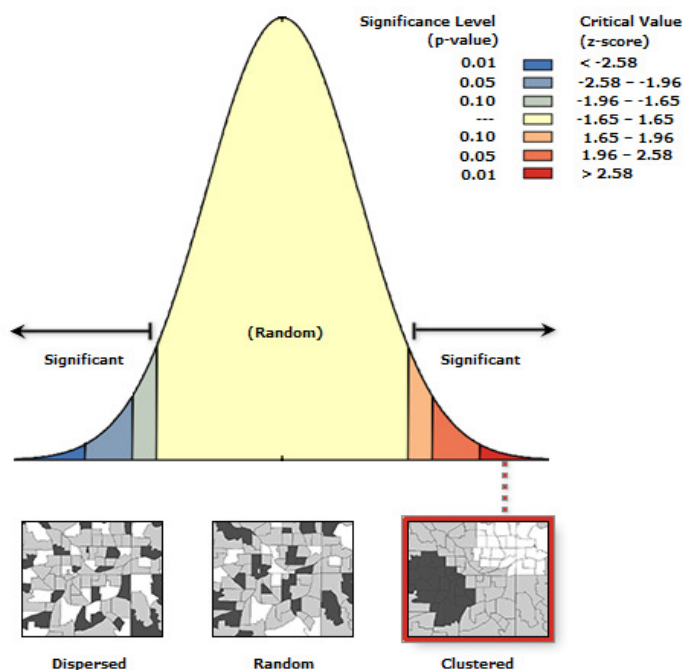| Moran's Index:	0.407680
Expected Index:	-0.007353
Variance:	0.002118
z-score:	9.017507
p-value:	0.000000

Figure 3: Distributional Pattern of Green Spaces for 2015 (Clustered).

Response Rate and Socio-economic Determinant: The results of the questionnaire survey are summarized in Table-5. The major areas of distinction between communities are in the areas of income and residential or housing density.

The significant points that arise from the results of the questionnaire survey may be summarized as follows: i. In terms of residential density small size and dispersed green spaces are found primarily in medium density residential areas while high density residential areas particularly in the tradition core of the metropolis have little or no green spaces left. Clusters of green spaces are found primarily in the low density residential communities as compared to the high density residential communities with poor prospects of greening; ii. ethnicity is not a major factor in explaining the spatial pattern of greening and degreening in the metropolis as there is no significant difference between the different ethnicities in terms of attitudes to greening and de-greening. However, as will be seen later the higher educational status of the Yoruba has developed in them a more positive attitude towards greening as compared to the migrant Ibo and Hausa who are more into pursuit of trade, industry and commerce. Therefore, ethnicity as an indicator cannot stand alone without a clear understanding of the behavioral patterns of the different ethnic nationalities; iii. religion is not a significant social ecology factor in explaining spatial patterns of greening and de-greening in spite of adherents of traditional religions having more need of green plants: v. in terms of occupational status, areas with high proportions of students, the self-employed are associated with low occurrence of green spaces as compared to areas dominated by civic/public servants, traders/business people; vi. medium and low density residential communities with higher levels of education have more positive attitudes towards greening and have more green spaces in the compounds.

Multivariate analysis of Relationships between Green Spaces and Socio-economic determinants for assessing Environmental Justice: Table-6 shows the summary of the multiple regression analysis to establish the relationship between green spaces and the socio economic determinants. R denotes the correlation between the dependent variables (DVs) and the independent variables (IVs). In this case, R = 0.392. It is a weak correlation. R square on the other hand indicates the proportion of variance in the distributional pattern of green spaces that can be "explained" by the four predictors (18-38,999, Hut, Artisan and Single apartment). R-square of 0.154 indicates that only 15.4% of the variation in green spaces can be explained by variability in 18-38,999, Hut, Artisan and Single apartment (R^2 = coefficient of determination, i.e. 0.154*100 = 15.4%). Thus, the remaining 84.6% can be explained by other factors in the study area. The Adjusted R Square estimates the population R square for this model and thus gives a more realistic indication of its predictive power.

Geographically Weighted Regression to test the effect of the significant Socio Economic Determinants on Environmental Justice: Geographically Weighted Regression (GWR) analysis package of ArcGIS software was used to visually identify and determine the degree or strength of the effect of the significant human groups in Ibadan Metropolis. The interest is in identifying which communities are more influenced by human groups at different levels of assessment.

The input variables for the GWR include
Dependent Variables: Green Spaces_2015sqm;
Explanatory variables: (18,000 -39,999naira and Artisan).
The output results are as follows:
Bandwidth: *0.020521;*
Residual Squares:*1672717481970.27;*

Effective Number: *44.3646021856384;*
Sigma:*157262.1734;*
AICc: *3043.309737;*
R2: *0.392025;*
R2Adjusted:*0.528256;*

Table-5: Socio economic characteristics

Variables	Low Housing Density	Medium Housing Density	High Housing Density
Male	9.7%	20.4%	24.8%
Female	8.4%	17.4%	19.3%
Less than 18 years	1.4%	4.0%	3.6%
18-28 years	6.7%	12.3%	14.1%
29-38 years	4.4%	11.1%	12.9%
39-48 years	3.6%	6.9%	9.1%
49-58 years	1.2%	2.7%	3.5%
59 and above	0.9%	0.9%	0.9%
No Formal Education	0.8%	1.8%	1.9%
Primary	1.0%	2.9%	3.3%
Secondary	8.0%	17.2%	20.1
Tertiary	8.3%	15.8%	18.7%
Quranic education	0.0%	0.0%	0.1%
Farming	1.1%	3.2%	2.1%
Artisan	2.3%	6.0%	10.9%
Civil/Public servant	6.2%	11.5%	10.8%
Trading/Business	4.7%	11.7%	14.2%
Student	3.2%	5.0%	5.6%
Self employed	0.7%	0.5%	0.5%
Christianity	13.6%	28.7%	32.4%
Islam	4.2%	8.7%	11.5%
Traditional	0.3%	0.4%	0.2%
Less than 18,000	5.1%	8.5%	10.0%
18,000-38,999	5.3%	12.2%	14.8%
39,000-58,999	3.7%	7.0%	8.9%
59,000-78,999	0.8%	3.2%	3.8%
79,000-98,999	1.6%	3.8%	3.9%
99,000 plus	1.6%	3.1%	2.7%

Table-6: summary of the multiple regression analysis

Model	R	R square	Adjusted R square	standard error of the estimate
1	0.392	0.154	0.120	187964.330

Figure-4 therefore identifies areas where the human groups have the greatest effect on green spaces using Local R^2. The Local R^2 shows how the indicators (i.e. income and occupation) work together to explain the spatial distribution of green spaces. Therefore, it is not only income that is responsible for the variation in green spaces in Ibadan metropolis; occupation also contributed to the spatial variation in green spaces.
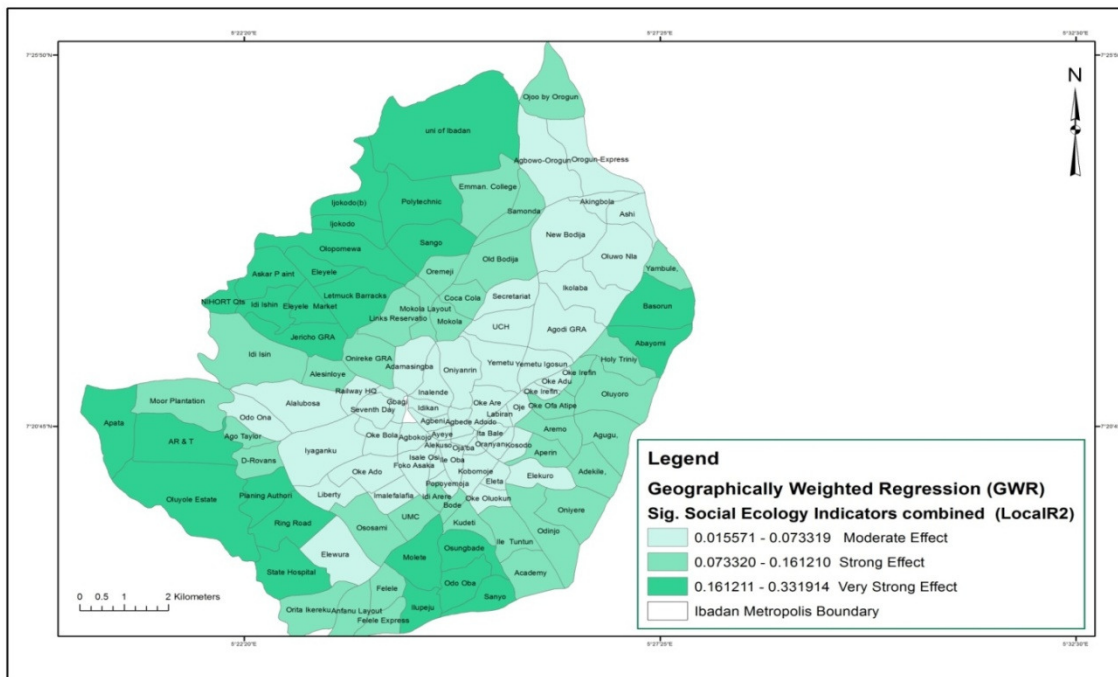

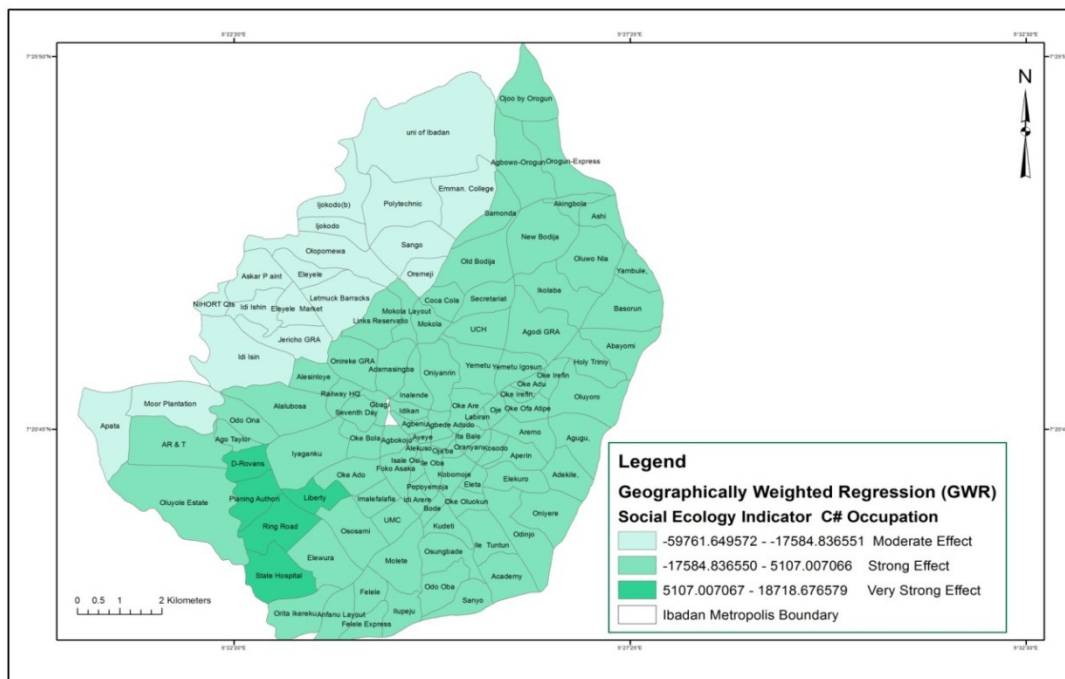**Figure 4:** Spatial Effect of the Indicators combined.

Figure-5: Spatial effect of types of occupation.

The maps in Figure-5 to Figure-3C show the spatial pattern of the strength of the effects of individual social ecology indicators. Figure-5 shows that occupation has "very strong effect" in explaining greening/degreening in the majority of communities in Ibadan metropolis; some of these communities include Agbowo, Oke Are, Odo Oba, Molete, Agodi GRA etc. Some communities fall in the "strong effect" category, for example, Apata, Jericho, Oremeji, Old Bodija etc. Those communities with "moderate effect" include, for example, Ijokodo, Olopomewa, University of Ibadan etc. In summary the effect of occupation greening/degreening in Ibadan metropolis is very strong in majority of the communities.

Figure-6 shows the individual effects of income in explaining the variation in green spaces in Ibadan Metropolis. Income has "very strong effects" in explaining the variation in greening in the majority of the communities in Ibadan Metropolis. However, the effect is categorized as only "strong" in a few communities such as Odo Ona, Ago Taylor, D'Rovans, Ring Road Apata, Oluyole, IAR & T, etc. In summary the effect of occupation on the variation in green spaces in Ibadan metropolis is very strong in majority of the communities.

Implications of the Spatial Pattern of Green Spaces for Environmental Justice in Ibadan Metropolis: Results from this research study show that environmental justice is lacking in Ibadan based on the following observations:

There is no even distribution of green spaces in Ibadan Metropolis: Spatial analysis in this study show that green spaces are clustered in some communities and communities which have no green spaces are also clustered (Table-5 and Figure-3). The

effect is a sharp dichotomy between areas enjoying the benefits of greening and those suffering the negative effects of de-greening. The concept of environmental justice sees human groups living in areas having green spaces as having a positive attitude towards greening while human groups in the areas with little or no green spaces have a negative attitude. The results show that income and the occupation group are more responsible for the disparity observed in the spatial distribution of green spaces in Ibadan metropolis (Table-6 and Figure 4-6).

There has been minimal involvement of the people in the greening process by Government over the years: Results from the global morans I, multi regression and Gwr show that the government has done little in ensuring the maintenance of green spaces and guiding against indiscriminate felling of trees an deforestation across the city. For instance during the Governor Ladoja regime efforts were made to green the metropolis then when the government changed into the Governor Akala administration the greening culture drastically reduced in Ibadan. The current administration made some effort to promote the greening culture by creating parks and demolishing houses to give room for an urban beautification scheme. Nevertheless, most greening schemes made by the government have been for political reasons without bearing in mind the environmental justice system. Most of the greening and urban beautification schemes are concentrated in the areas with large expanses of green spaces without touching the other side of the metropolis where greenery has virtually disappeared. The people have little or no say government environmental policy and programmes. The implication also is that the behavioural attitude of the people is influenced by the attitude of the government to greening.
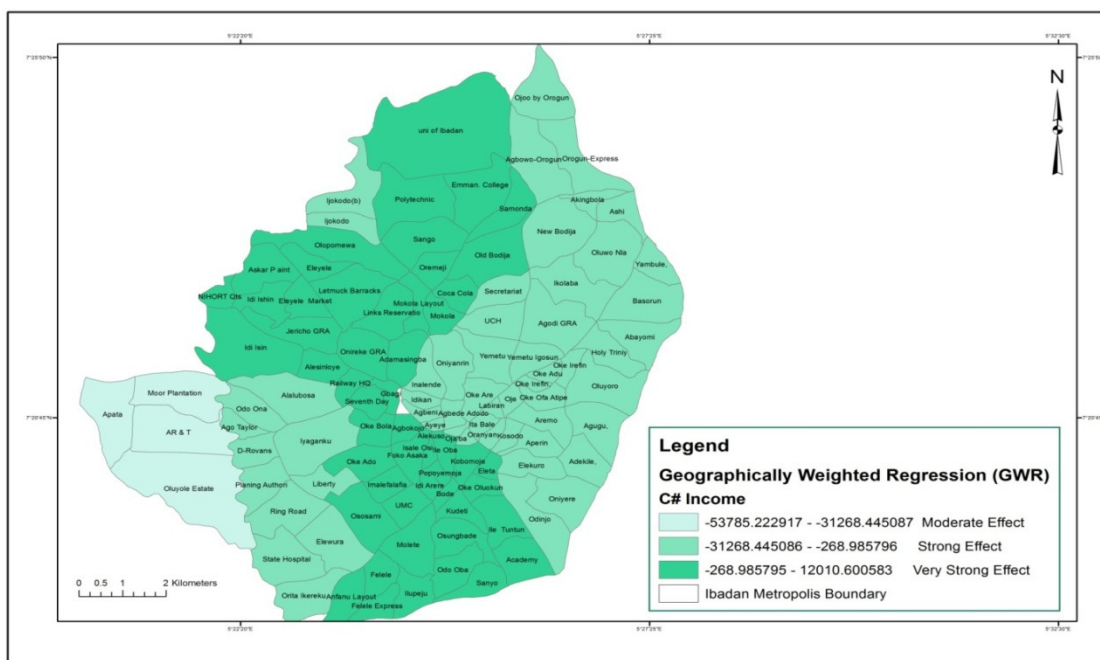

Figure 6: Spatial Effect of the Income Group.

Laws, Policies and regulations on urban planning and development are not adhered to by government officials: Governmental establishments such as the town planning authorities, Ministry of lands, Housing and Development, Waste Management Authority and the agency on urban beautification have not been carrying out their duties effectively. This is evident by the clustering of greening and beautiful projects, as well as the poor record of development control. Indeed, there is very little evidence of government intervention to improve the situation in the traditional core areas of the metropolis: the political will is not there to intervene to redesign and reorganize space in such areas. There is clearly a need for a progamme of urban renewal in traditional core of the city.

Conclusion

Green space is unevenly distributed in Ibadan Metropolis. This study has identified areas that are disadvantaged in terms of green spaces. The study also revealed that currently green spaces are preserved primarily in government reservation areas, institutions of higher learning and research centers and farms and along rivers. However, the green space distribution pattern is more a function of the pattern of unplanned and uncontrolled physical developments than of a deliberate effort by the people or government to maintain the green spaces. The central parts of the city, which are high density residential areas bear the burden of massive de-greening while the low density residential areas at the peri-urban locations, institutions and government reservation areas are enjoying the benefits of greening. Medium density residential areas characterized by housing estates also promote greening and are not as disadvantaged as the high density residential areas.

References

1. Turner B.L., Clark W.C., Kates R.W., Richards J.F., Mathews J.T. and Meyer W.B. (1990). The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years. Cambridge University Press with Clark University, Cambridge, 163-17. ISBN: 0 521 36357 8.

2. Baycan-Levent T. and Nijkamp P. (2004). Urban Green Space Policies: Performance and Success Conditions in European Cities. paper presented in the 44th Congress of ERSA in Porto, 25-29 August. 23-53.

3. Cilliers S., Cilliers J., Lubbe R. and Siebert S. (2013). Ecosystem services of urban green spaces in African countries—perspectives and challenges. *Urban Ecosystems*, 16(4), 681-702. DOI 10.1007/s11252-012-0254-3.

4. European Environment Agency (2002). Toward an urban atlas: Assessment of spatial data on 25 European cities and urban areas. Environmental Issue Rep. 30, EEA: Copenhagen, 1-99. ISBN: 92-9167-470-2

5. McDonald R.I., Forman R.T. and Kareiva P. (2010). Open space loss and land inequality in United States' cities. 1990-2000. *PLoS One*, 5(3), e9509. doi:10.1371/ journal. pone.0009509.

6. Davoudi S. and Brooks E. (2012). Environmental Justice and the city. Global Urban Research Unit, School of Architecture, Planning and Landscape Newcastle University.

   https://www.ncl.ac.uk/media/wwwnclacuk/socialrenewal/fil es/environmental-justice-and-the-city-final.pdf. pp 1-171.06 July, 2012.

7. Pless-Mulloli T. and Phillimore P. (2001). Pollution, Social Exclusion, Equity and Health. Paper presented in the first Sustainable Development Research Conference, December, 79-101.

8. Cutts B.B., Darby K.J., Boone C.G. and Brewis A. (2009). City structure, obesity, and environmental justice: an integrated analysis of physical and social barriers to walkable streets and park access. *Social science & medicine*, 69(9), 1314-1322.

9. Chiesura A. (2004). The role of urban parks for the sustainable city. *Landscape Urban Plan,* 68, 129-138.

10. Dai D. (2011). Racial/ethnic and socioeconomic disparities in urban green space accessibility: Where to intervene?. *Landscape and Urban Planning*, 102(4), 234-244. dx.doi.org/10.1016/j.landurbplan.2011.05.002.

11. Djibril C., Coulibaly A., Wang X. and Ousmane D. (2012). Evaluating green space use and management in Abidjan City, Cote D'lvoire. *International Journal of Economics and Management Engineering*, 2(3), 108-116.

12. MaConnachie M.M., Shackleton C.M. and McGregor G. (2008). The extent of public green space and alien plant species in 10 small towns of the Sub-Tropical Thicket Biome, South Africa. *Urban Forestry and Urban Greening*, 7, 1-13.

13. Oduwaye L. (2013). Globalization and urban land use planning: The case of Lagos, Nigeria. A paper presented at the 18th International Conference on Urban Planning, Regional Development and Information Society. Rome, Italy, 20-23 May., 33-63.

14. Ekanade C.T. (2006). Assessing residents' perceptions on urban trees and woodlots in Ibadan. (Unpublished masters dissertation) Department of Geography, University of Ibadan. Ibadan.

15. Taylor D. (1999). Central Park as a Model for Social Control: Urban Parks, Social Class and Leisure Behavior in Nineteenth-Century America. *Journal of Leisure Research,* 31(4), 420-477.

16. Mpofu T.P. (2013). Environmental challenges of urbanisation: A case study for open green space management. *Research Journal of Agricultural,* 1, 7-17.

17. James P., Tzoulas K., Adams M.D., Barber A., Box J., Breuste J. and Handley J. (2009). Towards an integrated understanding of green space in the European built environment. *Urban Forestry & Urban Greening*, 8(2), 65-75.

18. Fanan U., Dlama K.I. and Oluseyi I. (2011). Urban expansion and vegetal cover loss in and around Nigeria's Federal capital city. *Journal of Ecology and the Natural Environment*, 3(1), 1-10.

19. Ernstson H. (2013). The social production of ecosystem services: A frame-work for studying environmental justice and ecological complexity in urbanized landscapes. *Landscape and Urban Planning*, 109(1), 7-17. http://dx.doi.org/10.1016/j.landurbplan.2012.10.005.

20. Comber A., Brunsdon C. and Green E. (2008). Using a GIS-based network analysis to determine urban greenspace accessibility for different ethnic and religious groups. *Landscape and Urban Planning*, 86(1), 103-114.

21. Hofrichter R. (1993). Toxic struggles: the theory and practice of environmental justice. Philadelphia, PA: New Society, 1-57. ISBN: 0865712700.

22. Alston D. (1990). We speak for ourselves: Social justice, race, and environment. Washington, DC: Panos Institute, 1-117. ISBN-10: 1879358018.

23. Boardman B., Bullock S. and McLaren D. (1999). Equity and the Environment: Guidelines for Green and Socially Just Government. London: Catalyst/Friends of the Earth. https://www.ncl.ac.uk/media/wwwnclacuk/socialrenewal/files/environmental-justice-and-the-city-final.pdf. 1999.

24. Faber D.R. and Krieg E.J. (2001). Unequal exposure to ecological hazards: environmental injustices in the commonwealth of Massachusetts. *Environ Health Perspect*, 110(Suppl 2), 277-288.

25. Dobson A. (2012). Social justice and environmental sustainability: Just sustainabilities: development in an unequal world. London: Taylor & Francis.

26. Young G.L. (1974). Human ecology as an interdisciplinary concept: A critical inquiry. *Advances in Ecological Research,* 8, 1-105.

27. Young O.R., Berkhout F., Gallopín G.C., Janssen M.A., Ostrom E. and van der S. (2006). The globalization of socio-ecological systems: an agenda for scientific research. *Global Environmental Change,* 16(3), 304-316.

28. Rosa E.A. (2004). Tracking the Human Sources of Ecological Footprints: The STIRPAT Research Program. Presentation at Center for Environmental Policy, The Institute for International Studies, Stanford University, November 18, 2004.