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Assessment of Protected Green Space of Eleyele Dam, Ibadan

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Relationship has been established between urban green space depletion and urbanization in the developing countries, just as poverty and destruction of green space have also been found to be correlated. Green space particularly in the government reserved areas have also suffered depletion from urban dwellers in form of encroachment and over-harvesting. These have resulted in the abuse of green areas in cities, thereby denying the city's people the invaluable benefits expected from such green areas. This study assessed the protected green space of Eleyele dam of Ibadan, Oyo state Nigeria, with a view to suggesting sustainable policy guidelines. Two hundred and eleven questionnaires were administered on all the occupants using the space, to solicit information on their socioeconomic characteristics, status of tenure and security of the green space occupied among others. While Likert scale was used in analysing the frequency of harvested products, Pearson Product Moment Correlation was employed in testing the relationship between length of stay of occupants and size of land occupied. Results showed that firewood and herb products were more harvested constituting more than two-third (72%) of the entire harvest. It was also revealed that except gardening, all other activities in the plantation constitute danger to the green space. The result of Pearson Product Moment Correlation r = 0.61 showed a positive correlation between length of stay of occupants and size of land occupied. By implication, the protected green space is under a severe threat if the encroachment continues unabated. The study concluded by recommending that further granting of approval on the land be stalled, non-compatible activities that could further lead to depletion of the green space should be discouraged and there should be thorough monitoring of the activities of people within the area.

Keywords: Destruction, Encroachment, Green space, Protection, Sustainable development

INTRODUCTION

Green space like every other element in urban landscape has various roles to perform in the management of environment and by extension the overall wellbeing of the citizens. Greening the urban environment has been variously recognized to offer benefits of different kind to the urban milieu and the people (Cohen *et al*, 2008; Jim & Chen 2006; Aldous, 2005; Fam *et al.*, 2008; Nowak *et al.*, 2006; Baycan-Levent & Nijkamp, 2009). This explains why planning concepts such as garden city, green belt, green fingers and greenways highlight the need to preserve the natural environment of urban areas by incorporating many green spaces into the design of cities (Mensah, 2014a).

According to Chiesura (2004), urban green areas are strategic to the quality of life in cities. He argues that the empirical evidence of the benefits and importance of these areas is increasing, especially for environmental, ecological and visual benefits associated with them, such as air and water purification, wind filtration, noise pollution mitigation and microclimate regulation, besides the social services such as socialization, recreation and crime prevention.

However, most cities of the world, especially in the developing countries, have suffered from acute depletion of green spaces principally due to rapid urbanisation, low resource base of institutions on green spaces, lack of priority to green spaces, corruption, political instability and uncooperative attitudes of the local people (Mensah, 2014b). For instance, 41 percent of lands reserved for green spaces in Europe have been lost to different land uses (European Environment Agency, 2002). Also, rapid urbanisation has caused many cities in West Africa such as Lagos, Kano, Kaduna, Sokoto (Nigeria), Dakar (Senegal), Freetown (Sierra Leone), Abidjan (Cote D'lvoire), Accra, Kumasi and Tema (Ghana) to lose substantial amount of urban green spaces to urban sprawl and infrastructural developments (Fuwape *et al.* 2011). In a related development, a study on urban sprawl in Abuja (the capital city of Nigeria) and its effect on the natural vegetation cover revealed a considerable loss of the natural vegetation to the expansion of settlements (Fanan *et al.*, 2011).

The consequences of outright absence and/or insufficiency of green spaces in urban area are enormous and challenging, one, on the environment, and two, on the people. Environmentally, it has been established that lack of vegetative cover in urban areas

makes many African cities "ecologically unfriendly" with configurations that compromise their resilience to climate change (Food and Agriculture Organisation, 2012).The report further states that lack of vegetation and the use of heat-retaining building materials raise city temperatures, which lead to shrinking water tables. Also, tampering with them could result in generating soil erosion, deforestation and their effects on the natural ecology of the environment and climate protection (Jibril, 2010). Flooding is a threat to many large cities, including Lagos, Ibadan and many other urban centres in Nigeria (Ajayi *et al.,* 2012). The consequential effect of this, in many instances, is serious outbreaks of dysentery and cholera. Many towns built on hillsides and floodplains also bear the brunt of more frequent and intense storms because urban trees that could serve as wind breakers are lacking (CABE, 2004).

There is no doubt that considering the safety and physiological comfort derivable from green areas and vegetation, the well-being of humans could be said to be prone to high risk owing to the depletion of vegetation resulting in alterations in global temperatures (Omigbodun & Omigbodun, 2008). Epidemiological studies have provided evidence of a positive relationship between longevity and access to green space (Takano *et al.,* 2002; Tanaka *et al.,* 1996), and between green space and self-reported health (De Vries *et al.,* 2003). Lack of green space in cities can also lead to lack of interaction and cohesion among the residents. It is also worth mentioning that lack of urban green spaces threatens biodiversity and in no distant time could result in species extinction which is also capable of undermining sustainability. Similarly, lack of green spaces deprives cities of economic benefits in terms of investments, low property values, reduction of job opportunities, for as many people as could be engaged in parks and gardens and other related businesses are cut off. Eleyele dam is however exposed to flooding due to series of anthropogenic activities around it (Adeleru, 2017; Olanrewaju *et al.,* 2017; Bolaji, 2010) and also polluted by human and industrial activities within the metropolis (Ojelabi *et al*., 2017). While different studies have been carried on the quality of the water (Ojelabi *et al*., 2017; Agbede & Ojelabi, 2017; Olayinka *et al*., 2017; Ayeloja *et al*., 2014), this study tried to assess the encroachment of protected green space of Eleyele dam, Ibadan, Oyo state Nigeria, with a view to suggesting sustainable policy guidelines.

STUDY AREA

This research was carried out on Eleyele dam protected green space located in Ido Local Government Area of Ibadan, South-Western Nigeria. Eleyele lake catchment is located in Ibadan city, Nigeria on Latitude 7º20' - 7º25'N, and Longitude 3º51'- 3º56'E. It is located in the Northwestern part of Ibadan city centre, bounded by Eleyele built-up area in the South, Apete in the East, Awotan in the North and Ologuneru in the North-west (Ayeloja *et al*., 2014). The dam is the second largest water body after Asejire, dammed for the purpose of supplying water to Ibadan metropolis and environs. Besides, it is a ready source of water for notable companies such as Fan milk Plc. The dam was created in 1962, through an impoundment on Ona River with intention to provide raw water that would be treated for potable water supply to Ibadan city (Bolaji, 2010). The dam was constructed across the Ona river downstream its confluence with Alagbaa River. The Department of Forestry thereafter planted a forest reserve around Eleyele dam to serve as protection from siltation and also for use as electricity pole (Agbede & Ojelabi, 2017).

RESEARCH METHODOLOGY

Primary data was used in this study and the instrument of data collection engaged was questionnaire administration. Total enumeration method was used by administering Two hundred and eleven (211) questionnaires on all the occupants found using the green space. This was to solicit information on their socioeconomic characteristics, status of tenure and security of the green space occupied among others. This is justified by the small number of the occupants of the green space. The data were coded and run with the use of SPSS 21 version and thereafter analysed. Both descriptive and inferential statistical tools were used for the analysis. While descriptive tools used in included percentages, pie chart and bar chart and used to present results of socioeconomic characteristics, status and security of tenure, Likert scale was adopted to rate the frequency of harvest of forest products in the green space. Pearson Product Moment Correlation was employed in testing the relationship between length of stay of occupants and size of space occupied.

RESULTS AND DISCUSSION

Land ownership and security of tenure

The green space under review is not a free land belonging to no one, this section of the study tends to address the aspect of ownership and nature of tenure granted the occupants as well as the activities engaged in by the respondents. As indicated in Table 1, the knowledge of ownership of the green space by the respondents was investigated and the result showed that 86.7% of the respondents had knowledge of the owner as against 13.3% who didn't know the owner of the land. On who the owner is, 79.1% said it is the state government, 7.6% local government, while 13.3% claimed it was federal government. Given that the

green space is owned and managed by the state ministry of forest and agricultural resources, an arm of the state government, majority of the respondents were knowledgeable in the ownership of the space they occupied. On the means of securing the space, more than half of the respondents 54% claimed they visit the office in charge for allocation while the other 46% agreed they rent their space from individuals.
Of this number, 57.3% occupied half or less than half a plot while 42.7% claimed their own portion was one plot or more.

Table 1: Land ownership and security of tenure

Knowledge of land ownership	**F**	**%**
Yes	183	86.7
No	28	13.3
Total	211	100
Owners of the land	**F**	**%**
Federal government	28	13.3
State government	167	79.1
Local government	16	7.6
Total	211	100
Means of securing space	**F**	**%**
Visit to the office	114	54
Rent from individual	97	46
Total	211	100
Size of space occupied	**F**	**%**
Less than half plot	91	43.1
Half plot	30	14.2
One plot	32	15.2
More than a plot	58	27.5
Total	211	100

As presented in Table 2, more than half of them 54% secured approval before use and 46% occupied without approval. Of these number, more than half of the respondents 55.5% claimed to have secured the approval from individual mostly private while only 44.5% secured theirs from the state government, the rightful owner of the green space. By implication, it therefore means that most of the occupants of the green space got permission to settle there from individual agents who as original allotees might have secured the place from the government for profit making.

Table 2: Status of space occupied

Secure of approval before occupation	**F**	**%**
Yes	114	54
No	97	46
Total	211	100
Source of approval	**F**	**%**
State government	94	44.5
Private	117	55.5
Total	211	100

As indicated in Table 3, the study revealed that certain conditions were attached to the use of the green space while giving approval. 98.1% of the respondents claimed conditions were handed to them while only 1.9% claimed no condition was attached. Then, on the conditions, majority of the respondents 98.1% mentioned that they were told not to erect permanent structure while 1. 9% claimed they were told not to cut down trees.

Table 3: condition attached to the use of space

Condition attached	**F**	**%**
Yes	207	98.1
No	4	1.9
Total	211	100
Type of condition	**F**	**%**
No erection of permanent structure	207	98.1
No cutting of tree	4	1.9
Total	211	100

Management of waste in the green space area

Waste generation has been part of human life and all form of land uses and human activities generate waste. Managing waste in a sustainable way is an integral part of a healthy society. Unwholesome handling of waste in an area close to water can be dangerous as flooding and runoff can wash debris around the river catchment area, thereby contaminating the water. Waste handling is discussed in Figure 1

The study found that 88.6% of wastes generated around the green space were deposited right in the green space area while 11.4% of the respondents dump theirs outside the green space. By implication, refuse generation and dumping within the green space area can be dangerous as water can be contaminated. An earlier study on Eleyele dam by Agbede and Ojelabi, (2017) confirmed that major sources of Nitrate contaminants along the course of the dam include the use of agro-chemicals, industrial activities and decomposition of bio-degradable household wastes commonly dumped along the banks of the river.

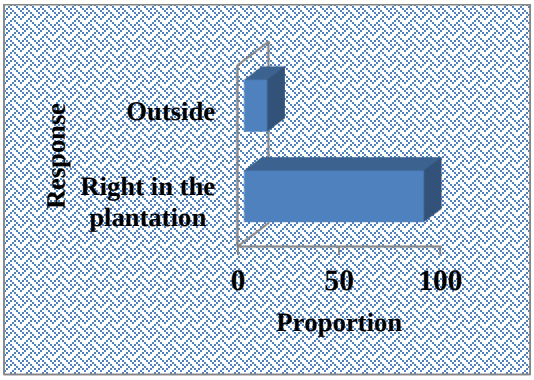

Figure 1: Waste around the green space

The study as presented in Table 4 also investigated the availability of toilet and found that there were few toilets available which could only be traced to those erected by religious houses on the green space. The result presented showed that 34.1% of the respondents confirmed availability of toilet as against 65.9 % who claimed there were no toilets in the area. On interrogation about where they used as toilet, more than two-third 70.1% of them claimed they defecate in bushes within the green space area while only less than one-third 29.9% make use of toilet around. This again may pose serious danger on the environment generally and in particular on the water body around in form of contamination. In an earlier study of water quality assessment of the dam by Ojelabi *et al*. (2018), presence of *Escherichia coli* in the water sample is a pointer to the fact that the dam water has faecal pollution (World Health Organisation, 1997) and this was reported to be as a result of human activities in the metropolis. This also corroborates the result of Olayinka *et al*. (2017), where it was reported that the physical, chemical, heavy metals and Polychlorinated biphenyls (PCBs) concentration of Eleyele Lake affect water quality as well as the quality of the overall ecosystem.

Table 4: Availability of toilet facility

Presence of toilet	**F**	**%**
Yes	72	34.1
No	139	65.9
Total	211	100
Where used when pressed	**F**	**%**
Toilet	63	29.9
Inside the plantation	148	70.1
Total	211	100

Given the results of finding on Table 5, it was discovered that security around the green space being a protected green space is nothing to write home about as only about less than one-tenth 7.6% of the respondents claimed the awareness of any security arrangement around the space whereas more than nine-tenth 92.4% said there was no sign of any security arrangement. Further finding revealed that there was no any form of restriction in the protected green space area, an indication that people with different motives had a free access in and out of the area. This invariably means that the activities of people around the area can hardly be controlled. On whether any form of arrest had being made in the past over misuse or trespass, the study found that even though some respondents claimed there had been cases of arrest 32.2%, almost two-third 67.8% differed and claimed there were no arrest of trespasser whatsoever. By implication, it therefore means that based on loose security arrangement of the area, it is prone to abuse of different dimension which in the long run might have contributed to environmental degradation of the forest.

Table 5: Security of the green space

Notice of security in the plantation	**F**	**%**
Yes	16	7.6
No	195	92.4
Total	211	100
Restriction in the area	**F**	**%**
Yes	57	27
No	154	73
Total	211	100
Arrest in the past	**F**	**%**
Yes	68	32.2
No	143	67.8
Total	211	100

In order to buttress the loose security situation on the green space, the study as shown in Table 6 found that series of harvest of green space products went on undisturbed, about 98.1% of the respondents were of the opinion that such harvest was ongoing.

Table 6: Harvest of forest product

Notice of harvest	**F**	**%**
Yes	207	98.1
No	4	1.9
Total	211	100

Test of relationship between length of stay and size of space occupied

Pearson Product Moment Correlation Analysis was used to examine the relationship between length of stay and size of land and the result was as presented in Table 7

As shown in Table 7, the relationship between length of stay of respondents and size of land occupied was observed to exhibit a positive correlation with the correlation coefficient (r) of 0.613. This suggests that as the period of stay extended, the size of the land occupied also increased. The implication of this is that the longer the occupants of the green space stayed, the more the space they occupied. This could further mean that due to security lapses in the area people tend to encroach beyond their original allocation. Further finding from the correlation analysis also indicated that there is statistical relationship between length of stay and size of land at $p>0.05$ confidence level ($p=0.000$).

Table 7: Relationship between length of stay and size of land

Correlations			
		Length of stay	Size of land
Length of stay	Pearson Correlation	1	.613*
	Sig. (2-tailed)		.000
	N	211	211
Size of land	Pearson Correlation	.613*	1
	Sig. (2-tailed)	.000	
	N	211	211

*. Correlation is significant at the 0.05 level (2-tailed).

As indicated in Figure 2, the study found that of the green space products harvested, firewood was the highest constituting more than one-third (38%) of the entire harvest. Herbs followed closely with 35%, tree made up 16% of the product harvested while other products formed the rest 11%. This result corroborates the earlier studies linking poverty with destruction of green space. For instance, UN Habitat (2010) linked the depletion of Africa's green environment to high rate of urban poverty as many of the poor people tend to over-rely on natural resources for their survival. Also, a study at South Africa found many poor communities to rely much on the green environment for additional income or to improve their livelihood (Cilliers *et al.*, 2012). It can therefore be inferred from the findings that firewood and herbs were more harvested than any other products as the urban poor people easily eke out a living from those materials.

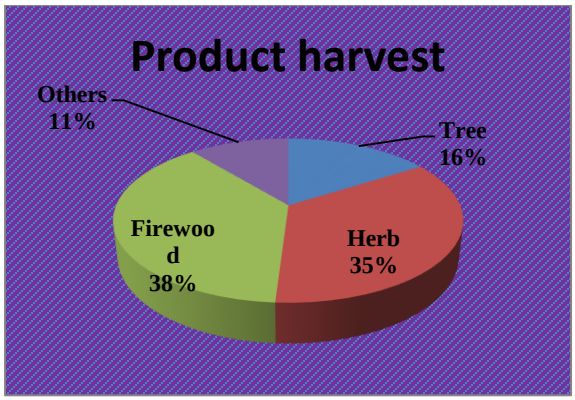

Figure 2: The green space product harvested

Table 8 shows the frequency of harvest of the green space products. The Likert scale was used to weigh the degree of frequency. This is done by attaching values of weight to different degree of responses as shown. It is observed in Table 4.8 that firewood has the highest positive frequency of harvest index of 0.6081. This implies that harvest of firewood was the highest in the area. This corroborates the submission of Raheem (2019) where it was reported that the locals turned to the various forests within Ibadan city (Agala, Dandaru and Eleyele forests among others) for fuel wood during protracted nationwide strikes, protests and political unrests in the country. The firewood harvest is followed in decreasing order by the harvest of herbs with frequency index of 0.1198.

Conversely, tree harvest had the least frequency index with -0.4252. By implication, it means that harvest of tree in the green space area was the least in terms of frequency. This low frequency of tree harvest might not be unconnected with the already depleted tree resources, not out of restriction.

Table 8: Frequency of green space product harvest

Green Space Products	Frequency Index					
	FWV	NR (f)	FWV/NR(f)	X	D	d^2
Tree	471	211	2.2322		-0.4252	0.1807
Firewood	689	211	3.2654		0.6081	0.3696
Herbs	586	211	2.7772		0.1198	0.0143
Leaves	575	211	2.7251		0.0677	0.0045
Sand	517	211	2.7502	2.6574	0.0928	0.0086
Others	463	211	2.1943		-0.4631	0.2144
Total			15.9444			0.7921

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concluded that though informal activities (car washing; block making; artisan work and religious activities among others) thrived on the protected green space and quite a number of people earned their livings therefrom, encroachment and depletion of the green space had enormous consequences on the environment. Also, dumping of waste inside the green space area was preponderance just as cutting of tree and harvesting of firewood were on the high side. Furthermore, the protected green space was not actually protected as the security around was too loose leading to unwholesome harvest and other abuses.

Recommendations

Given the various findings emanating from the study and the likely effects and implications directly on the protected green space of Eleyele Dam and indirectly on the water body, there is the need for measures towards the sustainable management of the green space. The following suggestions are therefore offered.

Quit notice should be served on the occupants of the protected green space. Granting of approval of space to the people should be stalled to put an end to further depletion of the green space. Besides, government needs to institute a security measure and thorough monitoring of the protected green space to prevent any form of encroachment particularly from the touts who could still be loitering around to swindle unsuspecting people by engaging in illegal allocation.

Furthermore, non-compatible activities that could further lead to depletion of the green space should be discouraged and there should be thorough monitoring of the activities of people within the area. The study revealed that quite a number of people earned a living from engaging in one activity or the other, consequently, the compatible land use such as gardening can be allowed in a controlled circumstance. Finally, the remaining green space should be revamped and regenerated by a way of afforestation and thoroughly secured by legislation. Therefore, if the recommendations can be sustainably implemented, the encroachment of the green space of Eleyele can be halted and sustainable environment achieved.

References

Adeleru, R.A. (2017). Nigeria - Ibadan Urban Flood Management Project: Environmental assessment: Environmental and Social Impact Assessment (ESIA) for emergency rehabilitation of Eleyele Dam, Oyo State (English). http://documents.worldbank.org/curated/en/566181485759738747/Environmental-and-Social-Impact-Assessment-ESIA-for-emergency-rehabilitation-of-Eleyele-Dam-Oyo-State

Agbede, O.A & Ojelabi, S.A (2017). Heavy Metal contamination Assessment of selected water sources in Ibadan Metropolis. *Mayfeb Journal of Civil Engineering*, 1, 1-14

Aldous, D.E., (2005). Education and training opportunities for turf management in Australia. *Acta Horticulturae*, 672, 71-7.

Ajayi, O., Agbola, S.B, Olokesusi, B.F., Wahab, B., Taiwo, O.J., Gbadegesin, M., … Abiola, N.A. (2012). Flood management in urban setting: A case of Ibadan metropolis. Special publication of the Nigerian Association of Hydrological Sciences. http://www.unaab.edu.ng

Ayeloja, A.A, George, F.O.A, Shorinmade, A.Y, Jimoh, W.A, Afolabi, Q.O. & Olawepo, K.D. (2014). Heavy Metal concentration in selected fish species from Eleyele reservoir, Ibadan, Oyo State, South western Nigeria. *African Journal of Environmental Science and Technology*, 8(7), 422-427

Baycan-Levent T, Vreeker R, Nijkamp P. (2009). A multi-criteria evaluation of green spaces in European cities. *European Urban and Regional Studies*, 16(2), 193-213

Bolaji, G.A., (2010). Hydrological Assessment of Water Resources and Environmental Impact on an Urban Lake: A case Study of Eleyele Lake Catchment, Ibadan, Nigeria. *Journal of*

Natural Sciences, Engineering and Technology, 9(1), 90-98

CABE Space (2004). The value of public space: How high quality parks and public spaces create economic, social and environmental value. Retrieved May 20, 2018 http://www.cabe.org.uk/AssetLibrary/2021.pdf

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, 68(1),129-138

Cilliers, S., Cilliers, J., Lubbe, R. & Siebert, S., (2012). Ecosystem services of urban green spaces in African countries: Perspective and challenges. *Urban Ecosystem*, DOI 10.1007/s11252-012-0254-3

Cohen, D.A., Inagami, S. & Finch, B., (2008). The built environment and collective efficacy. *Health & Place*, 14, 198–208.

De Vries, S., Verheij, R.A., Groenewegen, P.P. & Spreeuwenberg, P. (2003). Natural Environments – healthy environments? *Environment and Planning*, 35, 1717-1731.

European Environment Agency (EEA), (2002). *Towards an urban atlas: Assessment of spatial data on 25 European cities and urban areas.* EEA: Copenhagen.

Fam, D., Mosley, E., Lopes, A., Mathieson, L., Morison, J. & Connellan, G., (2008). *Irrigation of urban green spaces: A review of the environmental, social and economic benefits.* CRC for Irrigation Futures Technical Report No. 04/08.

Fanan, U., Dlama, K. I. & Oluseyi, I. O. (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.

FAO, (2012). *Growing greener cities in Africa.* First status report on urban and peri-urban Horticulture in Africa. Rome: Food and Agriculture Organization of the United Nations.

Fuwape, J. P. & Onyekwelu, J. C. (2011). Urban Forest Development in West Africa: Benefits and Challenges. *Journal of Biodiversity and Ecological Sciences*, 1(1), 78-94.

Jibril, I.U. (2010). The Return of the Greens in Abuja, Nigeria's New Capital City. FIG Congress 2010. *Sustainable Planning and Urban Renewal Facing the Challenges – Building the Capacity.* Sydney, Australia.

Jim, C.Y. & Chen, W. Y. (2006). Recreation-amenity use and contingent valuation of urban Green spaces in Guangzhou, China. *Landscape and Urban Planning*, 75, 81-96

Mensah, C.A. (2014a). Destruction of Urban Green Spaces: A problem beyond Urbanization in Kumasi City, Ghana. *American Journal of Environmental Protection*, 3(1), 1-9

Mensah, C.A. (2014b). Urban Green Spaces in Africa: Nature and Challenges *International Journal of Ecosystem* 4(1), 1-11

Nowak, D. J., Crane, D. E. & Stevens, J. C. (2006). Air pollution removal by urban trees andShrubs in the United States. *Urban Forestry & Urban Greening*, 4(3-4), 115-23.

Ojelabi, S.A., Agbede, O.A., Wahab, B.A., Aiyelokun, O.A. & Ojelabi, O.A. (2018).Water Quality Assessment of Eleyele Dam, Ibadan,South-Western, Nigeria. *Civil and Environmental Research*, 10(8), 52-59

Olanrewaju, A.N., Ajani, E.K. & Kareem, O.K. (2017). Physico-Chemical Status of Eleyele Reservoir, Ibadan, Nigeria. *J Aquac Res Development*, 8(9), 512

Olayinka, O.O., Adedeji, H.O., Akinyemi, A.A. & Oresanya, O.J., (2017). Assessment of the Pollution Status of Eleyele Lake, Ibadan, Oyo State, Nigeria. *Journal of Health Pollution*, 15, 51–62

Omigbodun, A. O & Omigbodun, O. O (2008). Climate Change and Health in Nigeria: Vulnerability and Adaptation in Akande, T and Kumuyi, A (eds.) *Challenges of Climate Change for Nigeria: A Multidisciplinary Perspectives*. Ibadan: New World Press

Raheem, W.M., (2019). *Analysis of Urban Green Space Development and Utilization in South-western Nigeria*. Unpublished PhD Thesis, Department of Urban and Regional Planning, Ladoke Akintola University of Technology, Ogbomoso

Takano, T., Nakamura, K. & Watanabe, M., (2002). Urban residential environments and senior citizens' longevity in mega-city areas: the importance of walk-able green space. *Journal of Epidemiology and Community Health*, 56(12), 913-916

Tanaka, A., Takano, T., Nakamura, K., Takeuchi, S., (1996). Health levels influenced by urban residential conditions in a megacity – Tokyo. *Urban Studies*, 33, 879-894.

UN Habitat (2010). The state of African cities 2010: Governance, inequality and urban land markets. Nairobi: UN Habitat.

WHO (1997). *Guidelines for Drinking Water Quality: Surveillance and Control of Communities Supplies vol. 3* (2nd Ed.). WHO: Geneva, Switzerland