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ENVIRONMENTAL IMPACT OF URBANIZATION ON LAND USE COMPATIBILITY AND ENVIRONMENTAL QUALITY IN PORT HARCOURT, RIVERS STATE

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ABSTRACT

This study examined the environmental impact of urbanization on land use compatibility and environmental quality in Port Harcourt Metropolis. The study adopted the multi-method research, integrating both qualitative and quantitative approaches through the convergent mixed method technique, where 399 household heads were selected from 189,317 household heads using the Taro Yamane formula. Questionnaires and checklists were administered to the household heads and ten (10) key informants respectively. Descriptive statistics, critical informant content analysis, and Geographical Information System (GIS) techniques were employed for data presentation and analysis for the study. Multiple Regression Analysis (MRA) was employed to test stated hypothesis for the study. The findings revealed numerous environmental changes resulting from land use/land cover change activities in the area to include deforestation, which accounted for 20.5%, degradation, which represented 19.7%, forest degradation corresponding to 19.7%, generation of waste causing pollution, accounting for 20% and decrease in environmental quality corresponding to 20.1% of the total sampled population of the study. Additionally, the impact of urbanization on environmental quality were revealed as flooding, which accounted for 11% of the sampled respondents as well as air pollution, representing 10.8%. Others ecological disaster (8.7%), waste disposal damping (8.9%), land use incompatibility (7.4%), slum developments and urban heat island (9.6%), land use conflict (8.1%), reduced wetland (8.4%), environmental degradation (7.4%), land use conversion (6.8%), overcrowding of buildings (7.1%) and habitat contamination (7.9%). The study concludes that rapid urbanization has significantly impacted land use compatibility and environmental sustainability in Port Harcourt metropolis. It is therefore recommended amongst others that the government should implement stringent urban development control measures to regulate land use and ensure sustainable urban growth as well as establish policies that limit haphazard expansion and promote planned development.

Keywords: Land use, urbanization, environmental quality, Port Harcourt, land use compatibility

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1. INTRODUCTION

Urbanization is the process of clustering people into distinct places, which changes the land for uses such as transportation, commerce, industry, and housing, is changing the earth's landscape features (Chiadokobi *et al*., 2011). Urbanization is an essential factor of modernization (Mbaya et al., 2019). Growth and progress in the social and economic spheres are propelled by it. However, urbanization also has significant impacts on health and the environment. The rapid rates of urbanization, population growth, and industrialization in cities of the world in the last decades have led to uncontrolled and uncoordinated development on swamps, flood plains, and natural drainage systems as well as on lands that were hitherto predominantly used as conservation sites (Visigah, 2017). Urbanization, land use dynamics, and the spatial configuration and their structure affect the functioning and quality of the urban areas that need to be sustainably managed (Ayotamuno *et al.,* 2010; Ayotamuno *et al.,* 2022; Ayotamuno & Gobo, 2016; Ramachandra *et al.,* 2012). A recent UN-Habitat report examined these impacts, highlighting the challenges and necessary changes for creating sustainable and resilient urban areas (UN-Habitat, 2021). The rapid urbanization and changing land use patterns have led to increased land degradation. This presents a significant obstacle in many developing nations. UNDP's response includes providing capacity-building and policy solutions, supporting countries in designing practical interventions in degraded landscapes and helping them achieve targets for achieving Land Degradation Neutrality (SDG 15.3) by 2030 (UNDP, 2010).

The scholarly debate about the impacts of urbanization and urban land use change has become almost incomprehensible. However, it is possible to distinguish a few significant debate threads, each emphasizing a particular issue of concern (Creutzig *et al*., 2019). First, significant concerns exist regarding the environmental outcomes of urban land use change. These impacts are primarily related to changing land cover which inevitably occurs when land is being developed and leads to an increased share of artificial and impervious surfaces, including built-up lands, such as rooftops, roads, parking lots, and pavement. These lead to flooding, air pollution, and other urban environmental problems, including increased noise pollution, which is increasingly recognized as a threat to human health and well-being (Ideriah T.J.K., *et al*., 2022). Gobo *et al*., (2022) highlighted the profound increase in noise pollution which have occurred due to the increases in commercial and industrial activities; population growth, expansion of highways and number of automobiles. Furthermore, as urban areas become more populated, the need for more land space to accommodate the increasing rate of urban population and economic activities along flood plains and wetlands increases, thereby raising the risk of urban dwellers and infrastructure to natural disasters such as floods (Nuissi & Siedentop, 2019).

In managing the urban structure and ecology, analysis of urbanization, urban land management, and land use dynamics is becoming more and more crucial in reducing the issues associated with haphazard, unplanned, and uncoordinated growth (Okwakpam & Epelle, 2013). Because land use is a process rather than an event, the Port Harcourt metropolis requires sophisticated methods and tactics for using geospatial data as auxiliary information to enhance the outcome of the land cover categorization, just as urbanization and land management, it can be forecasted and understood quite well before time (Ricaurte *et al.,* 2017; Wilson, 2015; Wizor & Eludoyin, 2020).

Pei *et al.* (2022) noted that in analyzing the impact of urbanization and land management using geospatial analysis to detect changes in land use and the degree to which urbanization is

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affecting the environment of Port Harcourt metropolis, remote sensing and geographic information systems (GIS) may be utilised to acquire spatial and temporal information within a specific time. Additionally, an analysis of land use dynamics and sustainability in Port Harcourt metropolis is required to evolve sustainable land use management approaches and framework. This is as observed by Gobo & Amangaraba (2007); Kazi *et al*. (2008); Kang *et al*. (2010); Ayotamuno & Enu-Obari (2017), the conversion of urban land away from the natural designations to somewhat little to un-bearing uses for development due to increase in the rate of urbanization and urban expansion, has created challenging impacts on the urban environment thereby calling for an effective urban land management through the use of geospatial examination of the Port Harcourt Metropolis's land use patterns and sustainability. Consequently, to ascertain the impact of urbanization on land management, this study employs geospatial analysis of land use dynamics and sustainability in Nkpolu-Oroworukwo, Borokiri, Fimie-Ama, Choba, Rumuomasi, Bori Camp, Rumuogba, Woji, Ogbogoro, Mgbuoba, Rumuokpareli and Mbori areas of the Port Harcourt metropolis, Rivers State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

Port Harcourt metropolis is the study area for this research, and it consists of Port Harcourt City Local Government Area and Obio/Akpor Local Government Area (Visigah, 2017). The study area is defined by a broad area contained in the Port Harcourt Master Plan of 1975 and spans an area of 1800 km^2 (Ede, 2015). The 1997 Port Harcourt Master Plan stipulated that Port Harcourt Metropolis is an area of 360km^2, out of which Port Harcourt City Local Government Area (LGA) covers 100km^2 and Obio/Akpor LGA covers 260km^2 of the land area (Ajie & Dienye, 2014).

The Port Harcourt Metropolis is located around 66 km2 away from the Atlantic Ocean. It is bordered by the LGAs of Ikwerre and Etche to the north, Oyigbo to the east, Emohua to the west, and Degema and Okrika to the south (Obisesan & Wali, 2021). (Fig 1).

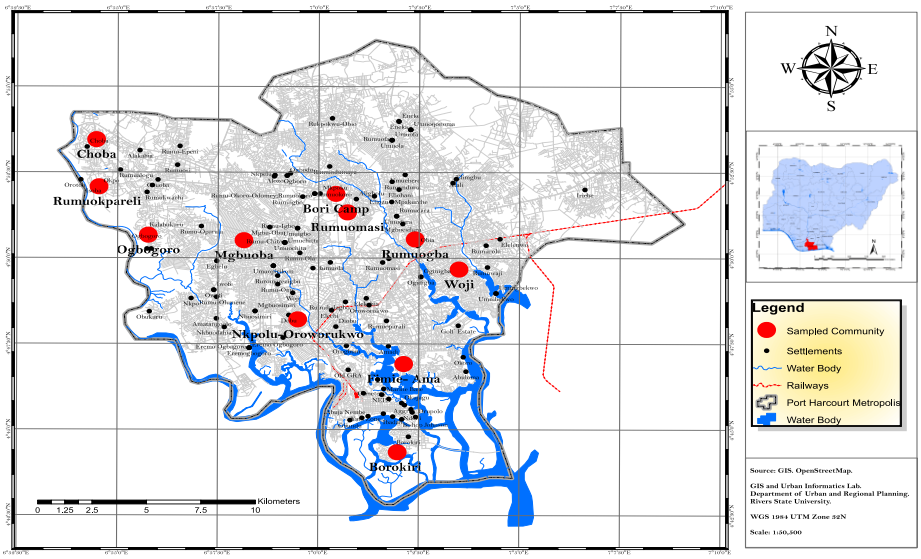

Figure 1: Map of Port Harcourt Metropolis showing the Study Location

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Source: GIS and Urban Informatics Laboratory, Department of Urban and Regional Planning, Rivers State University

2.2 Population and Sample Size of the Study

The population for this study comprised residents of the twenty-five (25) communities in Port Harcourt City Local Government Area (LGA) and the eighty-eight (88) communities in Obio/Akpor Local Government Area (LGA), all in Port Harcourt metropolis, Rivers State (National Population Commission (NPC) 1991, 2006 and 2019).

However, Port Harcourt City LGA, as well as Obio/Akpor LGA, were each divided into planned and unplanned neighbourhoods. The neighbourhoods were randomly divided into three (3) zones: the high-density, medium-density and low-density residential zones. Ten percent (10) of the 25 communities in Port Harcourt City LGA and ten percent (10%) of the 88 communities in Obio/Akpor LGA were selected for this study. Thus, three (3) communities were selected from Port Harcourt City LGA; one (1) community each from the high-density, medium density and low-density residential areas; and nine (9) communities were selected from the Obio/Akpor LGA; three (3) communities each from the high-density, medium-density and low-density residential areas. Consequently, in Port Harcourt City LGA, Nkpolu-Oroworukwo was selected from the high-density area, Borokiri was selected from the medium-density area, and Fimie-Ama was selected from the low-density area. In the Obio/Akpor LGA, the three (3) high-density communities selected are Choba, Rumuomasi and Bori Camp. In comparison, the three (3) medium-density communities selected are Rumuogba, Woji and Ogbogoro. Finally, from the low-density area, the three (3) communities selected are Mgbuoba, Rumuokpareli and Mbori. Twelve (12) communities and their residents were used for this study (Table 1). Two officials (key informants) each were chosen from Rivers State Ministry of Urban Development and Physical Planning (RSMUDPP), Rivers State Ministry of Environment (RSMEnv), Registered Town Planners (RTP), Planning Professionals (PP) and practicing environmentalists (PE).

2.3 Sample Collection

The data on this subject was derived from the Landsat Imagery of 1990, 2000 and 2020 of the Port Harcourt metropolis. These data were sourced from the USGS and Google Earth Explorer on the Landsat imagery of the study area. The geo-information software Arc GIS 10,10 was used in image processing, analysis, and visualization. Area of interest (AOI) was extracted from the Landsat scenes using the "windows" tool in Arc GIS 10.10. The bands' false Colour Composite (RGB) for each of the selected epochs (1990, 2000, 2010 and 2020) was made to increase the pictorial quality for straightforward visual interpretation and identification of features on the images. The images were further subjected to geometric correction using the "Resampling" technique. This was carried out to co-register the images as suggested. The images were reclassified using the Maximum Likelihood Algorithm into the various impacted features due to urbanization impacts in the various epochs in the study area. Also, this was supplemented with questionnaire administration to sample respondents and a checklist to key informants for data collection on the impact of urbanization on land use compatibility and environmental quality in Port Harcourt Metropolis.

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2.4 Method of Data Analysis

The descriptive and inferential statistics was employed for data presentation and analysis for the study. The data collected on the impact of urbanization on the urban landscape of Port Harcourt metropolis was determined using remote sensing and geospatial information analysis. Additionally, the data collected with the questionnaire were analyzed using descriptive statistics of frequency and simple percentage, employing the statistical package for the Social Sciences (SPSS) Technique. The data collected with the key informant checklist were analyzed using key informant content analysis. The inferential statistics was used to explain the results of the stated hypothesis for the study. The stated hypothesis was tested using the robust method of Multiple Regression Analysis. The multiple regression analysis was employed because the study is trying to check if there is a significant relationship between land use change, compatibility and environmental quality in Port Harcourt metropolis. These results were analyzed and presented in the form of maps and tables for clarity purposes, showing the extent of the impact of urbanization on the landscape of the Port Harcourt metropolis.

3. RESULTS

This was determined using Remote Sensing and Geospatial information analysis supplemented with data from survey questionnaires and key informant checklists. The geospatial data was acquired from the Landsat Imagery of Port Harcourt Metropolis for 1990, 2000 and 2020, sourced from the USGS (2024) to determine the dynamism in land use and land cover due to the increased rate of urbanization and how this had impacted on the urban environmental quality of Port Harcourt Metropolis. The imageries of Port Harcourt Metropolis so acquired analyzed geospatially for the years 1990, 2000 and 2020 showing the impacts of urbanization on land use compatibility and environmental quality are presented in Figures 2, 3 and 4.

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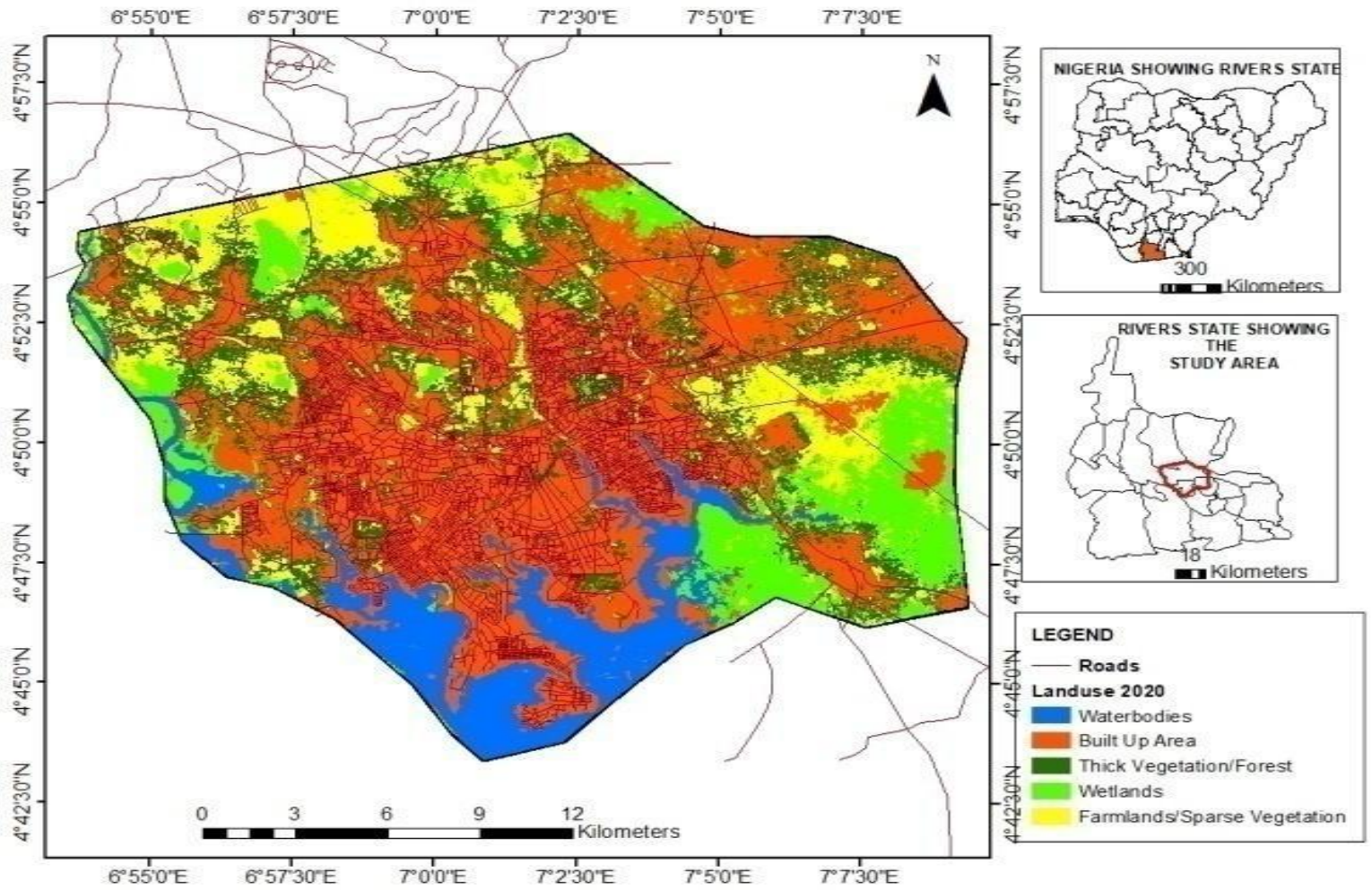

Fig. 2: Land Use Change Compatibility and Environmental Quality in Port Harcourt for 1990
Source: Researcher's GIS Earth Explorer, 2024

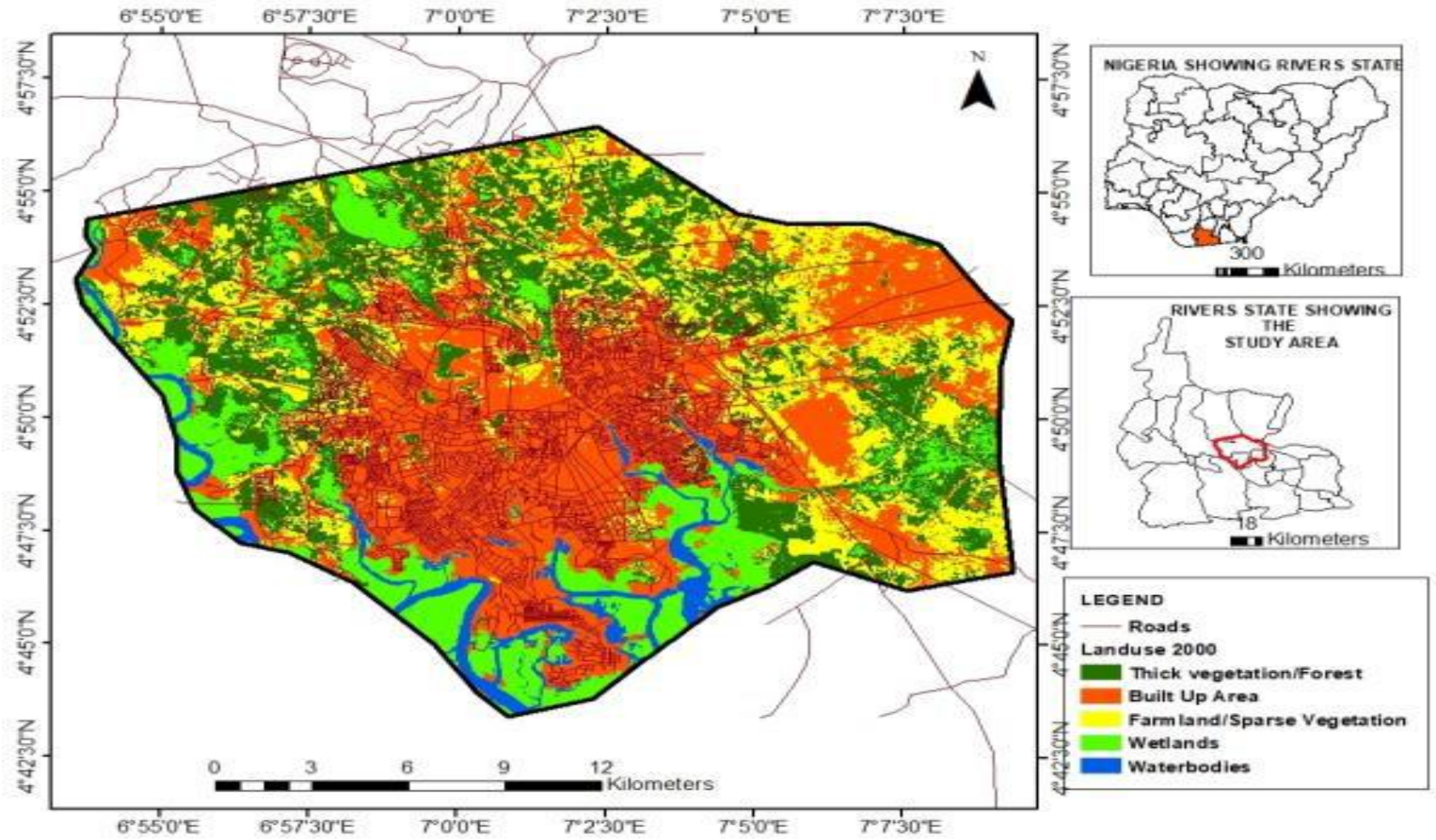

Fig. 3: Land use change compatibility for 2000 and environmental quality in Port Harcourt Metropolis
Source: Researcher's GIS Earth Explorer, 2024.

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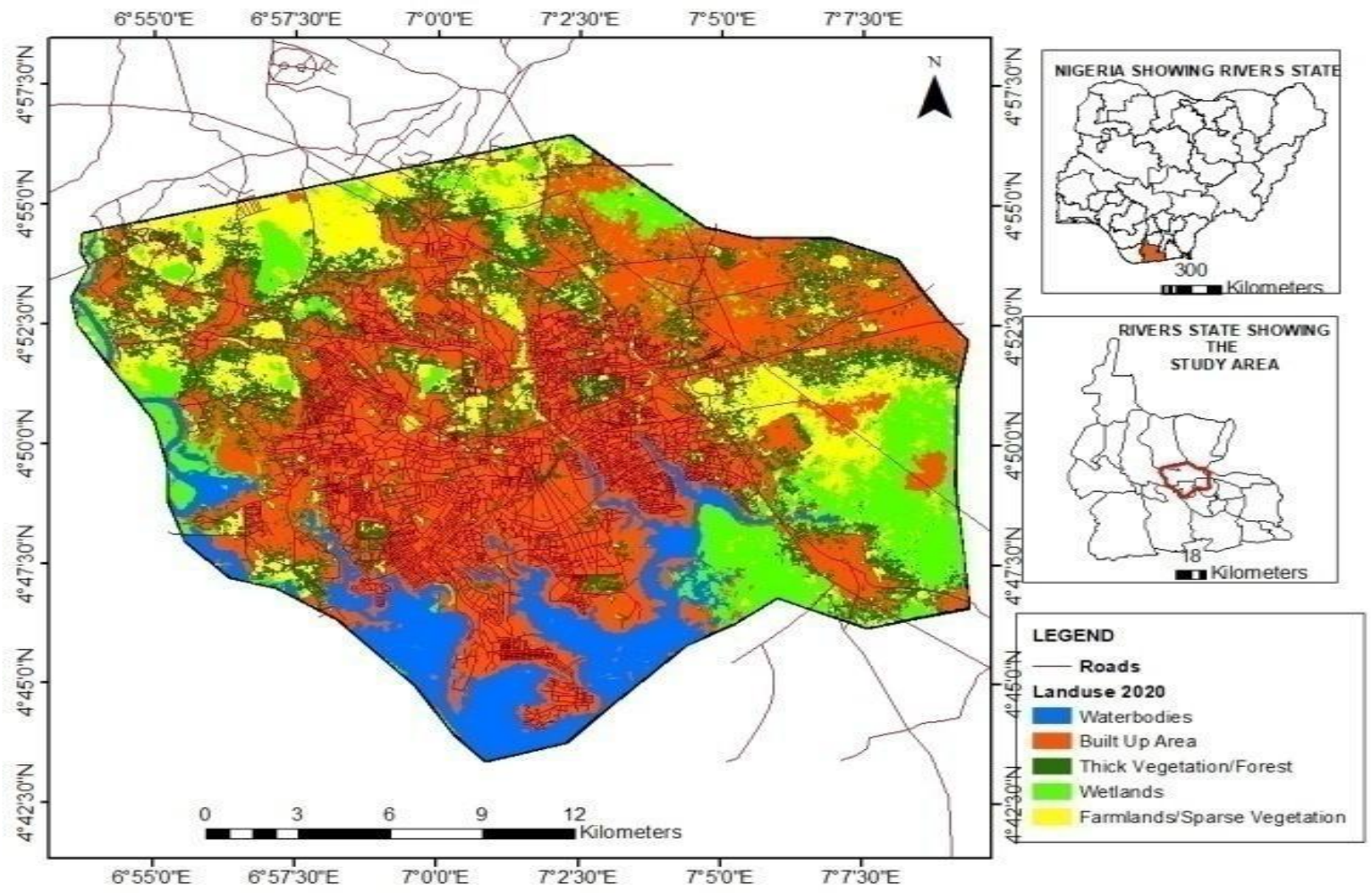

Fig 4: Land use change compatibility for 2020 and environmental quality in Port Harcourt Metropolis
Source: Researcher's GIS Earth Explorer, 2024

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In addition, survey data from sample respondents selected for this study on this subject matter were analyzed. The survey data analysis revealed numerous environmental changes resulting from land use change activities in the area, as shown in Table 1. It is shown that the environmental changes arising from land use/land cover change impact include deforestation, which accounted for 20.5% degradation, representing 19.7% forest degradation corresponding to 19.7%, generation of waste causing pollution, accounting for 20% and decrease in urban environmental quality corresponding to 20.1% of the total sampled population of the study (Table 1).

Table 1: Distribution of Impact of Land Use/Land Cover Changes on Environmental Quality

S/N	Options	F	%
1	Deforestation	78	20.5
2	Ecosystem degradation	75	19.7
3	Forest deterioration	75	19.7
4	Generation of waste causing pollution	76	20.0
5	Decrease in environmental quality	77	20.1
	Total	**381**	**100**

Also, the environmental impact and concerns of the current land use and land cover changes in the study area were investigated. The survey data analyzed revealed that the environmental impact of urbanization on land use and land cover changes include flooding, as 11% of the sampled respondents have affirmed. Others include air pollution (10.8%), ecological disaster (8.7%), waste disposal damping (8.9%), land use incompatibility (7.4%), slum developments and urban heat island (9.6%), land use conflict (8.1%), reduced wetland (8.4%), environmental degradation (7.4%), land use conversion (6.8%), overcrowding of buildings (7.1%) and habitat contamination (7.9%) (Table 2). This analysis shows that urbanization has seriously impacted the area's urban environment, land use, and land cover.

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Table 2: Distribution of Impact of Urbanization on Environmental Quality

S/N	Options	F	%
1	Flooding	42	11.0
2	Air pollution	41	10.8
3	Ecological disaster	33	8.7
4	Waste disposal and dumping	34	8.9
5	Land use incompatibility	28	7.4
6	Slum development and urban heat	29	7.6
7	Land use conflict	31	8.1
8	Reduced wetland/swamp	32	8.4
9	Environmental degradation	28	7.4
10	Land use conversion	26	6.8
11	Overcrowding of buildings	27	7.1
12	Habitat loss	30	7.9
	Total	**381**	**100**

3.1 key Informants Content Analysis

3.1.1 The Current Trend in Urbanization and Land Use Dynamics

Registered Town Planners and Urban Planning Professionals have noted that the current trend in urbanization and land use change can be described as:

1. Very rapid, unprecedented, and rapidly increasing.
2. The visible outcome of urban land use change in the wake of the current trend of urbanization in Port Harcourt is the spatial expansion of built-up areas.
3. A vigorously increasing and significantly changed alteration of land cover features accompanied by changes in the urban spatial structure and form.
4. The city size is increasing, becoming more prominent and will increase. For instance, in 1990, Port Harcourt held 10% of the population of Rivers State, but today, the figure is over 50%, and it will be 75% by 2050 (Registered Town Planners, Urban Planning Professionals).
5. The current trend shows that only 40% of Land Use and Land Cover changes in Port Harcourt will increase by 56% in 2030.
6. The trend in urbanization, evident in rapid urban growth and rural-urban migration, is influenced by economic, social, and environmental factors.
7. The trend in land use changes in the area, which is spiral, spatiotemporal and accelerating.

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3.1.2 Influence of Urbanization on Land Use Change

Registered town planners, officials of Rivers State Ministry of Urban Development and Physical Planning, urban planning professionals, and environmentalists have noted that urbanization significantly influences land use change. Their opinions are presented as follows:

1. Large areas of agricultural land have been transformed into residential and industrial land use.
2. The rate of development of infrastructure to harness the growth of the city's amenities, such as roads, health care, recreational, and educational facilities, among others, is increasing.
3. The increasing rate of land use incompatibility, as evident in street markets encroaching on roads and land use causing traffic congestions.
4. The increase in urban population within the city has caused overcrowding of housing spaces and pollution.
5. Green areas have been converted to residential areas to accommodate residents
6. Convert wetland/swamp to the built-up area etc.

Furthermore, the expert ideas, opinions, and responses of the key informants selected for this study were sought regarding the impact of urbanization on land use compatibility and environmental quality in Port Harcourt Metropolis. Thus, officials of the Rivers State Ministry of Urban Development and Physical Planning, Rivers State Ministry of Environment, Urban Planning Professionals, and Registered Town Planners noted that urbanization had impacted land use compatibility and the environment as seen thus.

3.1.3 Impact of Urbanization on Land Use, Land Cover, and the Environment

The impacts of urbanization on land use, land cover, and environmental quality, according to the environmentalists, the officials of Rivers State Ministry of Urban Development and Physical Planning, Urban Planning Professionals and Registered Towns include:

1. The shrinking of the drainage channels, shrinking of the shorelines, siltation of the rivers and drainage channels, flooding of the urban catchments, changes in soil morphology and compartments, etc.
2. Increased stormwater and overland flow, loss of biodiversity, deforestation, poor rate of stormwater infiltration, etc.
3. Transformation of the natural landscape to built-up areas.
4. Incompatibility in land use as there are predominant cases of mixed land uses and land use conflicts.
5. Convert residential areas to commercial areas, convert industrial areas into residential areas, generate and dispose of reckless waste, create pollution, create urban blight and urban heat islands, develop slums, and alter shoreline morphology.

3.1.4 Influence of Urbanization on Land Use and Land Cover Changes

A review of the documents and the content analysis of the key informants' checklist revealed the following:

1. Large areas of natural agricultural land were transformed into residential and industrial areas.
2. Conversion of wetlands and swamp areas into built-up areas, change in land use and land cover pattern.
3. Congested spatial arrangement in land use and decrease in agricultural land use.
4. The increased rate of depletion of the natural urban ecosystem and the pollution of the urban space from waste disposal.

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5. Land use conversion from one use to another, shanties' development, and distortion of the land use master plan.

Table 3: Distribution of Impact of Long-Term Consequences of Rapid Urbanization

S/N	Options	F	%
1	Development of slum	63	16.5
2	Water and sanitation problem	61	16.0
3	Poor housing condition	58	15.2
4	Housing over-crowdedness	54	14.2
5	Disease epidemic breakout	50	13.1
6	Pollution and improper waste generation	48	12.6
7	Poor infrastructural development and the growth of unplanned settlement	47	12.4
	Total	**381**	**100**

3.2 Test of Hypothesis

Ho: No significant relationship exists between land use change, compatibility, and environmental quality in Port Harcourt Metropolis.

The hypothesis was tested using the robust method of Multiple Regression Analysis (MRA). The data from Table 4, which provides information on environmental compatibility/quality and land use change conversion, was used to compute the correlation between the two variables, and the result of the analysis test is shown in Table 5. The results indicate a weak and positive correlation ($r=0.339$; $p>0.05$), as shown in the scatter diagram in Figure 5. This diagram also illustrates that the land use change conversion contributed 16.54% to the environmental compatibility/quality variation.

Therefore, it can be confidently state that the null hypothesis, which posits no significant statistical relationship between the land use change conversion of the study area and environmental compatibility/quality in Port Harcourt Metropolis, is indeed accepted. This acceptance, coupled with the rejection of the alternative hypothesis, underscores the certainty of our research outcome.

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Table 4: Land Use Change Conversion and Environmental Compatibility/Quality

Land Use Change Conversion	Environmental Compatibility/Quality
1	0.000328
3	0.000343
1	0.000324
3	0.000377
2	0.000411
3	0.00042
3	0.000305
1	0.000474
3	0.00041
1	0.000541
2	0.000539
3	0.000531
3	0.000496
3	0.000602
2	0.00056
1	0.000053
3	0.00041
1	0.000135
1	0.000308
2	0.000256
2	0.000238
3	0.000257

Table 5: MRA Hypothesis II Correlation between Land Use Change Conversion and Environmental

		Environmental Quality/Compatibility	Land use change conversion
Environmental Quality/Compatibility	Pearson Correlation	1	0.339*
	Sig. (2-tailed)		.123
	N	22	22
Land use change conversion	Pearson Correlation	0.339*	1
	Sig. (2-tailed)	.123	
	N	22	22

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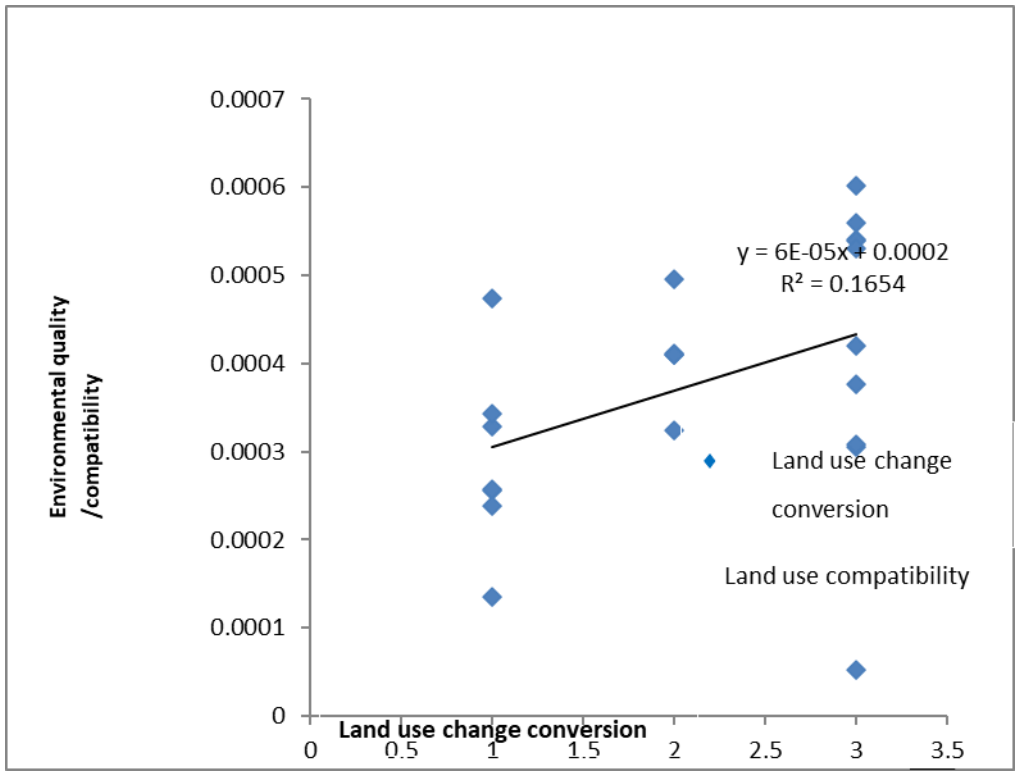

Fig 5: Positive relationship between the Land use change conversion and environmental quality/compatibility

4. DISCUSSION

The impact of urbanization on land use compatibility and environmental quality is shown in Figures 2, 3 and 4 and Tables 1, 2, 3 and sections 3.1.1, 3.1.2, 3.1.3 and 3.1.4. The analysis shows that urbanization has significantly changed Port Harcourt Metropolis's land use and land cover spatial pattern by altering and changing the area's natural landscape and environmental quality. From the analysis, it is found that the land use pattern and change conversion, which is due to a lack of adherence to urban development control mechanisms and ineffective legal urban planning framework, has been compounded by the high demand for land space, and this has resulted in land use incompatibility and land use conflict. Therefore, there should be energy conservation, promotion of green areas, and involvement of community and urban planners in the urban development process.

The analysis in Table 3 shows that land use and land cover changes caused by urban growth and expansion have led to different situations that have dotted the Port Harcourt environment. This is because changes in land use in some neighbourhoods in Port Harcourt have brought significant changes in environmental quality and is in line with the findings of Ayotamuno and Ekaka (2017), which states that in the next 20 (2040) or 30 (2050) years, conversion and re-conversion of land use classes will occur, thereby leading to land use incompatibility and conflict. Therefore, the over-saturation of the built-up areas in this study area has caused severe

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environmental issues, such as overcrowding of residential areas, pollution and reckless waste generation and disposal.

Rapid urban growth, with its attendant changes in the city landscape, leads to high demand for land space for various physical developments, as seen in the analysis, and this has brought a significant impact on the environmental quality and incompatibility in land use. Since land as a resource is a fixed stock, increasing land stock to accommodate city growth often results in encroaching on some land covers, such as wetlands and swamps, water bodies and riparian vegetation. This has brought significant change in the urban ecology, changing the morphology of the urban coastal forms and leading to environmental degradation. There is also an increase in land use conflict, over-crowding of housing space, reckless waste generation, urban heat islands and several other urban environmental problems.

Incidentally, the increasing rate of urbanization has caused wetland and water bodies depletion, thereby leading to eutrophication, pollution of the marine ecosystem as well as species extinction and decline, which has led to severe socio-economic conditions of people living in the coastal areas of Port Harcourt city, and this requires urgent attention to reverse the trend. This is in line with the finding of Akue et al. (2022), who noted that there is a need to quantitatively establish the actual stock of wetlands and water bodies loss in any urban area due to the increasing awareness of the sudden disappearance of wetland ecosystem which has resulted in the denial of the urban dwellers, the roles and serves, values and function it performs and the pollution of the urban landscape due to urbanization.

The findings further revealed that the land use pattern and change conversion due to urbanization are incompatible and conflicting because of ineffective legal framework and lack of adherence to urban development control regulations. The land-use changes observed for the period under investigation shown here provide the basis for understanding the pattern and possible causes and consequences of land use/land cover changes in the area. The supervised classification provided satisfactory results, which show the distinguishing of land use change and classes and how the changes in land use classes and conversion had impacted the environmental quality of the study area. The observed changes have shown mixed land use of residential/commercial, residential /industrial, and institutional/residential, depicting a conflict in land use zoning. Furthermore, a decrease in open spaces, overcrowding of residential areas/lack of setback standards, pollution of the area, and other indices have revealed that the land use classes in the area need to be more compatible, thus posing serious environmental concerns to the area. Therefore, the analysis further revealed that the detection of land use/land conversion had posed a deteriorating environmental quality.

5. CONCLUSION

This study highlights the profound environmental impacts of urbanization on land use compatibility and environmental quality in Port Harcourt, Rivers State. Utilizing Landsat Imagery from four epochs: 1990, 2000, 2010 and 2020, alongside data from surveys and key informant interviews, this research revealed pronounced environmental issues arising from rapid urbanization. Notably, flooding (11%) and air pollution (10.8%) emerged as predominant impacts, emphasizing the dire need for sustainable urban planning and policy interventions to mitigate the adverse effects of urbanization in Port Harcourt.

Hence, it is recommended that policymakers, urban planners and stakeholders promote land use practices that align with environmental sustainability goals to ensure that urban growth is

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balanced with the preservation of natural resources, thereby enhancing the liveability and resilience of the city. Environmental monitoring should be integrated in urban planning to inform urban planning decisions and mitigate the adverse impacts of rapid urbanization on environmental quality in rapidly urbanizing regions like Port Harcourt, ensuring a sustainable future for its residents.

REFERENCES

Ajie, U. E. & Dienye, A. (2014). Spatial data analysis of solid waste management system in Port Harcourt Metropolis after 100 years of its existence. Retrieved from www.tig.net/fig2014/papers/ts67h/TSD7H ujie-dunye 7163.PH.

Akue, L.O., Ikezam, W.I. & Brown, I. (2022). Exploring the nexus between urban growth trend and wetland loss in Port Harcourt municipality. International Journal of Hydrology, 6(4), 102-106.

Ayotamuno, A. & Enu-Obari, N. E. (2017). How has population growth and demand for housing affected land use in Port Harcourt, Nigeria. Global Educational Research Journal, 5(3), 563-578.

Ayotamuno, A. & Gobo, A. E. (2016). The effect of climatic changes on land use and land cover in spatial development in Port Harcourt; Nigeria. International Journal of Climate Change, 2(7), 223-246.

Ayotamuno, A., Gobo, A.E. & Owei, O.B. (2010). The impact of land use conversion on residential district in Port Harcourt, Nigeria. Sage Publications. Environment and urbanization, Vol. 22(1), 259 – 265. https://www.sagepublications.com

Ayotamuno, A., Gobo, A.E. & Owei, O.B. (2022). The assessment of land use change on the environment quality in some neighbourhoods in Port Harcourt, Nigeria. International Journal of Humanities, Social Sciences and Management, 2(4), 152 – 165

Chiadikobi, K. C., Omoboriowo, A. O., Chiaghanam, O. I., Opatola, A., & Oyebanji, O. (2011). Flood Risk Assessment of Port Harcourt, Rivers State, Nigeria. Advances in Applied Science Research, 2(6), 287-298 https://www.imedpub.com/articles/flood-risk-assessment-of-port-harcourt-rivers-state-nigeria.pdf

Creutzig, F., Bren, D.C., Weddige, U., Fusl, S., Beringer, T. & Glaser, A. (2019). Assessing human and environmental pressures of global land use change 2000-2010. Global Sustainability, 2(e1), 1-7. https://doi.org/10.1017.sus.2018.15.

Ede, P. N. (2015). Morphometric feature of a low-elevation urban catchments and the implication for flooding. Global Journal of Geosciences, 13(1), 9-14.

Gobo A. E., Ideriah, T. J. K. & Amaefuna, R.O. (2022). Assessment of noise levels in Abali Motor Park in Rivers State Nigeria. Global Scientific Journal. 10(07), 1044–1052. https://www.researchgate.net/publication/374415773_Assessment_of_Noise_Levels_in_Abali_Motor_Park_Port_Harcourt_Rivers_State

Ideriah, T. J. K., Amaefuna, R. O., & Dollah, O. C., (2022). Assessment of noise levels in Rumuokoro Motor Park in Rivers State, Nigeria. International Journal of Agriculture, Environment and Bioresearch, 07(06), 245–252. https://doi.org/10.35410/ijaeb.2022.5787

Kang, R. S., Storm, D. E., & Marston, R. A. (2010). Downstream effects of urbanization on stillwater creek, Oklahoma. Physical Geography, 31(2), 186–201. https://doi.org/10.2747/0272-3646.31.2.186

Kazi, T. G., Arain, M. B., Jamali, M. K., Jalbani N., Afridi, H. I., Sarfraz, R. A., Baig, J. A., & Shah, A. Q. (2008). Assessment of water quality of polluted lake and wetland using multivariate

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ISSN: 2456-8643

statistical techniques: A case study. Journal of Ecotoxicology and Environmental Safety, 72(2), 301-309

Mbaya, L. A., Abu, G. O., Makadi, Y. C., & Umar, D. M. (2019). Effect of urbanization on land use and land cover in Gombe metropolis, Nigeria. British. Journal of Earth Sciences Research 7(2), 53-61.

Nuissi, H., & Siedentop, S. (2021). Urbanisation and land use change. In book: Sustainable Land Management in a European Context (pp.75-99). DOI:10.1007/978-3-030-50841-8_5

Okwakpam, I. C. & Epelle, A. (2013). Land accessibility: The burden on socio-economic livelihood of women in Akpor Clan, Obio/Akpor Local Government Area, Rivers State, Nigeria. Journal of Economics and Sustainable Development, 4(14), 6-18.

Pei, L., Wang, C., Zuo, Y., Liu, X., & Chi, Y. (2022). Impacts of land use change on surface water quality using self-organizing Map in Middle Region of the Yellow River Basin, China. International Journal of Environmental Research and Public Health, 19, 10946. https://doi.org/10.3390/ijerph197710946.

Ramachandran, T. V., Althal, B. H., & Sana, D. D. (2012). In rights to urban dynamics through landscape spatial pattern analysis. International journal of applied earth observation and Geo informatics, 1(8), 329-343.

Ricaurte, L, F., Olaya-Rodríguez, M. H., Cepeda-Valencia, J., Lara, D. M., Arroyave-Suárez J., Finlayson, M., & Palomo, I. (2017). Future impacts of drivers of change on welfare ecosystem fertility in Colombia. Global Environment Change, 4(4), 158-169.

UNDP, (2010). United Nations Development programme. The Real Wealth of Nations: Pathways to human development. Human development Report, 2010.

UN-Habitat, (2021). United Nations Human Habitat and settlement. Global state of national urban policy 2021: Achieving sustainable development goals and delivering climate action. Global report.

Visigah, K. P. (2017). Peri-urban settlements and sustainable land management in Port Harcourt. Open online publication. https://www.researchgate.org

Wilson, C. O. (2015). Land use/ land cover water quality nexus; quantifying anthropogenic influence on surface water quality. Environmental Monitoring Assessment, 187, 424 – 436.

Wizor, C. H. & Eludoyin, O. S. (2020). Assessment of land use/land cover detection and its impacts on the human environment using geospatial techniques in the University of Port Harcourt host communities, Nigeria. Asian Journal of Advance Research and Report, 8(3), 40-53.