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APPLYING LAND MANAGEMENT TOOLS IN THE SUSTAINABILITY OF PROPERTY DEVELOPMENT AND ENVIRONMENTAL PROTECTION

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ABSTRACT: The Application of Land Management Tools (LMT) for Sustainable Land Development is capable of improving the environment of Property Investments and as such should be considered in Property Development decision making. Currently, visual observation in certain coastal towns in Nigeria shows that Property development takes place on wetlands which are exposed to frequent flooding. This can be exacerbated by poor land management practices. The study examined whether the noncompliance with, or absence of Land Management Tools are responsible for the development of properties in flood prone lands. It examined instance of incessant flooding of property investments along two high-brow property development neighbourhoods in Port Harcourt, Nigeria. The study was guided by the pragmatist philosophical stance, adopted a case study strategy and data was collected using field observations and remote sensing to obtain data. Photographic imagery of property Developments located within the study area was analyzed along with field data. The findings reveal that Land Management Tools appear not to have been considered prior to the development of properties within the study area. This has negatively affected the Property Development through the pattern and frequency of flooding. In addition, the prevalence of prime properties within the wetlands has also impaired the original ecosystem function of the environment. The study recommends stricter compliance with Land Management Tools which will ultimately lead to increased sustainability of property development investments and environmental protection.

Keywords: Land Management Tools, Sustainable development, Flooding, Environment and Property Development.

ABBREVIATION

Land Management (LM), Land Management Tools (LMTs), Sustainable Development (SD), Sustainable Development Goals (SDGs), Property Development (PD), Sani Abacha road (AR) and Peter Odili Road (POR)

I. INTRODUCTION

Land Management is an important field of study in the context of Sustainable Development as its tools can be used to ensure careful considerations in the choice of development sites by property investors, prevent or mitigate flooding hazards and disaster on Property Development before its occurrence. It can serve as a useful disaster risk reduction tool.

Property Development is a major contributor to a nation's economy but the environment in which it is located will make or mare its efficiency and effectiveness in contributing to a nation's economy. The above statement can be supported by Kropp (2012), which says that the development of real estate on wetlands and in flood plains results in lower property values.The World Bank (2014) report noted that the 2012 flooding in Nigeria resulted in about $9 billion loss on damages, economic loss above $7 billion amounting to $17 billion and 618,000 houses got destroyed. Flooding and its impact on Properties have been attributed to climate change and it is exacerbated by the nature and location of the environment (Gwanma, Wan Yusoff and Ismail, 2015).

There are suggestions for the reduction of flooding impacts using structural measures. This approach aims at controlling nature rather than working with nature. The avoidance of development on wetland environment which is a Land Management approach supports working with nature since it helps to protect the world's natural heritage and ecosystem. The Sustainable Development Goals (SDGs) Goal 11, aspires to make cities inclusive, safe, resilient and sustainable. It estimates that about 95 per cent of urban expansion in the next decades will take place in developing world and that by 2050 70 per cent of the world population is predicted to live in urban settlements (UN, SDG 11) Targets 3 and 4 of SDG 11 aspire to enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries and to strengthen efforts to protect and safeguard the world's cultural and natural

heritage (SDG 11.3 & 11.4). This will reduce the vulnerability and exposure of a property to flooding hazard and consequently disaster (Bin, Kruse and Landry, 2008). Just like in Agricultural profession, Land Management Tool such as Land Taxation could be used as a powerful tool to encourage sustainable development in more suitable locations through incentivization. It can also be used to deter some developments on wetlands (Mc Gill, 2010 and UN-HABITAT, 2011).

There are several observable reasons whydevelopment should not be carried out on wetlands and floodplains particularly to limit Property vulnerability and exposure to flooding hazard and disaster. It is believed that the LM practices in Nigeria are unsustainable, therefore the frequent flooding within most of its inner city affects properties in an avoidable manner. LMTs are basically applicable in Agricultural discipline but its principles can be adapted into the Real Estate profession in order to reduce flooding impact on Property Developmentin the context of Sustainable Development. The Land Management Tools discussed in the agricultural discipline especially in the Food and Agricultural Organisation's(FAO) publications are Land use planning/policy, Land Taxation, Land Information system, Land Tenure system, Land Valuation, Land Administration and Land Governance. (www.fao.org).

This research examined whether land management tools were applied in the sustainable development of property and environmental protection on the wetlands environment and how it is capable of affecting property by exploring the pattern of flooding, frequency and level of flooding in the study area of this research. This is because reducing inner-city flooding using Land Management approaches in the context of Sustainable Development have not been fully explored in Nigeria. It is to create an awareness for consideration, and inclusion of sustainable Land Management Tools during decision making for Property Investment and development purposes.

II. LITERATURE REVIEW

Ayeni and Basorun (2013) in Onuoha and Eze (2016) defined the environment as the totality of all external-physical or social resources available to the satisfaction of human needs, where man resides, and all activities take place. Ministry of Social Development (2003), has defined the environment as the physical environment that includes land, air, water, plants and animals, buildings and other infrastructure and all-natural resources that provide our basic needs opportunities for social and economic development. The satisfaction of human needs where man resides includes the ecosystem services man's natural environment provides and the man-made environment that are constructed to provide support to man. The benefit of social and economic development derived from these natural and man-made environment calls for the protection of man's environment. The most realistic and natural method of protecting our environment is by applying all the Land Management tools when planning land uses of any form especially property development in a way that our natural environment are not over exploited and depleted. Application of sustainable Land Management Tools supports working with nature in terms of property development thereby protecting the environment.

INTOSAI (2013), have observed that many current land planning and land management policies and models are based on the overexploitation of resources and on methods that have little concern for ecological balances. Ecological balances entails maintaining our ecosystem environment whilst modifying our made-made environment. Based on this observation, land management policies should consider past land use practices, land attributes and components and should predict what the future impacts are likely to be whether positive or negative. This is important for wetlands as one of the values of a Wetland as noted by Richardson (1994) is flood control and storage; as such when wetlands are damaged through developments especially impervious developments, there is every likelihood that it will intensify flooding within that environment.

Most areas that experiences incessant flooding are either wetlands or flood plains and they are mostly affected negatively. Flooding destabilizes and applies undue pressure on an environment and distort economic cycles. Property investment is a major contributor to any nation's economy therefore acting as an economic buster. An economy without property investments cannot exist and this will cause a dysfunctional system. Fibbens (1992), Bialaszewski (1990) and Guttery et al (1998) in Eves (2002) have determined that property that is either flood-affected or on wetlands has reduced values compared with similar properties without these detriments. Apparently, protecting our wetland environment implies protecting our property investments from flooding risk and disaster and improving our economy. Flood risk reduction is possible by using land management tools during property developments to protect wetlands and floodplains by allowing them flow naturally.

According to UNECE (1996), Land Management is the management of land from the economic and environmental perspective which includes; farming, mineral extraction, property and estate management and the physical planning of towns and the countryside. Land management for the purpose of this study includes land resources management and land use management. Land Resources Management is a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods

(Liniger, Mekdaschi Studer, Hauert, &Gurtner, 2006). While land use management could be said to be the knowledge-based procedure for series of activities done to generate one or more products or services

The functions of land management are to maintain and enhance productivity, Building resilience and stability, Protection of property from potential flooding, Economic viability and acceptability and equity (see World Bank, 2006; Gabathuler, 2009; Motavalli, Nelson, Udawatta, Jose and Bairdhan 2013). The enhancement of a productive economy is possible with the application of Land Management tools to the environment. The Land management tools are Land use policy and planning, land economic tools such as taxation, land information system, land tenure system, land administration and land governance.

Land information system is a form of Geographical information system that keeps accurate and reliable land cadastre record by taking note of land attributes and components data to represent land boundaries and tenure for easy storage, update, analysis, sharing and retrieval. Land Tenure has to do with the proper legal or customary titling of land documents to depict the extent and degree of land ownership. FAO (2002), Land administration, whether formal or informal, comprises an extensive range of systems and processes to administer land rights, land use regulation and land valuation and taxation. According to World Bank (2012), land use planning also involves protecting well-defined areas from cultural, historical, environmental, or similar reasons, and establishing provisions that control the nature of development. According to World Bank (2013), land governance is the process by which decisions are made regarding the access to and use of land in a manner that decisions are implemented in a way that conflicting interest is minimized. Land taxation is a compulsory levy on land by the government on the land owner.

Land Management covers all activities concerned with the management of the land as a resource both from an environmental, social and an economic perspective (Williamson, Enemark, Wallace &Rajabiford, 2010). Land Management practices affect all sectors of the environment and economy and as such could be said to be an approach that includes environmental and economic needs. The consideration of environmental and economic needs are the idiosyncrasies of sustainable development hence, Land Management could be termed a sustainable development approach.

Enemark (2005), Land Management is comprehensive as activities associated with the management of land and natural resources are required to achieve Sustainable Development. Our natural resources are not restricted to minerals, crops and economic trees but the entire ecosystem that make up a particular environment. The complete destruction of a wetland ecosystem for property development especially the ones with impervious areas are contrary to Sustainable Development principles. This statement can be supported by Krishna (2012), in his review of the land management and administration in Nepal where he stated that the current situation in Nepal is the rapid conversion of land to concrete jungles and unplanned land management which causes threat to sustainable development.

According to the United Nations (1987), Sustainable Development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability is the present protection of our environment by investing in the future through land management activities of all, for all and by all. It then means that everyone is responsible for sustainability for posterity reasons. One of the reasons the Sustainable Development Goals were developed is to meet environmental protection and needs. See SDG 11 target 6 which is to reduce the adverse per capita environmental impact in cities for which property development is a major factor. As such, any effective and efficient Land Management approach that includes Sustainable Development must consider specific environments and their attribute.

III. METHODOLOGY

The methodology describes the entire process adopted in conducting this research. The research is qualitative in nature based on a pragmatic research paradigm which attempts to integrate multiple realities in nature where different strategies are utilized within the same study, depending on the research question. There were no stereotype approaches to the problem. It adopted a case study strategy for observation, surveys and reviewed archival information and historical/contemporary perspective and focus (Schell, 1992). Property Development flanking high-streets in two neighbourhoods were utilized. The streets are namely, Sani Abacha road and Peter Odili road (from Ordinance junction to Okujagu junction) in Port Harcourt, Nigeria. These were used as the case study area with accessibility and permissible to survey and observe buildings, flooding patterns and the environments.

Data was collected using field observation,remote sensing data capture and photographic imagery was taken on the premise that “photographs do not lie” (Kakulu and Visigah, 2016). The field observation, open-ended and closed-ended interaction with the physical buildings and their users. This study adopted a conditional-systematic random sampling. The systematic random sampling is conditioned by the number of developed plots along each road. Twenty (20) properties were observed and surveyed in total. Five (5) properties sampled from either side of each road resulting in ten (10) properties for Sani Abacha road and ten (10) properties for Peter Odili road). On Sani Abacha road, sampling was done at intervals skipping 2 to 5

properties on both sides of the road because some plots were not developed, and some properties had much larger plotsizes than others. On Peter Odili road, properties were sampled at intervals of 10 since the road has a much longer span than the Sani Abacha road. A total of 10 properties were sampled with 5 properties on eitherside. The remote sensing images captured using Google Earthsoftware which is a computer program, that renders a three-dimensional (3D) representation of Earth based primarily on satellite imagery. Using its features of historical imaging, images were captured, andphotographs were sampled on 4 – 6 yearly intervals depending on the available images on the google earth repository.

A simple descriptive analysis was used for closed ended interaction, image analysis for observation from photographic imagery and survey and content analysis to analyse open ended interaction.

IV. DATA PRESENTATION AND ANALYSIS

The analysis and presentation of data analysed were constructed on each data collected.

4.1 Field Observation (Open Ended Interaction)

From the open-ended interaction and field observation, the causes of flooding are as a result of the terrain, plot elevation relative to road/drainage, obstructed flow in the drainage and heavy rainfall. The Flood pattern depends on the side, some roads donot flood as it did a few years previously while others are worse off. In some areas, properties flood each time it rains while others only experience flooding each time it rains heavily. Some properties experience flooding despite the construction of surface drainage but Plots with higher elevation relative to the road do not experience flooding.

4.2 Close Ended Interaction from Field Observation

The close-ended interactions are the ones with specific answers to the interactions and observation shown in Tables 1 – 4.

Table 1 Elevation of plots relative to road/drainage Level

LOCATION	BRL	RL	ARL	TOTAL %
Sani Abacha Road	80	10	10	100
Peter Odili Road	20	40	40	100

Key: Below road level (BRL), Road level (RL), Above road level (ARL)
Source: Wechie (2018)

Table 1 shows the elevation of property plots relative to the road/drainage level for Sani Abacha Road and Peter Odili road that currently experience flooding. On Sani Abacha road, 80% of the Properties have their elevation below road level, 10% on-road level while the other 10% is above road level. On Peter Odili Road, 20% are below road level, 40% is the same as the road level and the other 40% are above the road level. These findings are further analyzed in subsequent sections.

Table 2 Susceptibility of property to flooding

LOCATION	YES	NO	TOTAL %
Sani Abacha Road	90	10	100
Peter Odili Road	60	40	100

Source: Wechie (2018)

Table 2 shows the susceptibility of properties to flood on Sani Abacha Road and Peter Odili Road (from Ordinance junction to Okujagu Junction) to flood. On Sani Abacha Road, 90% of the properties are susceptible to flood while 10% of them are not susceptible to flood. On Peter Odili road, 60% of the properties are susceptible to flood while 40% of them are not susceptible to flood.

Table 3 Flood frequency in each location

LOCATION	ER	HR	P	TOTAL %
Sani Abacha Road	0	100	0	100
Peter Odili Road	32	68	0	100

Key: Each time it rains (ER), only heavy rains (HR) and periodically(P)
Source: Wechie (2018)

Table 3 shows the flood frequency for susceptible properties. On Sani Abacha Road, the frequency of flooding for each time it rains is 0%, only when it rains heavily is 100% while periodically is 0%. On Peter Odili Road, the flood frequency for each time it rains is 32%, only when it rains heavily is 68% and 0% for periodic flooding.

Table 4 Flood level relative to road drainage

LOCATION	BELOW DRAINAGE	ABOVE DRAINAGE	TOTAL %

Sani Abacha Road	10	90	100
Peter Odili Road	0	100	100

Source: Wechie (2018)

Table 4 shows the elevation of property plots relative to the road/drainage level. It shows that on Sani Abacha Road, only 10% of the properties flood when the flood is below the road drainage and the other 90% flood only when the flood is above the road drainage. On Peter Odili Road, no property floods below the drainage but 100% of the properties that actually experience flooding do so only when theflood is above the road drainage level.

4.3 Photographic Imagery of Sani Abacha Road

Below is the photographic imagery of Sani Abacha Road showing the sampling points and corresponding elevations relative to sea level. The images were captures remotely and ground truthing was done using a GPS to obtain the actual coordinates of the properties visited.

Image 1: Remote Sensing Data Capture showing a General Overview of Sani Abacha Road

Source: Google Earth 2018 image in Wechie (2018)

The photographic image above from remote sensing represents the general overview of Sani Abacha Road. As at 2018, most of the plots on Sani Abacha Road have properties located on them.

Image 2: Remote Sensing Imagewith placemarks of Property/plots on Sani Abacha Road

Source: Google Earth 2018 image in Wechie (2018)

The properties indicated with placemarks in image 2 above is the photographic image of the number of plots visited and observed. A GPS too was used to obtain the coordinates of each property visited.

4.3.2. Historical Images of Sani Abacha road

The captured images in Images 3, 4 and 5 below show historical images obtained from remote sensing of the various property plots (represented with placemarks) that were visited and observed for 2003, 2008 and 2013 respectively. It revealed the alarming rate of property developments over the years on the Sani Abacha Road despite its very low terrain and susceptibility to flooding. The sequence of observation and their elevations above sea level in parenthesis are AB01(8m), AB03(7m), AB05(7m), AB07(7m) and AB09(6m) on one side of the road and AB02(7m), AB04(7m), AB06(6m), AB08(7m) and AB10(6m) on the other side of the road. The elevations relative to mean sea level are rather worrisome leaving very little leeway to escape perennial flooding and a minus for sustainable property development.

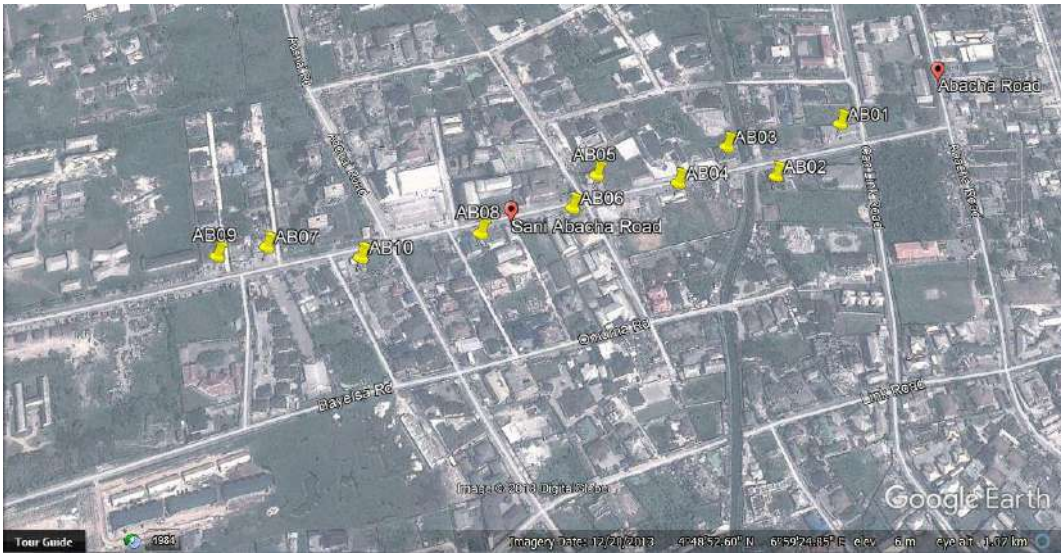
Image 3: Historical Image of Sani Abacha Road (2003)

Source: Google Earth 2018 image in Wechie (2018)

Image 4: Historical Image of Sani Abacha Road (2008)

Source: Google Earth 2018 image in Wechie (2018)

Image 5: Historical Image of Sani Abacha Road (2013)



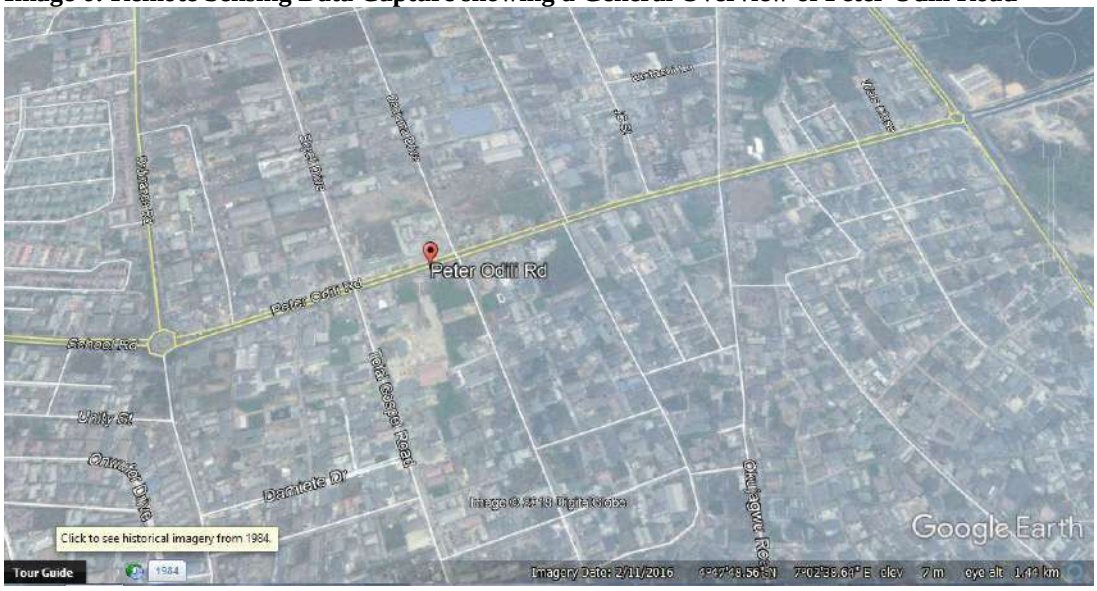
Source: Google Earth 2018 image in Wechie (2018)

4.4 Photographic Imagery of Peter OdiliRoad

Below is the photographic imagery of Odili showing the sampling points and corresponding elevations relative to sea level. The images were captured remotely and ground truthing was done using a GPS to obtain the actual coordinates of the properties visited.

4.4.1 Photographic Imagery of Peter Odili Road

Image 6: Remote Sensing Data Capture showing a General Overview of Peter Odili Road



Source: Google Earth 2018 image in Wechie (2018)

Image 6 shows the general overview of Peter Odili Road and the level of property development along the environment. It could be visually observed that almost all the plots on Peter Odili road had been reclaimed and developed on.

Image 7 Remote Sensing Imagewith placemarks of Property/plots visited on Peter Odili Road

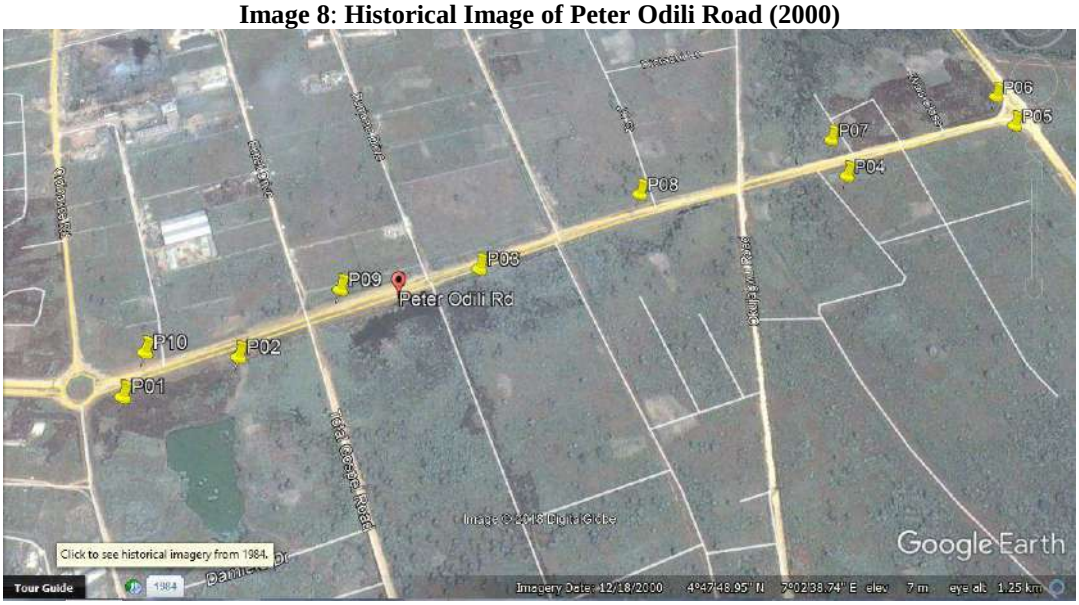
Source: Google Earth 2018 image in Wechie (2018)

The properties indicated with placemarks in image 7 above is the photographic image of the number of plots visited and observed. Coordinates were obtained using a GPS instrument.

4.4.2 Historical Images of Peter Odili Road

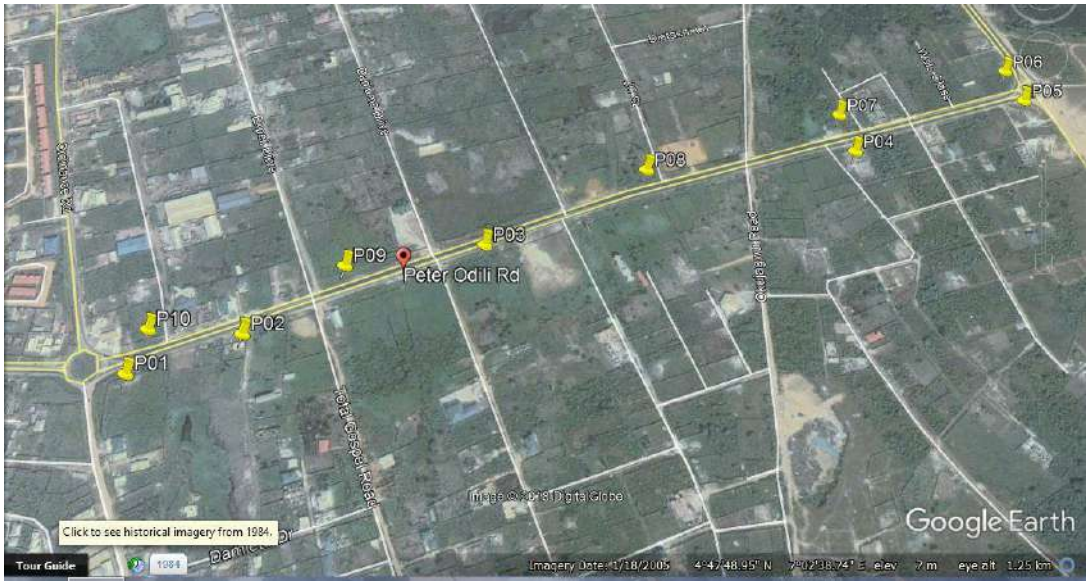
The captured images in Imagesin Images 8, 9 and 10 below shows historical images from remote sensing of the various property plots (represented with placemarks) that were visited and observed for 2000, 2005 and 2011 respectively. It revealed the rate of property developments over the years on Sani Abacha Road. The sequence of observation and their elevations in parenthesis are P01(15m), P02(10m), P03(7m), P04(6m) and P05(9m) on one side of the road from Ordinance junction towards the west in the image to Okujagu junction towards the east, and P06(7m), P07(5m), P08(4m), P09(7m) and P10(13m) on the other of the road from Okujagu junction back to Ordinance junction.

Image 8: Historical Image of Peter Odili Road (2000)



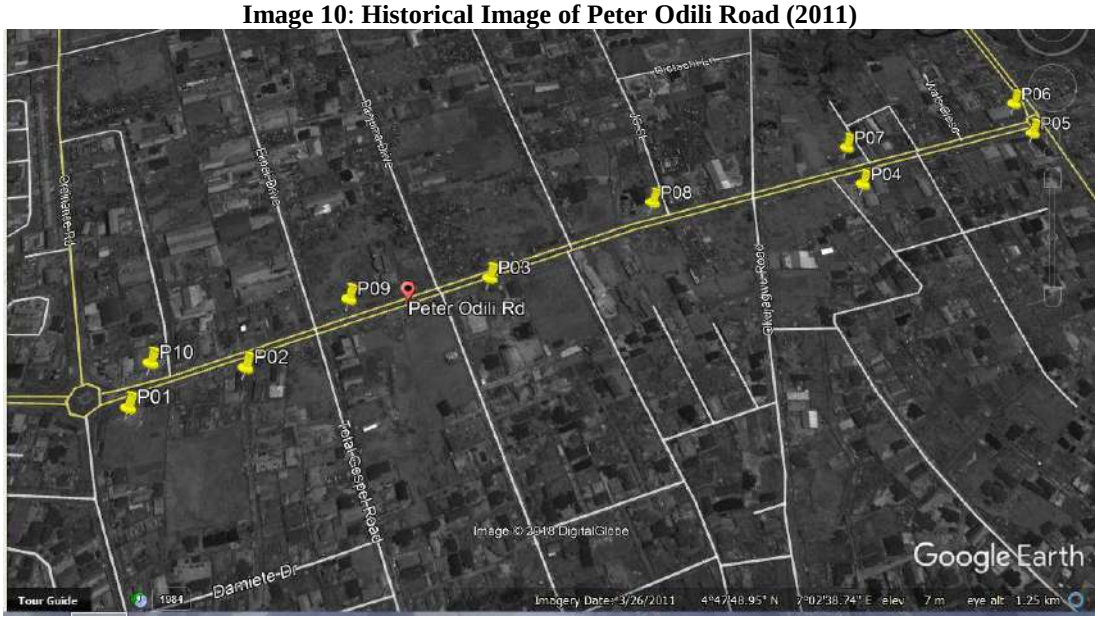
Source: Google Earth 2018 image in Wechie (2018)

Image 9: Historical Image of Peter Odili Road (2005)



Source: Google Earth 2018 image in Wechie (2018)

Image 10: **Historical Image of Peter Odili Road (2011)**



Source: Google Earth 2018 image in Wechie (2018)

V. DISCUSSION

Flooding, Property Developments and the environment of Sani Abacha Road

From the photographic image of 2013 (image 5), it is visible that more than half of the plots had been developed and some of the observed properties that were interacted with were not in existence at that time. A good analysis of the historic images to the present general overview of the Sani Abacha road (image 2) revealed that almost all the plots have been developed between2003 to 2017 irrespective of its susceptibility to flood as a result of its terrain. The property development on the plots which did not factor in land management tools norconsider environmental protection are major contributory factor to the frequent flooding experienced in the area.

The recently constructed road and drainage with an increased elevation to combat flooding on the road from the nearby canal has actually contributed to the frequent flooding experienced by properties flanking the road. The construction which increased the road height considerably, has resulted in plot elevation of 80% of the sampled property developments below road level, 10% on the same level as the road level and the other 10% are above the road level. The outcome of the construction the property plots below and at the same elevation level with the road and drainage are susceptible to flood at different flood level and frequency whereas the 10% above road level donot experience flooding. The flooding and its frequency occureach time it rains and most especially

when it rains heavily. Property plots with lower elevation experiencehigher flood levels while the ones with higher elevation have lower flood levels. The submerging of property development plots by flood demonstrates lack of environmental protection in this case the man-made physical environment. Some properties regularly affected by flood shown by a visible indication of water mark on them.

The observeddifferential plots elevation are as a result of indiscriminate reclamation of wetland as could be seen on image 5. Flooding on Sani Abacha Road is largely attributed to the terrain, the plot elevation and the frequency and intensity of the rain irrespective of the drainage and could have been averted by applying Land Management Tools such as heavy taxation and stringent development conditions to deter reckless development in the area while ensuring that approved developments satisfy the criteria for sustainability of property development and environmental protection.

Flooding, Property Development and the environment of Peter Odili Road

The historical image of Peter Odili (image 8) revealed that is a wetland and more than 90% of the plots have been developed over a period of 18years (see image 6, 8, 9 and 10) despite the nature of the terrain which is a major contributor to the frequent flooding observed. On Peter Odili Road, 40% properties have their plot elevation above the road level, 20% below road level and the other 40% have their properties plot elevation at road level. The elevation of the plots is analogous to a valley between to table land as the higher plot elevations are located from the Okujagu and Ordinance junction on both sides of the road while the lower plots elevations are at the centre of the stretch on both sides of the road.

From the properties observed, 60% of them are susceptible to flood with most of them having visible water marks on the walls. The presence of the water mark is a sign of an unsustainable development. Whereas, the remaining 40% that do not flood are as a result of higher elevations. Flood water flows from the left side to the right side of the road while approaching from Ordinance junction (West on the image) to Okujagu junction (east of the image). Practically, the 32% of the properties that are susceptible to flood are flooded each time it rains is a justification that the plots with lower elevations relative to the road level are the ones that gets flooded each time it rains while the other 68% flood only during heavy rains.

Over the years, the rate of property development on the wetland of Peter Odili Road from year 2000 to 2018 has increased tremendously which exacerbates flooding experiences and depletes the man-made and natural environment. Simultaneously, the plots elevation variance is consequential to the topography and the rains also contributes immensely to the pattern and flow of flood especially with heavy rainfalls. Properties with lower elevations flood frequently and with higher flood level than properties with higher elevation. This implies that flood frequency and level is directly proportional to property plot elevation and rainfalls.

VI. CONCLUSION

Land Management tools were not applied in the development of property along Sani Abacha and Peter Odili roads that are wetland environments. The tools of heavy taxation as a deterent or stringent conditions that protect the investment and the environment were not considered. Hence the frequent flooding experienced on property investment located within those areas and the impairment of the original ecosystem function. The application of land management tools to any environment especially man-made environment will aid sustainable property development and protect the environment. The study recommends the use of Land Management Tools as at when necessary to prevent such colossal waste of investment capital in the future and for the protection, preservation and restoration of the environment and more research into the application of Land Management Tools in property development and environmental protection for Sustainable Development since the principles are mostly discussed in the agricultural discipline.

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