Analysis and implications of swampy lands development in Major City of Nigeria

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Abstract: **With the current trend and challenges of built-up swamp, many urban centres are experiencing consistent flooding and food insecurity causing huge damages and losses. The aim of the study was to analyse the implications of swampy development and the concern before the contributors of physical development in Nigeria. It explores the institutional arrangement for swamp management, planning measures that have been undertaken to reduce non-scientific development and management of swamplands, and possible ways to enhance the application of urban planning to reduce built-up swamp and management. However, the strength of physical planning in mitigating the development of swamp is well recognised. Also inadequate plans and poor enforcement makes development of swamp preparedness, response and recovery laughable hence resilience is frail .This study therefore set out to disentangle pertinent land uses that vanished swampland in Port Harcourt, ascertain the pattern and consequences of the encroachment in to swampy land. The research employed structured questionnaire techniques for data collection while Pearson product moment Correlation coefficient and mathematical percentage (MP) were the analytical tools used. The findings show that transportation land use (r = .262 p>.05), industrial land uses (r = .211 p>.05), residential land uses (r = .358 p>.05) commercial (r = .222 p>.05) and institutional were the significant factors for sprawling and by extension the development of swampy land in Port Harcourt urban space. In addition, the result also shows that the loss of food security (23%), recreation (11%), education and research services (15%), tourism/recreation (17%), open space and aesthetics (17%) cultural value (17%) are the major effects. The study concluded with recommendations that town planning board, authorities and registered town planners in consultancy services should advice state government on the risk and challenges of buildings on swamp regions and blockage of water ways of Port Harcourt Nigeria.**

*Keywords***: Port Harcourt, development, swampy lands, analysis and implications**

I. INTRODUCTION

The procedure outlook and overall framework that prescribed how swampy land should be developed globally have gone through a series of evolutionary stages. Nowadays, a number of policy frameworks exist and attest to the fact that relevant authorities have concerted effort to reduce the disastrous effect of developed swampy zones on residents. The uncontrolled increase of human population instigates over concentration of anthropogenic activities in swamp areas planned for agrarian and related development. Accordingly, most developing countries have observed

physical challenges in terms of quantity, scale and trend particularly in the last three decades. In reactions to this problematic, the globe has developed policies and procedures for the development, reduction and management of swampy regions. Nigeria being part and parcel of the global community and a signatory to this framework developed series of mitigation measures on wetland management together with the policies of national urban development to integrate and domesticate modern approaches and apparatus announced at the global level (federal ministry of Housing and Urban Development 2012). However, swamplands include lakes and rivers, swamps and marshes, wet grasslands and peat lands, oases, estuaries, deltas and tidal flats, near shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans. The advantages of swampland are provision of services such as food and fibre which are essential for human welfare and regulate the recharge and protection of groundwater from natural hazards, which are critical for sustaining vital ecosystem functions. Wetlands also have considerable aesthetic, cultural, educational and spiritual values and provide sustainable opportunities for recreation and tourism. The development of residential houses encroached on urban wetland and outline measures for wetland dwindling and well-looked-after for sustainability (RobMcInnes 2010). The impacts of human activities on wetland include; direct habitat loss (from development, land reclamation, roads, in-stream dredging), altered water regime (from dams/barriers, stream redirection, hard surfacing, water extraction), pollution (from garbage, sewage, oil and chemical spills, pesticides, airborne toxins), introduction of exotic species (weeds, pests and domestic pets) and other ecosystem modifications (for example, altered fire regimes, dieback and changes in salinity (Stella 2010). The built up of swampy lands has become a serious challenge facing many Nigerian cities especially Port Harcourt. The rising rate of swampland development is worrisome and unacceptable. It seems that policy makers are not interested to evolve pragmatic measures cable of reducing urbanization encroachment to swamplands to the barest minimum; the situation keep on aggravating and it has defied all the strategies guiding physical and urban development. All the strategies for urban development such as master plan, planning scheme, neighbourhood development plans and urban renewal, seems not in any way reducing the encroachment problems facing swampland, but has been

hijacked by some selfish environmentalist and greedy Nigerian.

Urban sprawling and by extension the development of swampy land has been the bane of the urban areas; it has defied solutions of ministries, agencies and local planning authorities. The intensification of the human population residing in wetlands and the populaces of swamplands came across a number of challenges such as housing units, structural failure and waterborne sicknesses. The causes of building in swamplands are to meet housing demand and public interest on reclamation of swamplands for urban development as well as solution for speedy sprawl (sithole and goredema 2013). The major sources of wetland losses within urban areas were never-ending sand filling and encroach in wetland environment for economic uses (construction) and persistent flooding that always in the urban areas. It is against this backdrop that the researchers deemed it necessary to investigate the socio-environmental implications of swampy land development in Port Harcourt urban space. From the fore-going, earlier correlated studies made it clear that flimsy works exist on analysis and implications of swampy lands development in Port Harcourt city   studies, where they abound; there are no contemporary and internal' researches on the implications of swampy lands development of Port Harcourt urban space and its suburb in Nigeria. Hence this becomes a gap in knowledge that this article intends to seal. As a result, the tenet or ideology of this article is to identify the built land uses and their consequences in the swampy areas; the gap necessitated the study on analysis and implications of swampy lands development in Port Harcourt city, Nigeria.

Empirical/Previous Studies

A number of studies have been conducted in urban areas of the globe. The studies connect with the problems and inappropriate physical planning and development of swampland. Seavoy (1980) investigated the character of population pressure in the existing changeover of tree crops to wet rice cultivation in Northwestern Kalimantan, Indonesia. The author argued that the current change is occurring as a result of senescent trees no longer produce sufficient produces to replace rice adequate and large food security of the enlarged population. The research also hammered on policies of the Indonesian government and data were accessible on the level of population growth. Amare, Hans, and Gete, Z.(2011) stressed that increase in population triggered the instant effect on shrub land and forestry deforestation in the late 1970s, as an exponential failure of per capita cropland and grazing land, that constitute the key physical assets of livelihoods of the depressed farming community in the area. Additionally, the study indicated that the shortage of cultured land in the area neither attracts agricultural intensification nor bring about variation into non-farm sector, since agriculturalists fail to reply to the insufficiency of cultured land via large out-migration in north-eastern Ethiopia. The work acknowledged that Boserupian predicted that land-use increase from

enhanced labour and land productivity could not take place in the area but the Malthusian hypothesis appears suitable while the popular farming families were penniless and find it difficult to satisfy subsistence food demands, and live in absolute poverty. According them, the situation has been brought about by population pressure and consequences of the strategies that have been practicalised in a systems starting from 1950s.

The study conducted by Sverre (1996), analysed the population pressure hypothesis of Ethiopian highlands through quantitative methods. The hypothesis stressed that underneath comparable physical conditions deeply battered areas occur in extremely populated regions chosen soil erosion index (SESI) and types of water erosion as the dependent variable. However, categorical and ordinal were included in the study but ordinal cumulative logit model was chosen for the analysis while the result imply that as pressure from people and livestock surpasses some threshold, a rapid degradation of land take place. Similarly, Frito, Joshua, Lawrence and Curtis (2007) assessed the causes of deforestation in Haiti, particularly in Forêt des Pins Reserve. The study applied yearly normal area vacant forest per family as the dependent variable. Other data were obtained with the availability of survey instrument administered to 243 farm families in 15 locations outside inside the Reserve. The analysis was held using tobit regression and find that family size, education of head of the household, land tenure regime, and farm labor were significant factors distressing land clearing. Employing multiple data sets from the Chitwan Valley Family Study in Nepal, Dirgha and Lynette (2007) proved that entities from districts with larger proportions of land under farming experienced first birth at rates higher than those from areas with slighter scopes. Meanwhile, people from districts with larger sizes of land under public infrastructure experienced first birth at rates lower than those from zones with smaller proportions.

The previous research of Hamisai, Musisi, Raban and Frank (2005) used multi-date panchromatic aerial photographs of 1:25,000 and 1:50,000 scales over four time portions between 1963 and 1997 examine the environmental impacts of increasing population density in Zimbabwe's Serima communal lands of Gutu district in Masvingo province. Their result indicate worsening environmental direction in the form of deforestation, increased soil erosion, decline in grazing resources and expansion of arable land into marginal areas. In furtherance, they maintained that high population density is in continuous initiation of unsustainable land use practices, releasing population pressure by land redistribution promises to offer long-term alternatives. In the assessment of the effect of population growth on carbon dioxide (CO2) discharges and urban land use change from the year 1990 – 2006, Hannes and Jennifer collected the statistics of 1062 counties within 22 European nation-states. The studies and data acquired was analysed via panel regressions, spatial econometric models while the result stressed that a significant effect from regional population growth on carbon dioxide (CO2) releases and

urban land use expanded in Western Europe. But dissimilarity; the first hand member states in the East, other factors appear more significant. Masahiro, Yukio, Taro, and Ryutaro (2000) investigated the effect of population growth on land use and survival pattern in two ecologically opposing Huli, Heli and Wenani, in the Tari of New Guinea gighlands. In continuance, the comparable nature of population increase impacted on the land fluctuated distinctly. But in the area of Heli, a decline in land efficiency in respect of disproportionate agricultural persuaded agriculturalists to curtail the unplanted period but bring about more land degradation and difficulties in increasing food production. With regard to divergence, Wenani residents managed to survive with the population increase that expanded districts for farming and probably stand to increase the people's contemporary invention glassy, even if gradually normal disagreements on land privileges ought to decline the residents' opportunity to fruitful zones. That in 1994 climatic worries, land and means of crops harvesting had three spells higher in Wenani than Heli were residents are under hardship and critical food scarcity. Their analysis revealed that the current impacts of population pressure on food security varies among the communities, based on native setting and survival design while deforestation, urban enlargement, farming, and other anthropogenic concentration has significantly changed the Terrain's scenery.

Across India, Pakistan, and Sri Lanka, Khalid, Himayatullah, Muhammad, Zohra, and Muhammad (2011) carried out pragmatic studies on the relationship between population and environmental degradation from 1985-2009. Using Im-Pesaran-Shin (IPS) test of unit root to discover order of integration, Pedroni examination of panel co addition on long-run relationship and unconnected regression equation (sure) for the assessment of the effect of demographics dials on environmental issues in the three countries under investigation, Their work result found that too much population growth rate attracts harmful changes on the environment. The analysis demonstrated that increase in population brought about more demand on more production which may be motivated by escalation of arable land and rising population that gives pressure on farming land, pressurising the agriculture on land inferior and poorer eminence weakening. In acquisition of assessment data obtained from 2,270 agrarian property-owners in Colorado and Wyoming including the analysis via multilevel regression model, Catherine, Keske, Patrick and Christopher (2016) studied Population and Perceived Land Use Changes as Threats to Sense of Place in the New West. The research precise objective was to investigate variables forecasting the way agrarian property-owners look at threats to agrarian standard of living and sense of place. The findings posited that property-owners in farming-dependent regions and zones prone to more-amenity had highest concern than other landowners that measured almost escalations in population growth that might impend an agricultural way of human survival. The authors added that all the insights connected to

know if persons exist in in New West or Old West regions. The work concluded that part of the related variables of New West and Old West economic arrangements forecasted if residents observe population growth and land use dynamics as intimidations to intelligence of an area.

Soumya (2017) studied the direction of population growth, socioeconomic expansion, and dynamics in land use prominence and the rate land under forest weakened over time and across regions of India. Therefore, the study assumed that urbanization is linked to increased land consumption outside agricultural reasons and compactness of population with force of cropping pattern. In another manner, the analysis established that remarkable intensification exist between population and expansion. They maintained that population increase in land plentiful and semi-arid region like Rajasthan and Gujarat. In addition, the research failed to determine robust provision for the assumptions. Their article concluded that land use information available in Indian management foundations ought to be supported while journal should be available appropriate. They added that current strategies for curbing population and mitigating forest land dilapidation and ecological contamination.

Wali (2015) Scrutinized urbanization and disappearance of wetland in the whole Port-Harcourt urban, the thesis applied remote sensing systems to examine land use /land cover changes via landsat5 TM and landsat7 ETM images of 1984, 1999, 2003 and 2013.The covered study covered urban expansion pattern about 29 years and vagaries in the future time of 30 years prediction. The analysis via 2014 ArcGIS10.0, ERDAS IMAGE 2014 and IDRISI Selva detailed that 40066.59 hectares of was outlined in Port Harcourt urban and seemed as possible area for growth. On the analysis of imageries, land use/land cover such as salt water wetland, freshwater wetland, fallow land, built-up areas and water bodies. However, kappa statistics result shows that overall accuracy evaluation in 1984 accounted 90.00% (0.85 kappa coefficient), 88.00% for 1999 (0.8337 kappa coefficient), 100% for 2003 (1.0000 kappa statistics) and 100% (1.0000 kappa coefficient). His work calls for prudent strategies for management of wetland resources and upgrading of official preparation to enable the integration of wetland procedures that may be fully injected into town planning and other environmental process. While Izeogu (1989) noted that Port Harcourt urban environment is characterised by rapid development and expansion. That the problems associated with the rapid urbanization include poor housing conditions; inadequate waste disposal and sanitation; flooding and poor drainage; and air, land and water pollution and conclude that measures to mitigate it are needful.

II. THEORETICAL/ CONCEPTUAL FRAMEWORK

Pre environmental Development Project Framework

The analysis adopted pre environmental development project or framework propounded by Ubani, Bumaa and Alaci (2020). The framework addressed how spatial development of

swampy regions anchored on formal concentration of land use activities (commercial, residential, industrial, and institutional and transportation) in swampy zones naturally designated agricultural land use and allied matters. Contained that urban development and expansion has advanced in such a way that areas naturally made to boost food security and enhanced environmental safeties were desperately developed for human settlement. furthermore, the town planning and architectural requests in respect of location, zoning in terms of urban planning attentions and requirement for mixture of land uses, infrastructural provisions in swampy areas must consider safety problems or issues first (the necessary standard for urban planning design and proposal to develop land uses that fit a purpose). Hence, the most economically safe, functional, and aesthetic land use development is predictable; and to create these, professionals such as town planners, surveyors, architects and civil engineers are practically involved. According the proposal, the town planner is first development number of the environment who prepares master plans or location maps showing existing topography, buildings, communication routes e,g. road network, preliminary designs showing proposed development, environmental conditions, statutory scheme maps, layout and townscape studies. In Nigeria, the eligibility and development of master plan remains the duty of a registered town planner who must be a member of town planning registration council (TOPREC) empowered to regulate town planning practices. However, the town planners must get involve with their clients (government, community and individuals) and draft plans/ designs for suitable swampy zones. They are responsible for site analysis plans and report, environmental impact assessment, building plan rejection, approval and development control of various land uses in the physical environment. The next to town planning services is the responsibilities and services of a registered land surveyor that must obtain the membership of surveyors' registration council of Nigeria (SUCON). In every settlement designated urban by the town planning analysis, the land surveyor carries out subdivision survey and ensure that site boundaries and position of existing services like water mains etc are indicated.

In a nutshell, the Architects registered with the architects' registration council of Nigeria (ARCON) enhance the development of a proposed land uses or environment by producing the town planning standard of site plan, floor plan, section, elevation, components of drawing, and assemblage drawings. They also produce buildings in adherence to the original survey plan, hence tendencies to super head the building design group. In the same trend to actualize the development of swampland and other land uses across the urban centres, a professional structural engineer must be allowed to make the necessary provision in respect of architectural design and building suitability, safety, construction and other services. However, the structural engineer will avert some economic and environmental problems by ensuring all proposed built swampy zones or land uses incorporate structural stability by adopting some structural components such slabs, beams, columns, walls and foundations.

The frame work further explained that all proposed development for swamp regions requires the inputs of environmental professionals to ameliorate the socio-environmental effect of the unprofessional development or built swampy land, uncontrolled flooding, indigenous copping strategies and loss of existing swampy land naturally meant for agriculture and allied matters and remedied through regular disapproval of other proposed land use activities in swampy regions. Any time development control unite of an urban environment discovers any form of proposed building development within the hemisphere of wetland land, in the area such proposal most be subjected to illegal structure and it demolition must occur with immediate effect to avoid the risk of environmental disaster. But each time existing land use in the swampy zone diktat worrisome, the town planning authority in charge of that zone must ensure that development plans guiding the land use or structural development of wet zones are reviewed to expunge all built structures outside town planning stipulated standard. However, any physical development plan or design that has to do with swampy area, its redevelopment or improvement rests on the initiative legitimate responsibility of the qualified environmental development team especially the practicing town planners and the entire urban planning agencies. Hence, this provides the framework for embracing the scientific and mandatory framework for development and management of wetlands. In furtherance appraised the effort for not captivating or endorsing the unprofessional sectors or services for the development of swampy lands especially the low income members of the urban environment.

III. METHODOLOGY

The unit presents the research framework and analyses the method of data collection, technique, sampling, population and instruments. The method further arrange for larger scope of attention which springs the sampled population the opportunities to analyse the imputes and ascertain the various deterrents in the midst of the target population. However, the research design was considered appropriate based on the data obtained by researcher relatively from enormous integer of persons at a time via structured questionnaires which entailed close ended questions and had answer options like (Strongly agree, Agree, Undecided, Disagree, Strongly Disagree). Though it was and was also divided into Personal data while the population under investigation consists of low, medium and high income residence of Port Harcourt urban. However, the research sample frame considered the settlements under analysis and the sample size was limited to 500 respondents out of an estimated population though each household was investigated in any carefully selected compounds of the designated neighbourhood. The study finally sampled 630 (90%) prints of questionnaires in the swampy built districts

(Port Harcourt town, Bishop Johnson, bundu, baptise, captain amangala and cemetery area.

An Aerial view showing some of the areas that constitutes Port Harcourt urban

Rivers State Map Showing Port Harcourt Urban((Eleme; Emohua; Etche; Ikwerre; Obio/Akpor; Okrika; Oyigbo; Port Harcourt City local government area)

Source: Geographical scope of Greater Port Harcourt cited in goggle map.

Data Analysis

According to Coffey and Atkinson (1996) data analysis cannot be said to evolve around collecting or coding of neither data information nor it is just a matter of categorization and classification. Therefore, data analysis incorporates all the facet of displaying or representing activities that are been

Table 1: Sampled   questionnaire for communities under investigation

S/N	Urban Community	Projected Population	Household Population	Sample Size	%
1	P/H Township	20,684	4,500	122	20
2	Bishop Johnson	11,593	1,954	97	15
3	baptise	9,903	964	122	20
4	Cemetery area.	18,473	2,743	97	15
5	Bundu	28,878	6,813	72	10
6	captain amangala	40,534	8,453	120	20
	TOTAL	**130,065**	**25,427**	**630**	**100**

Field survey (2021)

IV. RESULT AND DISCUSSION

Responsible factors or Land uses for Extinct of swampland in Port Harcourt Nigeria

The analysis of spearman's rho correlation coefficient evidenced that significant relationship between some land uses (transportation, residential, industrial, commercial and institutional factor) and forfeiture of swamplands.

Transportation: The analysis publicized that strong association exist between high technological application in construction of roads/building of transportation land uses and the attraction of other anthropogenic activities on swamp land. The findings meticulousness beckoned on a connexion measurement of (r=.262, $p<0.5$).The investigation suggested that there is a constructive relation between the creation of transportation land uses and disappearance of swampy and arable lands in Port Harcourt region of Nigeria. The level and number of built transportation land uses in physical development of Nigeria swampy areas are very higher and sometimes create environmental problems unlike the western world cities built on the sea and marshland through technological practices and without adverse effect. This implies that the strength of the relationship is strong and the constant strength of the character is 25% which shows shared input of built transportation land uses in practically (25%) development of swampy zones and urban sprawling in Port Harcourt city of Nigeria.

Residential: The findings between built residential areas and loss of swampy areas in Port Harcourt established the association factor of (r =358, $p<.05$) which submitted that continuous   relationship exist between   increase of built residential land uses and loss of urban conserved swampy

done. The questionnaires for every income group of the sampled population were numbered sequentially to guarantee simple coding. The coded responses were bolstered into the computer utilizing the Statistical Package for Social Sciences (SPSS version 20) capable of analysing data fed into it whereas the data was potted into tables' figures utilizing descriptive statistics.

areas in Port Harcourt Nigeria. The implication is that the figure of determination is 30.18% which means that the residential houses of dissimilar income group occupied about 30 % of swampy environment in Port Harcourt urban. The work also detail that majority of the houses built on swampy areas are owned by higher income personalities who sand fill swampy areas in the name of property acquisition in city of Port Harcourt.

Industrial: The breakdown for scattering of industries in swampy lands of Port Harcourt was found to be (r = .268 $p>.05$). Based on the analyses, there is a significant relationship between light, medium and heavy industries and built-up urban swamp in Port Harcourt metropolis. This implies that the escalated and uncontrolled development of industries in the table and swamplands of Port Harcourt urban trigged by presence of raw material, technical know-how and financial resources. The implication is that about 27% increase in population between 1999- 2020 especially the unemployed motivated the establishment of industrials in swampy areas.

Commercial : on the side of swampy areas and development of commercial activities, the findings show that robust relationship exist between commercial land use activities and disappearance of Port Harcourt swamplands at (r =255, $p<.05$). This means that 25% present increase of developed swampy areas of Port Harcourt urban is taken by commercial land uses. The result further established that siting of physical development projects such as commercial plazas through reclamation of land across the swamp areas of contributed towards the developmental abandonment of rural and suburb communities the study areas.

Table 2: Land Uses Built in swampland of Port Harcourt Urban Nigeria

Built land uses in swampy Areas	Spearman rho coefficient Statistics	Sig	Number
Transportation	.262 **	.000	632
Residential	.358**	.000	632
Industrial	.211**	.000	632
Commercial	.222**	.000	632

Field Survey 2021

Natural Implications of swampland Losses in Port Harcourt Urban of Nigeria

The mathematical percentage (M.P- %) analysis held and demonstrated by the research in table 2, tutored that the consequences   of built-up swamplands or development include food security (17%), recreation purposes (11%),

environmental education and research (15%), (23%), cultural value (17) open space and aesthetics (17%). This implies that urbanization has led to loss of (a) food and habitat for fish and wildlife (b) water quality improvement and flood storage (c) shoreline erosion control (d) opportunities for recreation (f) education and research (g) prevention of coastal areas from storm (h) delivering of beautiful spaces for sightseeing, hiking, fishing, hunting, boating, bird watching, and photography (i) high wildlife habitat and more aesthetically pleasing environment for wildlife and (J) valuable open space, green belts and zones of spiritual significance . See the table below

Table 3: Built-up swamplands and lost values in Port Harcourt Nigeria

S/N	Built-up Losses/ aftermath	Mathematical percentage (%)	Metro-observation
1	Food security	23	Below average
2	Recreation/ Tourism	18	Total lost
3	Education and research	16	Totally lost
4	Cultural	15	very common
5	Open space and aesthetics	17	very common

Field survey 2021

V. CONCLUSIONS AND RECOMMENDATIONS

The response of Port Harcourt residents towards the concentration of human activities in swampy region, especially transportation, commercial, industrial and residential land uses has become a perennial occurrence since 1999 and is rather inadequate because the government reacts to such issues by carrying out curative strategies. There is indeed the need for a more proactive approach to swamp management in Port Harcourt. This study calls for a paradigm change. Change from over- concentration of critical resource on curative directions to preventive measure. Town planning is basically a preventive measure and it can go a long way in improving the development of swamplands. It can also reduce the vulnerability of the urban swamp districts. The role of urban planning by ensuring a drastic reduction in the effect of flooding swampy areas with other land use activities can therefore not underrated. The implication is that swamp as an agriculture land use that foster food security across the garden city environ continues to loss it values with the alarming rate of food insecurity. The study also addressed the problem of swampland including the factors responsible for it losses, which is critical to the formulation of appropriate swampland management and policies. It delivers experiential indication on the scale and nature of factors that determine swamplands disappearance. The information is crucial to the policy makers because they form basis for formulation of policies and programmes towards addressing the problem and conversion of swamp.

Effective request of urban planning in swampy management requires the promotion of inclusion of built-up swampy reduction mitigation measure in all neighbourhoods planning.

Urban planning requires yearly assessment of developed swamp zone and management by all level of government; fortifying the capacity of existing planning authorities at all levels, communities and private sector for deterrence, readiness, reactions and recapture activities of swamp management and ensuring that development laws mitigations measures are completely fulfilled during the physical development of swamp.

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