American Journal of Humanities and Social Sciences Research (AJHSSR)
e-ISSN :2378-703X
Volume-5, Issue-6, pp-455-462
www.ajhssr.com
Research Paper Open Access

Mitigating Physical Vulnerabilities of Coastal Communities: A strategy for land value enhancement in Obuama, Nigeria

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ABSTRACT: Physical vulnerabilities of coastal communities in Obuama area of Rivers State were investigated to ascertainif there is a relationship between physical vulnerability and land value trends and whether mitigation through the application of sustainable land management (SLM) tools can be used tomitigate these vulnerabilities.Indicators of Physical Vulnerabilities such as accessibility in terms of road infrastructure, design of buildings, construction, amenities and population density were considered.A pragmatic research philosophy was adopted with a case study strategy. Data was collected key informant interviews, field observation and discussions. Yardsticks for mitigation and sustainable land management tools were obtained via secondary sources. Data was analysed using Multiple Criteria Decision Analysis (MCDA) and trend analysis. The findings reveal that Obuama communities are prone to physical vulnerabilities and several communities/fishing settlements suffer similar pattern of vulnerabilities. The study revealed that areas that have fewer vulnerabilities had land values higher than areas that had higher physical vulnerabilities. However, in areas with medium to high physical vulnerability, land values remain similar irrespective of the high vulnerability which may be attributed to other factors such as high demand and fixed supply due to terrain challenges. The study recommends the introduction of SLM Mitigation tools such as land use planning; coastal mapping; coastal/wetland planning; community master plan development which can reduce vulnerability and ultimately improve land values. The authors recommend an interventionist partnership with government and international agencies, advocacies and blue financing that will lead to an increase in land values in the study area.

Keywords:*Physical vulnerability, mitigation, coastal communities, land management, land values.*

I. INTRODUCTION

I.1 Problem Statement

As a result of population growth, urbanisation and a movement towards the coast, the vulnerability of coastal areas has greatly increased(1). The coastal zone is where about 50% of the planet's people have chosen to live and this percentage continues to increase. These people can have profound impacts on this diverse and often fragile environment and the processes and hazards that characterize the coastal zone can significantly affect humans and their development and way of life.(2) The physical attributes and activities in the coastal region have brought with it, hazards which make such places vulnerable. Most coastal communities have their ecology endowed with mangrove, salt marshland, estuarine, flora, and fauna. The need for eco-balance is what has given rise to this study mitigating the physical and environmental vulnerabilities of coastal communities in the Obuama area through sustainable land management. The study area is of importance to the people of Nigeria and particularly the Kalabari's speaking people of the Niger Delta Area.A mitigation approach is needed to ameliorate the plight of the people in the study area to reduce their physical, environmental, economic and social exposure along with coping mechanisms outlined in order to enhance land values. Land as a critical capital asset provides the enabling environment for infrastructural development, tourism, agriculture, and environmental management that ameliorates pollution is essential. Sustainable land management refers to the use of land to meet the various needs of man while recognizing the need to ensure long term socioeconomic and ecological functions of the land. Sustainable land management incorporates a system of ecologies and planning to ensure inter-generational balance. (3)

I.2 Study Objectives

The 'Brundtland Report' upheld that an intricate interdependent and global relationship exists between environmental protection, economic growth, and social equality.(4)The study explores options for mitigating the physical and vulnerabilities of Obuama coastal communities in Rivers State and suggests a sustainable approach that will enhance the quality of landwithin the communities and as such,improve their values as well.

Specific objectives of the study were to:

1. Identify thephysical vulnerabilitiesthat the communities in the study area(Obuama), are exposed to;
2. Identify and examine the sustainable land management tools that have assisted in building resilience to these vulnerabilities;
3. Suggest appropriate mitigation steps that can be taken to enhance property and land values in select communities.

I.3 Vulnerability and Coastal Communities

Vulnerability is a broad concept that not only incorporates being individually exposed to physical, psychological, or emotional harms but also incorporates a social dimension that refers to the inability of people, communities, or societies to overcome the effect of stressors to which they are exposed and are at risk of not realizing their potential to achieve positive life outcomes.(5)Generally speaking, vulnerability is the state or quality of being exposed to the possibility of being attacked or harmed, either physically or emotionally.(6) Vulnerability has been defined as the degree to which a system, or part of it, may react adversely during the occurrence of a hazardous event. This concept of vulnerability implies a measure of risk associated with the physical, social and economic aspects and implications resulting from the system's ability to cope with the resulting event(7)

Physical vulnerability is related to the built environment and the major determinants are accessibility, building design, construction, amenities/ infrastructure, and population density. To counter vulnerability, there must be measures to avert or at least lessen the effects of the hazard itself where possible (through mitigation, prediction and early warning preparedness) capacities must be built to cope with hazards and most importantly tackle the most causes of such vulnerability such as poverty, poor governance, discrimination, inequality, and inaccessibility to environmental resources and sustenance. Physical, economic, social and political factors spell the level of vulnerability and capacity to resist or recover from hazards.(8) Poor people are more vulnerable to hazard and are less likely to cope when a disaster occurs.(8) Incapacitated persons, nursing women, widows, the aged and little children lacking family support as well as displaced persons owing to natural disasters or conflicts are case studies of poor and vulnerable groups.Coastal communities have over the years suffered serious physical degradation with studies showing their vulnerability. The geographic elevations of coastal communities are often very low but with high population density. (9) Nigeria has also experienced incidences of flooding (flash flood, urban floods, channel floods, back swamp floods, coastal inundation, etc.)(10) The worst being the 2012 flooding where more than 2 million people were displaced and 363 deaths reported.(11)

Land degradation increases the vulnerability of managerial environments and communities. Problems associated with land degradation occur in several parts of the world. The pressure is deepened as climate change becomes more bearing. The rise in sea levels is escalating the risk of erosion with storm surges and extreme weather. (12).Hubs of activities like industrial development, resource exploitation, recreation activities and concentration of population have made effective demand on coastal management. Pressures on coastal geomorphological hazard points are increased. The loss and causalities drawn from natural disasters like wind, storms surge linked flooding, seismic hazards and tsunami incidence have provoked large international concerns. (9).An action of mitigation is a specific action, project activity or process that is taken to reduce or remove completely in nature to people and property hazards and their impacts.(13). Mitigation management is a total solution that involves the management of the environment. The natural environment is the most valuable asset and it links and supports us in ways that can't be replicated. It is the rock on which our economies are built and pivotal to ensuring sustainability.Sustainable land management is the use of land to meet the various needs of man (infrastructure, building, agriculture, forestry, conservation, hydrology) while ensuring long-term socio-economic and iconological functions of the land and is one of the pivots in AGENDA 21's goal of sustainable development.It is also defined as a system of technologies and or planning that aims to integrate ecology with a socio-economic and political principle in the management of agriculture and other land uses to secure intra and inter-generational balance. (3), and that geo-information is essential in sustainable land management.

II. METHODOLOGY

The study employed a case study approach based on the research questions. The case study research strategy focuses on individuals, groups or organizations and their views on the subject were captured. Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon

within its real-life context using multiple sources of evidence.(14). Unlike the experimental strategy, the boundaries between the phenomenon being studied and context are not clearly evident.(15)Empiricalexploratory data was obtainedfrom interaction with respondents in their natural environment. The inductive concept which stresses on data collection before determining the relationship between vulnerabilities on coastal communities and sustainable land management was essential to reduce researcher bias.Owing to the subjective nature of the study, key informant interviews, observations, and discussions formed part of the data collection strategies. The primary data sourcing technique was adopted as the authors did not have documentation on the Obuama area. Mitigation/sustainable land management tools were derived from relevant literature and the analysis was undertaken using Multiple Criteria Decision Analysis (MCDA).

III. RESULTS

Field observations showed varying degrees of accessibility in terms of roads, differences in building designs and construction, availability of amenities and services and population the in the area. A Likert scale from 1 – 4 was developed and used where communities with the lowest level of physical vulnerability, having obtained the lowest combined score for accessibility - roads, design of buildings, quality of construction, amenities and high population density were rated 1 and those with the highestcombined score, rated 4.Physical Vulnerability was measured by the level of physical development which could improve preparedness for possible adversity and improve coping capacity.

3.1 Accessibility

Neighbourhoods with good accessibility command higher property values than those without (16). Accessibility was observed and scored based on the availability and quality of existing road networks and ratings were assigned to each category.Tarred road with drainage = 1; Tarred road without drainage = 2, Wide road but not tarred = 3, Footpaths = 4. The observations reveal that ten percent of the communities had tarred roads without drainage, fifty percent had wide roads but not tarred while forty percent had only footpaths - see Table 1.

Table1: Accessibility and Physical Vulnerability

Community	Rate	Score
Harrystown	2	60
Usokun	3	90
Ilelema	3	90
Okpo	3	90
Sama	3	90
Tema	3	90
Mgbetokuru-kiri	4	120
Agba-ama	4	120
Odibo-kiri	4	120
Sokari-kiri	4	120

Source: Researchers Fieldwork, 2019

Keys to Likert Scale Rating: 1=30, 2 = 60, 3 =90, 4 = 120

3.2 Building Design

Poorly designed and constructed buildings are signs of physical vulnerability(17). Buildings were grouped based on design into four design categories namely: 1 = Masonite/duplex, 2 = Bungalow/block flats, 3 = Rooms with toilets within and 4 = Rooms with external toilet. Field observations revealed that ten percent of the community had more of bungalows/block of flats, forty percent had rooms with toilet within, while fifty percent had rooms with external toilet. Vulnerability arising from design of building was hence very high in the fishing settlement (Mgbetokruru-Kiri, Agba-ama, Odibo-Kiri and Sokari-Kiri), high in Usokun, Ilelema, Okpo, Sama Tema and moderate in Harrystown. - see Table 2.

Table 2 Building Design and Physical Vulnerability

Community	Rate	Score
Harrystown	2	40
Usokun	3	60
Ilelema	3	60
Okpo	3	60
Sama	3	60
Tema	4	60
Mgbetokuru-kiri	4	80
Agba-ama	4	80
Odibo-kiri	4	80
Sokari-kiri	4	80

Source: Researchers Fieldwork, 2019

Keys to Likert Scale: 1=20, 2 = 40; 3 =60, 4 = 80

3.3 Building Construction Materials

Poorly constructed buildings are signs of physical vulnerability as mentioned in 3.2 earlier(17) Poorly constructed buildings do not only have bad exposure but also yield low rental and capital values. Building design and construction was observed and ratings were assigned to each category. 1 = Mostly blockwork and masonry. 2 = A combination of blocks and wooden structures, 3 = Blocks and corrugated iron sheets (zinc) and 4 = Mud houses with /thatch or corrugated iron sheets.The observations reveal that ten percent of communities had predominantly block/masonry type of buildings, twenty percent had buildings that were predominantly of blocks/wooden construction, thirty percent had buildings that were predominantly blocks/ corrugated iron sheets while forty percent had mud/thatch/corrugated iron sheets - see Table 3.

Table 3: Building Construction Materials and Physical Vulnerability

Community	Rate	Score
Harrystown	1	20
Usokun	2	40
Ilelema	2	40
Okpo	3	60
Sama	3	60
Tema	3	60
Mgbetokuru-kiri	4	80
Agba-ama	4	80
Odibo-Kiri	4	80
Sokari-Kiri	4	80

Source: Researchers Fieldwork, 2019

Keys to Likert Scale: 1=20, 2 = 40; 3 =60, 4 = 80

3.4 Amenities/Utility Services

The availability of amenities and utility services such as electricity, water supply - reticulated, neighbourhood borehole for private use, and drainage - natural or constructed, that can make a community/neighbourhood function properly were observed. The provision of amenities plays a crucial role in the determination of land values(18) Ratings were assigned to each category namely: 1 = Electricity, reticulated water supply and drainage; 2 = Electricity, neighbourhood borehole, natural drainage; 3 = Electricity, private boreholes/wells/ no drainage; 4 = No electricity, no drainage, no borehole

Table 4 Amenities/Utility Services and Physical Vulnerability

Community	Rate	Score
Harrystown	1	12
Usokun	2	24
Ilelema	3	36
Okpo	3	36
Sama	3	36
Tema	3	36
Mgbetokuru-kiri	4	48
Agba-ama	4	48
Odibo-kiri	4	48
Sokari-kiri	4	48

Source: Researchers Fieldwork, 2019

Keys to Likert Scale: 1=12, 2 = 24; 3 =36, 4 = 48

3.5 Population

Physical vulnerability is the potential for physical impact on the built environment and population(19). A thickly populated community will have more stretch on amenities and hence make such communities more physically vulnerable than a sparsely populated community. Population was observed and scored based on density and ratings were assigned to each category. 1 = Low density, 2 = Medium density, 3= High density and 4 = Very high density. The observations reveal that twenty percent of the communities had a medium population while eighty percent had a low population - see Table 5.

Table 5: Population and Physical Vulnerability

Community	Rate	Score
Harrystown	2	36
Usokun	2	36

Ilelema	1	18
Okpo	1	18
Sama	1	18
Tema	1	18
Mgbetokuru-kiri	1	18
Agba-ama	1	18
Odibo-Kiri	1	18
Sokari-Kiri	1	18

Source: Researchers Fieldwork, 2019

Keys to Likert Scale: 1=18, 2 = 36, 3 = 54, 4 = 72

IV. ANALYSIS

4.1 Multi Criteria Decision Analysis

Using the results presented in section 3, a Multi Criteria Decision Analysis (MDCA) was conducted to ascertain the level of vulnerability associated with physical development and this was correlated with land values in the study area.In a group aggregate of 100, the study assigned 30 accessibility as it was considered critical to physical vulnerability. Accessibility provides the surface link between properties, properties and amenities and users. Without accessibility, land/property is not useful. Design of buildings and construction which stems from design details were allocated 20 points each. A good design and construction elicit aesthetics, functionality and value. A high population density in an area could affect the value of land/property and lead to early obsolescence as such, 18 points was allocated to it. Amenities which include reticulated water and electricity and other services were given 12 points. See Table 6 and Fig. 1

Table 6 Multicriteria Analysis of Physical Vulnerabilities

Communities	30 Accessibility	20 Building Design	20 Construction	12 Amenities	18 Population	100 Total
Harrystwon	60	40	20	12	36	**168**
Usokun	90	60	40	24	36	**250**
Ilelema	90	60	40	36	18	**244**
Okpo	90	60	60	36	18	**264**
Sama	90	60	60	36	18	**264**
Tema	90	60	60	36	18	**264**
Mgbetukuru-kiri	120	80	80	48	18	**346**
Agbama-kiri	120	80	80	48	18	**346**
Odibo-kiri	120	80	80	48	18	**346**
Sokari-kiri	120	80	80	48	18	**346**

4.2 Physical Vulnerabilityand Land Value Trends

The results from the MCDA are ranked in Table 7 along with the prevailing land values in the study area. corresponding land values to show the impact of physical vulnerabilities on land values and justify the need for SLM tools as a form of mitigation. Investigation revealed that land values in the area under the study range from N1m to N4m.

Table7 Physical Vulnerabilities Impact on Land values

Communities	Total	Vulnerability	Land Values ('0000)	Level
Harrystwon	168	Less Vulnerable	400	High
Ilelema	244	Vulnerable	100	Very Low
Usokun	250	Vulnerable	150	Average
Okpo	264	Vulnerable	100	Very Low
Sama	264	Vulnerable	120	Low
Tema	264	Vulnerable	120	Low
Mgbetukuru-kiri	346	Very Vulnerable	150	Average
Agbama-kiri	346	Very Vulnerable	120	Low
Odibo-kiri	346	Very Vulnerable	120	Low
Sokari-kiri	346	Very Vulnerable	120	Low

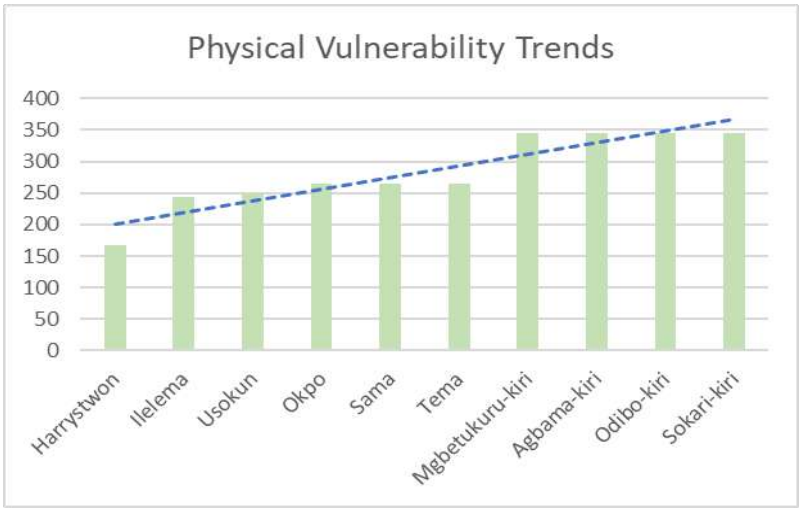

FIGURE 1:

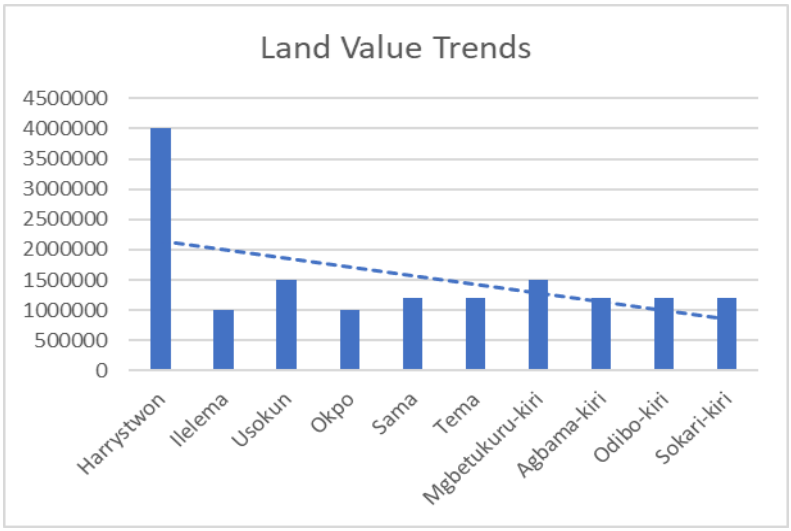

FIGURE 2

The chart in Figure 1 shows the vulnerability trend with Harry'stown having the lowest score and four communities Mgbetukuru-Kiri, Agbama-Kiri, Odibo-kiri and Sokari-Kiri having the highest scores. While Figure 1 shows an upward trend, Figure 2 (Land Values) shows a downward trend when correlated with Figure 1 (Physical Vulnerability) which indicates that the lower the physical vulnerability, the greater the potential for higher land values.

4.3 Applicability of SLM tools for Mitigation

There are several possible options and SLM tools which could be used to reduce physical vulnerabilities in coastal communities and which if deployed in the study area could lead to an enhancement of land values in the future. These were identified in the course of the study via secondary data sources as follows:

1. Land use Planning
2. Preparation of Coastal Maps
3. Costal/wetland planning
4. Development of Community Master plan
5. Drainage Construction
6. Public Participation
7. Community Awareness Campaigns, and
8. Partnerships

Data from secondary sources reveals that Land use regulation increase the value of land positively(20). Community master plan can be used to produce an index for competition of site between various uses acting on the forces of demand and supply(21) Both land use planning and community master plan can serve to reduce community's exposure to vulnerability(22) and (23) The price of the land can be contingent upon its locational features or amenities which include drainage. Coastal maps and coastal wetland planning are important in allocating land use at the coastal areas.

V. FINDINGS AND DISCUSSION

The study examined the physical vulnerability associated with the Obuama study area. using variables such as accessibility, design of the buildings, construction amenities and population density. The results of physical vulnerabilities suggest that Harrystown with a total score of 168 is less physically vulnerable to the multiple criteria considered. Usokun, Ilelema, Okpo, Sama and Tema had a score index of between 244 and 264 which suggests that they are more vulnerable than Harrystown in terms of the physical conditions considered, while Mgbetokuru-Kiri, Agba-ama, Odibo-Kiri, and Sokari-Kiri are most vulnerable with a score of 346 each.

The graphs in Figs 1 & 2 of MCDA scores for physical vulnerabilities and property value (₦'m) plotted reveal that property value was highest in Harrystown where vulnerability was lowest.Harrystown had the highest land value of ₦4m per plot decreasing to ₦1m at Ilelema and Okpo. Usokun had land value as ₦1.5m with Mgbetokuru, while Agba-ama, Odibo-Kiri, and Sokari-Kiri had ₦1.2m each. Accessibility, neighborhood quality, land title zoning regulations and provisions of amenities play a crucial role in the determination of land values(18). Harrystown with the least vulnerability score commands a land value of ₦4m. Usokun is next in land value with a higher physical vulnerability. The effect vulnerability on land values did not follow the same trend as expected in Ilelema, Okpo, Sama and Tema as the study revealed that these communities although having the similar vulnerability scores of had differences in prices. Sama and Tema had land values ₦1.2m per plot each while Okpo and Ilema showed land values of ₦1.00m.

The research thus shows that there are other factors besides vulnerabilities and mitigation that contribute to land value. Sama and Tema communities are more strategically located on the road than Ilelema and Okpo. This, therefore, brings in the theory of location.Land values in Mgbetokuru-Kiri exceeded that of Agba-ama, Odibo-Kiri, and Sokari-Kiri with ₦1.5m against ₦1.2m. The least of these fishing settlements had the same land value as Sama and Tema beating Ilelema and Okpo. The explanation here may be that the concepts of hedonic values and psyche values shored up the land values in these fishing settlements. Mgbetokuru-Kiri had at land value of ₦1.5m because in terms of location, it is more strategic.Hedonic value- the value a user receives based on the property and its usefulness, attractiveness and innate satisfaction (pleasure) it gives to the user, confirmed the price of land in Mgbetokuru-Kiri above the other fishing settlements.

VI. CONCLUSION AND RECOMMENDATIONS

This research revealed that mitigation intervention is needed to reduce adverse physical vulnerabilities. The absence of soft and hard tools in sustainable land management makes it compelling for government, corporate organizations, individuals to rise to the challenge. Most often the connection between communities and transportation of wares is expensive due to the absence of proper road networks.

6.1 Recommendations

For the Obuama coastal area to reduce physical vulnerabilities and improve land values, the researcher recommends that:

1. Given the high state of physical vulnerabilities, Land use planning and coastal wetland planning should be introduced in the entire Local Government Area.

2. As a way of ensuring a higher level of mitigation, the co-operation and partnership of government and international environmental organizations like the Global Environmental Facility (GEF) are advocated.

3. Coastal communities' resilience should be built with blue funds. Funds should be provided to reduce the effects of sea debris, shoreline erosion, and improved technology.

4. Land-use planning can contribute significantly in mitigating vulnerabilities and enhancing property values. Land use planning, therefore, is advocated.

5. The Land Use Act of 1978 has not only placed the devolution of land at the local government levels in the hands of local government allocation and advisory committees but has prescribed the setting up of land management committees with professionals at community levels. This has not been practiced in Rivers State and has resulted in gross violation of the Land Use Act. Advocacy is proffered here that the necessary community awareness schemes, public participation, community masters plan and partnership from government and oil companies that operate in the area should have all hands in desk to restore the proper use of land.

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