

Perception of Effectiveness of Land Reclamation Strategies and Housing Delivery In South-south Region, Nigeria

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Corresponding Author: MeeluBari Barinua Tsaro Kpang Department of Environmental Management and Toxicology, Federal University Environment and Technology, Koroma/Saakpenwa, Ogoni	Abstract: This study examined the perception of effectiveness of land reclamation strategies and housing delivery in South-South Nigeria. The cross-sectional survey design was adopted in the study. The Taro Yamene formula was applied on the target population to determine the sample size for the study. Accordingly, out of 400 copies of questionnaire administered, 395 copies were returned implying that the data for this study was generated through questionnaire administration. Afforestation was found to be largely ineffective, with only 22% of respondents perceiving improvements in environmental sustainability (WM = 2.0) showing poor implementation and weak enforcement as key obstacles. Similarly, drainage and irrigation systems were deemed ineffective for wetland reclamation which was consistent with findings in literature on inadequate infrastructure and poor maintenance. Arising from the findings, implementation and enforcement of stronger policies to ensure land reclamation benefits both low- and high-income populations, revision of regulatory frameworks to promote equitable access to reclaimed land for housing development as well as giving priority to reclaimed land for investment in road, drainage, and utility infrastructure to make the land more suitable for sustainable housing development, reducing environmental risk and improving quality of life were strongly recommended among others. Keywords: Effectiveness, Perception, Housing Delivery, Land Reclamation Strategies.
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Introduction

All the continents of the world are surrounded by water bodies such as oceans and sea. The coastline is the meeting point of continent's land and the oceans while its members include the beaches, cliffs, caves, arch, headland and estuaries that line up at the end of the land (World Bank, 2019). The land mass stretching from the inland limit of tidal or ocean spray influence, to the outer, of the continental shelf within 60 to 200 kilometers of the coastline, characterized by inter-connections amidst neighboring ecosystems and directly influenced by both the land based and human activities is defined as the coastal area (Daniel, 2014). Interestingly, proximity to the coastline, a coastal amenity and housing attribute through land reclamation is one of the driving forces of urban coastal dynamics. Land reclamation, the transformative process of converting unused or underutilized areas into valuable assets for human activities, has gained prominence in response to urbanization and developmental needs especially in coastal states of the world where land is constantly threatened by coastal erosion and flooding. Reclamation of coastal cities is imperative where offshore lands or tidal marshes are covered by shallow water and additional land is critically needed, the land can be reclaimed by construction of dikes roughly parallel to the shoreline, followed by drainage of the area between the dikes and the natural coastline (Cotula, 2007). Land reclamation is the process of creating new land from the sea (Furuset, 2018); the simplest method of land reclamation involves simply filling the

area with large amounts of heavy rock and/or cement, then filling with clay and soil until the desired height is reached. Abubakar and Doan (2010), opined that while it offers the promise of expanding urban spaces and fostering economic growth, a critical examination of its effects on housing delivery in coastal states becomes imperative. Land reclamation in coastal cities is not an entirely new practice that entails dredging and transporting large amount of sand from the sea-bed to create an artificial land for infrastructural and industrial development (Mongabay, 2010; Udo (2023)).

As a result of increasing population density and need for infrastructural development, the coastal lands are reclaimed for housing projects. Housing is a key input in economic, social, and civic development. Housing investment remains valuable and a major economic driver, both in developed countries and developing countries and many housing-related activities are known to contribute directly to achieving broader socio-economic development goals. Studies have shown that housing activities in developing countries have economic benefits beyond the housing sector. Thus, a successful housing delivery initiative would provide avenues of capacity building to free the urban poor from the shackles of poverty and even propel them into wealth. Land reclamation, characterized as the artificial creation of new land through draining marshy areas or filling existing water bodies, has become a hallmark of coastal states in the South-South Nigeria's expansion strategy (Sulyman, 2000). The geographical location of

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coastal states in South-South Nigeria has necessitated demand for expanded land space fueled by extensive reclamation activities aimed at addressing the urgent need for additional land to support housing delivery. On the premise of the above, this study is targeted at examining land reclamation and housing delivery in coastal areas of the south -south.

Materials and Methods

The South-South is located in the Niger Delta region of Nigeria and lying within latitudes 4°16'0"N – 7°38'0"N and longitudes 4°19'30"E – 9°22'30"E) as shown in Figure 1. It covers over 70,000km² and constitutes about 7.5% of Nigeria's land mass. Here, the total annual rainfall is varying from 2400mm to 4000mm (NPC, 2006)). The target population of the study was determined by first enumerating the households in the area, after that the population of households was multiplied by the number of

households enumerated giving a total of 29482200. Consequently, the population of the study area was subjected to Taro Yamane formula to determine the sample size for the study as shown in the equation below while the analysis was done using Kruskal Wallis test.

Taro Yamane Formula Computation

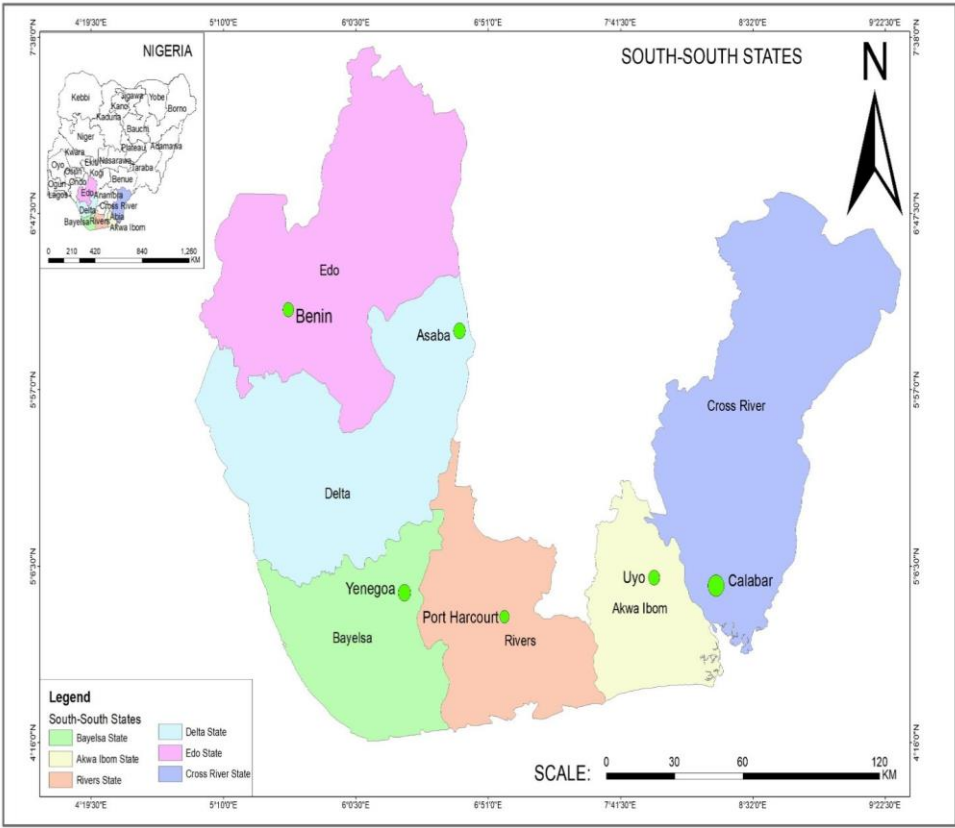
$$n = \frac{N}{1+N(e)^2}$$
(eqn 1)

Where n = sample size
N = Overall population size (29482200)
e = 0.05
n= 399.9 (approximately 400)

Table 1: Population of the Study

S/N	Name of States	Population	Sample Size
2	Akwa-Ibom	2,537,400	34
3	Bayelsa	3,738,300	50
4	Cross River	5,636,100	75
6	Delta	4,777,000	64
7	Edo	7,476,800	101
10	Rivers	5,316,600	72
	Total	29,482,200	400

Figure 1: South-South States



Results

Table 2: Land reclamation in south-south Nigeria

Items	SA (%)	A (%)	SD (%)	D (%)	Total (%)	WM
Land reclamation through afforestation has improved environmental sustainability in the study area.	38(9.6)	49(12.4)	171(43.3)	137(34.7)	395(100)	2.0
The use of drainage and irrigation systems has effectively reclaimed wetlands for agriculture.	24(6.1)	40(10.1)	176(44.6)	155(39.2)	395(100)	1.8
Sand-filling is a commonly used method for reclaiming degraded land in this area.	152(38.5)	161(40.8)	31(7.8)	51(12.9)	395(100)	3.0
The conversion of abandoned mining sites into productive land has been successful.	113(28.6)	142(35.9)	76(19.2)	64(16.2)	395(100)	2.8
Government policies and regulations support effective land reclamation practices.	13(3.3)	28(7.1)	169(42.8)	185(46.8)	395(100)	1.7
Community participation plays a key role in land reclamation efforts.	32(8.1)	36(9.1)	149(37.7)	178(45.1)	395(100)	1.8
Land reclamation has contributed to increased agricultural productivity in the study area.	10(2.5)	19(4.8)	184(46.6)	182(46.1)	395(100)	1.6
The use of landfill and waste management techniques has effectively restored degraded land.	23(5.8)	48(12.2)	153(38.7)	171(43.3)	395(100)	1.8
Coastal reclamation through seawall construction and sand nourishment has been effective.	0(0)	3(0.8)	184(38.7)	208(43.3)	395(100)	1.5
Land reclamation efforts have led to significant improvements in biodiversity restoration.	10(2.5)	14(3.5)	177(44.8)	194(49.1)	395(100)	1.6

The data in Table 2 provides insight into the perception of various land reclamation strategies in South-South Nigeria. It highlights the effectiveness and acceptance of different methods, as well as challenges in policy implementation, community participation, and environmental impact. On the issue of Land reclamation through afforestation has improved environmental sustainability in the study area 22% (SA + A) of the respondents believed afforestation has improved environmental sustainability. However, 78% (SD + D) disagreed, with a weighted mean (WM) of 2.0, indicating low effectiveness of the reclamation technique. This suggests afforestation efforts are either insufficient or poorly implemented in the region. Just 16.2% (SA + A) think that drainage and irrigation methods have actually regenerated wetlands for cultivation; 83.8% (SD + D) do not agree. Maintenance problems and environmental problems could be reasons for the low weighted mean (WM) of 1.8. The purpose of this survey was to determine whether sand-filling is a prevalent practice for restoring deteriorated soil in this region. Twenty-seven percent (SD+D) disagreed, whereas seventy-three percent (SA+A) attested to its use. A high weighted mean (WM) of 3.0 indicates this method is widely accepted and seen as effective. This suggests that sand-filling is a dominant land reclamation approach in the region.

The respondents revealed their opinion on the conversion of abandoned mining sites into productive land has been successful. On this, 64.5% (SA + A) believed this method has been successful, while 35.4% (SD + D) disagreed. A weighted mean (WM) of 2.8 indicates moderate success, suggesting mining site reclamation is gaining attraction. On the other hand, only 10.4% (SA + A) believe government policies support land reclamation. A majority (89.6%) disagreed, with a very low weighted mean (WM) of 1.7. This suggests a lack of effective government interventions, enforcement, or incentives for land reclamation projects. Respondents perception on community participation playing a key role in land reclamation efforts; showed that 17.2% (SA + A) agreed that community participation plays a key role, while 82.8% (SD + D) disagreed. The low weighted mean (WM) of 1.8 suggests inadequate local involvement, which may be due to lack of awareness, engagement, or incentives. When the respondents were asked if land reclamation has contributed to increased agricultural productivity in the study area, only 7.3% (SA + A) believe land reclamation has increased agricultural productivity. A significant 92.7% (SD + D) disagreed, with a very low weighted mean (WM) of 1.6. This indicates that land reclamation efforts have not significantly translated into improved agricultural output. Again, the opinion of the respondents on the use of landfill and waste management techniques has effectively restored degraded land;

18% (SA + A) consider these methods effective, while 82% (SD + D) disagreed. The weighted mean (WM) of 1.8 suggests limited success in using waste management for land restoration. As to whether coastal reclamation through seawall construction and sand nourishment has been effective is not a known method of land reclamation in the area. Only 0.8% (SA + A) averred that these efforts as effective, while 82% (SD + D) disagreed. The lowest

weighted mean (WM) of 1.5 highlights that coastal reclamation efforts are largely ineffective or absent. Finally, respondents perception on land reclamation efforts have led to significant improvements in biodiversity restoration, only 6% (SA + A) agreed that land reclamation has improved biodiversity, while 93.9% (SD + D) disagreed. A weighted mean (WM) of 1.6 shows that these efforts have had minimal success in restoring biodiversity.

Table 3: kruskal Wallis test for difference types of land reclamation in South-South Nigeria

Items	n	Kruskal Wallis H	df	Asymp. Sig	Remark
Land reclamation through afforestation has improved environmental sustainability in the study area.	395	03.12	5	0.06	Not significant
The use of drainage and irrigation systems has effectively reclaimed wetlands for agriculture.	395	06.11	5	0.12	Not significant
Sand-filling is a commonly used method for reclaiming degraded land in this area.	395	16.03	5	0.00	Significant
The conversion of abandoned mining sites into productive land has been successful.	395	18.21	5	0.01	Significant
Government policies and regulations support effective land reclamation practices.	395	02.11	5	0.31	Not significant
Community participation plays a key role in land reclamation efforts.	395	15.13	5	0.03	Significant
Land reclamation has contributed to increased agricultural productivity in the study area.	395	01.02	5	0.12	Not significant
The use of landfill and waste management techniques has effectively restored degraded land.	395	04.13	5	0.13	Not significant
Coastal reclamation through seawall construction and sand nourishment has been effective.	395	03.15	5	0.12	Not significant
Land reclamation efforts have led to significant improvements in biodiversity restoration.	395	02.16	5	0.08	Not significant

The Kruskal-Wallis H test was conducted to determine whether there were statistically significant differences in the effectiveness of different land reclamation methods in South-South Nigeria. The test examined responses across various land reclamation techniques, with results indicating significant differences for some methods while others showed no statistically significant variation. The results show that sand-filling ($H = 16.03$, $p = .00$) is significantly different from other land reclamation methods. This suggests that sand-filling is perceived as a more effective, respondents revealed that this technique compared to other approaches. Similarly, the conversion of abandoned mining sites into productive land ($H = 18.21$, $p = .01$) also showed significant differences, indicating its relative effectiveness. Additionally, community participation in land reclamation efforts ($H = 15.13$, $p = .03$) demonstrated statistical significance, suggesting that variations in community involvement influence the success of reclamation projects. With these results, land

reclamation programmes can surely be improved with more participation.

Land reclamation techniques such as afforestation, drainage and irrigation systems, and landfill and waste management practices did not indicate significant differences in answers ($H = 3.12$, $p = .06$, $H = 6.11$, $p = .12$, and $H = 4.13$, $p = .13$, respectively). The lack of significance indicates that these methods do not yield substantially different outcomes or perceptions compared to others. Furthermore, government policies and regulations ($H = 2.11$, $p = .31$) were not found to be significantly different, reflecting a general lack of effectiveness or variation in policy implementation. Similarly, agricultural productivity ($H = 1.02$, $p = .12$) and coastal reclamation efforts ($H = 3.15$, $p = .12$) did not exhibit significant differences, suggesting that land reclamation efforts have not resulted in measurable improvements in these areas.

Table 4: Housing types in South-South Nigeria

Items	SA (%)	A (%)	SD (%)	D (%)	Total (%)	WM
Traditional mud houses are still widely used in rural areas of South-South Nigeria.	43(10.9)	58(14.7)	156(39.5)	138(34.9)	395(100)	2.0
Modern bungalows and duplexes are the dominant housing types in urban areas.	141(35.7)	157(39.7)	32(8.1)	45(11.4)	395(100)	2.9
High-rise apartments are becoming increasingly popular in major cities of the region.	32(8.1)	46(11.6)	144(36.5)	173(43.8)	395(100)	1.8
Informal settlements and slum dwellings are common in low-income areas.	134(33.9)	156(39.5)	45(11.4)	60(15.2)	395(100)	2.9
Stilt houses (houses built on water) are a significant part of the housing culture in riverine communities.	135(34.2)	144(36.5)	57(14.4)	59(14.9)	395(100)	2.9
Gated estates and luxury housing developments are growing in the region.	129(32.7)	154(39)	49(12.4)	63(15.9)	395(100)	2.9
Public housing schemes by the government provide adequate housing for low-income earners.	10(2.5)	15(3.8)	198(50.1)	172(43.5)	395(100)	1.7
Most houses in South-South Nigeria are built using locally sourced materials.	11(2.8)	32(8.1)	176(44.6)	176(44.6)	395(100)	1.7
Housing infrastructure in South-South Nigeria meets modern building standards.	45(11.4)	76(19.2)	138(34.9)	136(34.4)	395(100)	2.1
There is a high demand for self-built homes compared to rented apartments.	59(14.9)	83(21)	132(33.4)	121(30.6)	395(100)	2.2

Table 4 presents the distribution of housing types in South-South Nigeria, based on respondents' perceptions of traditional and modern housing structures, informal settlements, government interventions, and construction materials. Traditional mud houses remain a feature of rural areas, though they are not predominant, with only 25.6% of respondents strongly agreeing or agreeing that they are widely used. A majority (74.4%) disagreed or strongly disagreed, resulting in a weighted mean (WM) of 2.0. In contrast, modern bungalows and duplexes are perceived as the dominant housing types in urban areas, with 75.4% (SA + A) affirming this claim and only 19.5% (SD + D) disagreeing (WM = 2.9).

High-rise apartments are not yet widely popular, as 80.3% of respondents (SD + D) did not perceive them as a common housing type (WM = 1.8). However, informal settlements and slum dwellings are acknowledged as prevalent in low-income areas, with 73.4% of respondents agreeing (WM = 2.9). Stilt houses, which are characteristic of riverine communities, were also reported as significant, with 70.7% agreeing (WM = 2.9). Similarly, gated estates and luxury housing developments are growing in prominence, with 71.7% of respondents supporting this

observation (WM = 2.9). Public housing schemes, however, were rated poorly in terms of effectiveness, as only 6.3% agreed that they provide adequate housing, while 93.6% disagreed (WM = 1.7). Additionally, most houses in the region are not perceived to be built using locally sourced materials, as only 10.9% (SA + A) supported this claim, while 89.2% disagreed (WM = 1.7). Housing infrastructure in South-South Nigeria was rated as moderately meeting modern building standards, with a WM of 2.1, indicating mixed perceptions. The demand for self-built homes was relatively high, as 35.9% of respondents agreed, while 64% disagreed (WM = 2.2). The findings indicate that modern bungalows and duplexes dominate urban housing, while traditional mud houses are declining in relevance. Informal settlements and slum dwellings remain common, and there is increasing demand for luxury housing and stilt houses in riverine areas. Government-provided housing and the use of local materials are perceived as inadequate. These insights highlight the need for improved housing policies, enhanced public housing schemes, and better urban planning strategies to accommodate both low-income and high-end housing demands.

Table 5: Kruskal Wallis test for spatial difference in housing types in South-South Nigeria

Items	n	Kruskal Wallis H	df	Asymp. Sig	Remark
Traditional mud houses are still widely used in rural areas of South-South Nigeria.	395	05.23	5	0.07	Not significant
Modern bungalows and duplexes are the dominant housing types in urban areas.	395	19.42	5	0.05	Significant
High-rise apartments are becoming increasingly popular in major cities of the region.	395	04.13	5	0.15	Not significant
Informal settlements and slum dwellings are common in low-income areas.	395	14.19	5	0.00	Significant
Stilt houses (houses built on water) are a significant part of the housing culture in riverine communities.	395	28.02	5	0.01	Significant
Gated estates and luxury housing developments are growing in the region.	395	19.45	5	0.00	Significant
Public housing schemes by the government provide adequate housing for low-income earners.	395	04.18	5	0.08	Not significant
Most houses in South-South Nigeria are built using locally sourced materials.	395	04.13	5	0.17	Not significant
Housing infrastructure in South-South Nigeria meets modern building standards.	395	02.16	5	0.21	Not significant
There is a high demand for self-built homes compared to rented apartments.	395	0.23	5	0.14	Not significant

The Kruskal-Wallis H test was conducted to determine whether significant spatial differences exist in housing types across South-South Nigeria (Table 5). The test examined variations in the prevalence of traditional, modern, and informal housing structures across different locations in the region. Several housing types demonstrated significant spatial differences. Modern bungalows and duplexes showed a statistically significant difference ($H = 19.42$, $p = .05$), suggesting that their distribution varies significantly between urban and rural areas. The results confirm that these housing types are more prevalent in urban areas than in rural communities.

Similarly, informal settlements and slum dwellings exhibited a significant spatial difference ($H = 14.19$, $p = .00$), indicating that low-income housing patterns vary across locations. This result supports the observation that informal settlements are concentrated in specific areas, particularly in urban peripheries and low-income regions. Stilt houses, which are a unique feature of riverine communities, displayed the highest spatial variation ($H = 28.02$, $p = .01$). This result underscores the geographic specificity of stilt housing, which is predominantly found in water-based communities. Additionally, gated estates and luxury housing developments also showed a significant spatial difference ($H = 19.45$, $p = .00$). This suggests that high-end housing developments

are more prominent in certain locations, likely in major urban centres with higher-income populations. Some housing types did not exhibit statistically significant spatial variation. Traditional mud houses ($H = 5.23$, $p = .07$) showed no significant difference, indicating that they are distributed relatively evenly across rural areas. Similarly, high-rise apartments ($H = 4.13$, $p = .15$) did not display a significant difference, suggesting that their presence is not yet well established in South-South Nigeria.

Other housing types, such as public housing schemes ($H = 4.18$, $p = .08$) and locally sourced building materials ($H = 4.13$, $p = .17$), also lacked significant spatial variation, implying that these factors do not vary meaningfully between locations. Moreover, housing infrastructure meeting modern building standards ($H = 2.16$, $p = .21$) and demand for self-built homes compared to rented apartments ($H = 0.23$, $p = .14$) were not significantly different across locations, suggesting that these trends are relatively uniform throughout the region. The significant results for modern bungalows, informal settlements, stilt houses, and luxury housing developments indicate distinct housing patterns across different areas in South-South Nigeria. Urban centres tend to have more modern bungalows and luxury estates, while informal settlements are concentrated in low-income areas. The presence of stilt houses is regionally specific to riverine communities. Conversely, the lack

of spatial variation in public housing schemes, locally sourced materials, and high-rise apartments suggests that these factors are either underdeveloped or have not yet reached levels where geographic differences are apparent. This could indicate uniform policy implementation or limited infrastructural development across the region. The Kruskal-Wallis H test results reveal significant spatial differences in certain housing types, particularly

modern, informal, and high-end housing structures. These findings highlight the need for targeted urban planning policies to address disparities in housing accessibility, infrastructure development, and affordable housing options. A strategic approach is necessary to improve housing conditions in low-income and rural communities while sustaining the growth of modern and luxury housing developments in urban centres.

Table 6: Land reclamation effects on housing delivery in South-South Nigeria

Items	SA (%)	A (%)	SD (%)	D (%)	Total (%)	WM
Land reclamation has significantly increased the availability of land for housing development	34(8.6)	22(5.6)	166(42)	173(43.8)	395(100)	1.8
Housing affordability has improved due to increased land supply from reclamation projects	0(0)	1(0.3)	187(47.3)	207(52.4)	395(100)	1.5
Reclaimed land in the South-South region is suitable for long-term housing development	113(28.6)	147(37.2)	78(19.7)	57(14.4)	395(100)	2.8
The use of reclaimed land has led to the development of modern housing estates	43(10.9)	41(10.4)	143(36.2)	168(42.5)	395(100)	1.9
Land reclamation has contributed to environmental challenges	154(39)	178(45.1)	35(8.9)	28(7.1)	395(100)	3.2
Government policies on land reclamation have positively influenced housing delivery in the region	15(3.8)	20(5.1)	172(43.5)	188(47.6)	395(100)	1.7
Reclaimed land is mostly used for high-cost housing rather than affordable housing	147(37.2)	162(41)	28(7.1)	58(14.7)	395(100)	3.0
Infrastructure development (e.g., roads, drainage) in reclaimed areas supports sustainable housing growth	45(11.4)	79(20)	134(33.9)	137(34.7)	395(100)	2.1
Communities living on reclaimed land face significant challenges related to land tenure and ownership	153(38.7)	168(42.5)	18(4.6)	56(14.2)	395(100)	3.1
Land reclamation has led to an increase in housing investments in the South-South region	34(8.6)	68(17.2)	151(38.2)	142(35.9)	395(100)	2.0

Table 6 provides details on whether or not there are South-South Nigerian individuals who feel land reclamation impacts the delivery of homes. The evidence shows that land reclamation has had mixed impacts in the supply of housing in the area, its affordability, and its sustainability. A low weighted mean (WM) of 1.8 is the outcome of the majority of respondents disagreeing (43.8%) or strongly disagreeing (42.0%) that land reclamation has contributed significantly to the availability of land for house building. Similarly, the lowest weighted mean (WM) of 1.5 was achieved when 52.4% of respondents disagreed and 47.3% strongly disagreed that the heightened availability of land through reclamation projects has served home affordability. This implies that in spite of land reclamation activities, there remain considerable obstacles to the construction of affordable and accessible housing in the area.

With 37.2% agreeing and 28.6% strongly agreeing, with a WM of 2.8, opinions were more positive regarding the suitability of reclaimed land for building long-term housing. With a lower WM of 1.9, however, most of the respondents disagreed (42.5%) or strongly disagreed (36.2%) when they were asked if land reclamation had resulted in the emergence of modern housing settlements. The results show that although reclaimed land may be good enough for future developments, it is not very useful when it comes to modern housing. A notable concern is the environmental impact of land reclamation, where 45.1% agreed and 39.0% strongly agreed that it has contributed to environmental challenges, yielding the highest WM of 3.2. This underscores the environmental risks associated with land reclamation, such as flooding and ecosystem disruption. Additionally, government policies on land reclamation appear ineffective in promoting

housing delivery, as 47.6% disagreed and 43.5% strongly disagreed that policies have had a positive influence, resulting in a low WM of 1.7. Findings indicate that reclaimed land is predominantly used for high-cost housing rather than affordable housing, with 41.0% agreeing and 37.2% strongly agreeing, yielding a WM of 3.0. This is still another sign that land reclamation projects are supporting the rich while sacrificing the residential needs of the poor families. With 34.7% disapproving and 33.9% strongly disapproving, responses were also equally split regarding the development of infrastructure on reclaimed land with a moderate weighted mean score of 2.1. Residents on reclaimed land are in serious difficulties with land tenure and ownership, as

seen through a high WM of 3.1, with 38.7% strongly agreeing and 42.5% agreeing.

Finally, with a WM value of 2.0, the impact of land reclamation on housing investments was fairly insignificant, since 35.9% of respondents disagreed and 38.2% of them strongly disagreed that investments have risen considerably. While some of the opportunities in home development in South-South Nigeria have been made possible through land reclamation, the benefits seem to favor high-cost housing over accessible and affordable housing, the figures suggest. Improved delivery of housing in the area in an inclusive and sustainable way requires that environmental concerns, weak government policy, and issues regarding land tenure are addressed.

Table 7: Effectiveness of land reclamation on housing delivery in South-South Nigeria

Items	SA (%)	A (%)	SD (%)	D (%)	Total (%)	WM
Land reclamation has increased the availability of land for housing development in South-South Nigeria.	15(3.8)	28(7.1)	165(41.8)	187(47.3)	395(100)	1.7
Housing projects built on reclaimed land are structurally durable and long-lasting.	132(33.4)	139(35.2)	89(22.5)	35(8.9)	395(100)	2.9
The cost of housing has reduced due to the expansion of available land through reclamation.	1(0.3)	5(1.3)	174(44.1)	215(54.4)	395(100)	1.5
Government policies on land reclamation have positively influenced housing delivery.	2(0.5)	18(4.6)	144(36.5)	231(58.5)	395(100)	1.5
Reclaimed land has provided sustainable housing solutions for low-income populations.	1(0.3)	7(1.8)	183(46.3)	204(51.6)	395(100)	1.5
Housing infrastructure (e.g., roads, drainage) in reclaimed areas is adequately developed.	11(2.8)	17(4.3)	189(47.8)	178(45.1)	395(100)	1.6
Flooding and land subsidence are major challenges affecting housing on reclaimed land	17(4.3)	48(12.2)	177(44.8)	153(38.7)	395(100)	1.8
Private sector involvement in land reclamation has improved the quality of housing delivery	133(33.7)	145(36.7)	82(20.8)	35(8.9)	395(100)	3.0
Land reclamation has led to a significant increase in housing investments in the region	100(25.3)	109(27.6)	100(25.3)	86(21.8)	395(100)	2.6
Communities living on reclaimed land face minimal environmental risks affecting housing	56(14.2)	53(13.4)	149(37.7)	137(34.7)	395(100)	2.1

Table 7 presents the respondents view of the effectiveness of land reclamation on housing delivery in South-South Nigeria. From the evidence, numerous problems of housing affordability, infrastructural growth, and environmental viability continue to persist, even with the influence of land reclamation in the sector. Land reclamation has not added land availability for residential growth, according to most respondents (47.3%) or strongly (41.8%), and hence the weighted mean (WM) of 1.7 is low. Also, the lowest weighted mean of 1.5 was achieved when 54.4% of the respondents disagreed and 44.1% strongly disagreed that land reclamation has saved on housing costs. These findings show that although land reclamation has increased land to availability, it has not necessarily resulted in cheaper or more affordable homes. With 35.2% agreeing and 33.4% strongly agreeing, the answers were more positive in the sense of the structural durability of housing complexes built on reclaimed land, giving a relatively high

WM of 2.9. An equally 3.0 WM was attained when the private sector involved itself in land reclamation, with 36.7% agreeing and 33.7% strongly agreeing that it has improved the quality of housing deliveries. These results indicate that while housing affordability is still an issue, the private sector has played a role in improving dwellings' quality in reclaimed areas. With 58.5% disagreeing and 36.5% strongly disagreeing, at a WM of 1.5, the findings indicate that government efforts on land reclamation have not effectively enhanced housing delivery. Similarly, reclaimed land has not provided sustainable housing solutions for low-income populations, as 51.6% disagreed and 46.3% strongly disagreed, also resulting in a WM of 1.5. These findings highlight the need for stronger policy interventions to ensure that land reclamation benefits all socioeconomic groups.

The adequacy of housing infrastructure in reclaimed areas received a low rating, with 45.1% disagreeing and 47.8% strongly

disagreeing that infrastructure such as roads and drainage is well developed, leading to a WM of 1.6. Additionally, flooding and land subsidence were identified as major challenges, with 44.8% strongly disagreeing and 38.7% disagreeing that these risks are minimal, resulting in a WM of 1.8. A moderate number of respondents agreed (27.6%) or strongly agreed (25.3%) that land reclamation has led to increased housing investments, with a WM of 2.6. However, environmental risks remain a concern, as 37.7% strongly disagreed and 34.7% disagreed that communities living on reclaimed land face minimal environmental risks, resulting in a WM of 2.1. The findings suggest that while land reclamation has contributed to housing development in South-South Nigeria, its effectiveness is limited by issues related to affordability, infrastructure, and environmental risks. Government policies have not significantly improved housing accessibility, and private sector involvement appears to be more effective in ensuring housing quality. Future efforts should focus on improving affordability, addressing environmental challenges, and ensuring adequate infrastructure development to maximize the benefits of land reclamation for housing delivery.

Discussion

Perception of Land Reclamation

The findings presented in Table 2 provide critical insights into the perception and effectiveness of land reclamation strategies in South-South Nigeria. Findings show congruence and inconsistency with findings from existing research. Having a low weighted mean (WM) of 2.0, the study determined that afforestation is widely considered a poor land reclamation method. Only 22% of respondents were in favor of the idea that it has enhanced environmental sustainability. Adegbite et al. (2021) also found that afforestation activities in Nigeria tend to be plagued by a lack of funds, poor implementation, and poor monitoring, thereby rendering them ineffective in reviving the environment. This is in agreement with their findings. Olalekan et al. (2020) also noted that deforestation forces and weak enforcement practices have frustrated afforestation efforts within the Niger Delta region. This study provides merit to the assertion that afforestation, as good as it may have in theory regarding the environmental benefits, has produced no observable result in practice within the area. The study indicated that the restoration of wetlands has not been successful with the implementation of drainage and irrigation systems, as 83.8% disagreed and the WM was only at 1.8.

This aligns with the claims made by Ekeocha and Nwankwo (2019), who reported that the functioning of drainage systems in Nigeria is obstructed by the lack of good infrastructure and maintenance. Ogunbanwo et al. (2022) also posited that environmental degradation and poor management of water result in most irrigation projects failing in wetland zones. This study substantiates such concerns by showing that the South-South region indeed has real barriers to applying drainage and irrigation to land reclamation, despite these being potential practices. The study findings show that sand-filling is a recognized land reclamation exercise; a high WM of 3.0 and 79.3% of the respondents testified to its practice. Ibem and Amole (2020) settled that sand-filling is the most prevalent way of restoring degraded land, especially for urban development schemes. Sand-filling is also employed in building new residences and expanding existing facilities in Nigerian coastal regions, according to Adekola and Mitchell (2018). On the other hand, research by Olawale and Eze

(2021) advises that sand-filling too intensely can cause flooding, erosion, and the killing of marine animals. More work is required to determine the long-term sustainability of sand-filling, however, the existing results do affirm its popularity and apparent effectiveness. With 64.5% of the respondents agreeing and a WM of 2.8, the study revealed that transforming abandoned mining land into productive land is a moderately successful endeavor. As per what Nwosu et al. (2020) found, some abandoned Nigerian mines have been transformed into productive farms and new city centers. Despite the enhancement of reclamation in mines, Ajibola and Omotosho (2019) believe that soil contamination and recovery of ecosystems are still issues of concern.

Based on the findings that are prevalent presently, more needs to be done so that there is environmental sustainability even when there is an improvement in reclamation of mining sites. Land reclamation is thought to be backed by government policy by only 10.4% of the respondents to this survey, but the weighted average is merely 1.7. Ojo and Uche (2021) found that land reclamation in Nigeria lacked robust policy guidelines and enforcement; this aligned with their discovery. Moreover, having a low WM of 1.8, the study proved that only 17.2% of the respondents believed that community involvement is vital to restoration activities. Based on this, Afolayan et al. (2019) highlighted how community participation tends to be disregarded in land reclamation schemes in Nigeria, resulting in resistance, ineffectiveness, and poor long-term results. For the effectiveness of land reclamation schemes to be improved, the findings indicate that new policies and increased community participation are required. With a very low WM of 1.6 and only 7.3% of the respondents agreeing, the survey concluded that land reclamation has not actually raised agricultural productivity. The findings concur with those of Eze and Akpan (2020), who concluded that soil quality and environmental degradation on the majority of Nigeria's reclaimed lands make them unfit for agriculture. Land reclamation has not resulted in meaningful recovery of biodiversity, as the study indicates. Only 6% of the interviewees agreed, while the WM was 1.6. This offers credence to the claims presented by Adebayo et al. (2021), that biodiversity is negatively impacted by land reclamation due to the fact that it usually puts economic growth at the expense of ecological recovery.

With a WM of 1.8 and only 18% of the interviewees feeling that these interventions are useful, the study concluded that land rehabilitation by landfill and waste management was unsuccessful. Of particular interest is that waste management processes in Nigeria are inadequately regulated such that landfill reclamation operations (Chukwu and Emenike, 2019). According to Okonkwo et al. (2020), pollution is a common problem in reclaimed waste lands, thus reducing their worthiness for sustainable development. The most recent survey revealed that coastal reclamation through barrier construction and sand nourishment is not a popular practice, since only 0.8% of the respondents agreed and a very low WM of 1.5 was reported. Balogun et al. (2018) found that coastal reclamation in Nigeria is generally not successful because of insufficient funds and limited government action. In order to improve the efficiency of land reclamation in South-South Nigeria for agricultural and housing development, these results emphasize the importance of better policy enforcement, greater local community participation, and sustainable practices. The results of this Kruskal-Wallis H test are in agreement with existing literature on the efficiency of land

reclamation in Nigeria. Ibem & Amole (2020) and others have demonstrated that sand-filling is a highly sought-after approach to land stabilization because it acts rapidly and produces a significant impact ($H = 16.03$, $p = .00$). In accordance with the present study's result, Nwosu et al. (2020) also highlights the effective rehabilitation of retired mining areas ($H = 18.21$, $p = .01$). However, the insignificance of afforestation ($H = 3.12$, $p = .06$) and drainage techniques ($H = 6.11$, $p = .12$) corresponds with Ojo and Uche (2021), who critique their poor implementation in Nigeria.

Types of Housing in the Study Area

The findings on housing distribution in South-South Nigeria align with existing literature on housing development, urbanization, and socio-economic disparities in the region. The observed dominance of modern bungalows and duplexes in urban areas is consistent with studies by Akinbogun et al. (2021) and Olayiwola et al. (2019), who found that rapid urbanization and rising income levels contribute to the increasing prevalence of contemporary housing structures. The significant spatial difference in their distribution ($H = 19.42$, $p = .05$) reinforces these observations, highlighting urban-rural disparities in housing access and affordability. Informal settlements and slum dwellings remain prevalent in low-income areas, as reflected in the study findings (73.4% agreement, $WM = 2.9$). Informal housing persistence is the result of poor urban planning, high land prices, and ineffective government intervention, as noted by Ibem and Amole (2020). Slums also exist in high concentrations in peri-urban and low-income areas due to migration and a lack of adequate housing supply, as supported by UN-Habitat (2018) and statistically significant spatial heterogeneity ($H = 14.19$, $p = .00$). Ukoje and Kanu (2020) comprehensively investigate the importance of stilt houses among flood-risk communities and establish that 70.7% of riverine communities agree with this statement ($WM = 2.9$). Stilt houses showed the most spatial variability compared to building types ($H = 28.02$, $p = .01$), which indicates their geographical distinctiveness and justifies Ebies' (2019) claim that indigenous housing systems along coastal areas of Nigeria are attuned to natural environments.

In line with the trend noted by Olotuah and Bobadaye (2019), there has also been a rise in the occurrence of gated estates and top-end housing estates (71.7% agreement, $WM = 2.9$). The geographical concentration of such innovations in high-income urban centers has empirical support from the statistically significant geographical difference ($H = 19.45$, $p = .00$) and is aligned with Adedeji et al. (2021) study attributing the increase in luxury housing to high-net-worth individuals and off-shore investors in the housing sector. As 93.6% of the respondents did not concur that public housing projects provide proper accommodation, they received a low rating for effectiveness ($WM = 1.7$). This lends credence to the claims made by Adebayo (2020) and Ibem et al. (2013) that government-initiated housing projects in Nigeria are plagued by poor planning, rampant corruption, and general inefficiency. The overall failure of public housing programs in the area is suggested by the lack of extensive spatial variation ($H = 4.18$, $p = .08$), which is an indication of a broader national pattern of poor public housing provision (Olotuah, 2019). About ninety-two percent of the respondents did not concur that building projects have a tendency to utilize local resources ($WM = 1.7$). This is contrary to what Alagbe (2016) found, who explained the price and feasibility of locally produced materials. The fact that

there is little of a geographical gradient in the underutilization of local resources ($H = 4.13$, $p = .17$) suggests that this is an issue everywhere, perhaps because people prefer to use foreign materials and newer methods of construction. There was no statistically significant variation in housing infrastructure scores by locations ($H = 2.16$, $p = .21$), meaning that there was a moderate satisfaction of current building standards by areas ($WM = 2.1$). This is echoed by research findings of studies by Ede et al. (2019), showing some divergence in house quality with some areas providing superior infrastructure, while others contain inferior constructions with poor amenities. Finally, there was a remarkable degree of interest in houses constructed by the owners themselves (35.9% agreement, $WM = 2.2$), but the Kruskal-Wallis H test yielded nothing ($H = 0.23$, $p = .14$). As huge as the cost of construction is, and as inappropriate as existing mortgages are, self-construction is still the form of housing in Nigeria, a report carried out by Akinyode and Oluwatobi (2020) indicates.

Effects of Land Reclamation on Housing Delivery in the Study Area

The findings of this work align with existing studies on land reclamation and housing development in developing regions. Previous studies have shown that although land reclamation does provide more land, it does not necessarily translate to more affordable homes (Aigbavboa & Thwala, 2018; Olayiwola et al., 2019). As most of the respondents in this survey did not think that land reclamation made a significant impact on housing affordability ($WM = 1.5$) or availability ($WM = 1.8$). An earlier study by Zhang et al. (2021) revealed the same trend in other coastal towns where affordable housing is given lower priority than luxury housing on land reclamation. Engineered reclamation development increases stability of the land but is costly to construct (Li et al., 2020). The reclaimed land is suitable for long-term exploitation ($WM = 2.8$), as per this observation. This research suggests that, despite this potential, modern residential developments over reclaimed land continue to be underdeveloped ($WM = 1.9$), in conformity with the problems concerning land tenure security and ineffective regulation reported by Adegun (2020).

Land reclamation's environmental impact is a notable discovery ($WM = 3.2$). This concurs with a report by UNEP (2021) and Nwilo et al. (2018), indicating the potential for ecological issues the practice poses, including flooding, erosion, and biodiversity loss. Obinna et al. (2019) contend that a lack of regulatory implementation in Nigeria's urban land markets tends to drive biased development towards high-end housing developments, which aligns with the argument that land reclamation favors high-income segments ($WM = 3.0$). The findings also highlight governance challenges, with respondents perceiving land reclamation policies as ineffective in promoting housing accessibility ($WM = 1.7$). This aligns with past studies (Omirin & Antwi, 2020) that critique the lack of inclusive urban planning strategies in Nigeria's housing sector. Similarly, tenure security issues ($WM = 3.1$) reflect broader concerns about land ownership conflicts in reclaimed areas, as noted by Akinola (2018).

Effectiveness of Land Reclamation on Housing Delivery in the Study Area

Findings suggest that land reclamation has not significantly increased land availability for housing development ($WM = 1.7$) or reduced housing costs ($WM = 1.5$). This aligns with studies by

Olayiwola et al. (2019) and Aigbavboa & Thwala (2018), who argue that while land reclamation expands land resources, it often caters to high-end real estate, leaving affordability unaddressed. Zhang et al. (2021) also emphasize that reclaimed land in developing economies is often commercialized, limiting its impact on affordable housing. The study finds that government policies on land reclamation have not significantly improved housing delivery (WM = 1.5). This is supported by Akinola (2018) and Omirin & Antwi (2020), who both lament the absence of inclusive housing policies that focus on low-income earners and the ineffectiveness of urban administration in Nigeria. This supports the argument that ineffective regulations make it more difficult to distribute reclaimed land.

Findings by Nwilo et al. (2018) and UNEP (2021), highlighting problems such as subsidence, flooding, and inefficient drainage networks in reclamation areas, are supported through their high value on environmental concern (WM = 2.1) as well as unavailability (WM = 1.6). Such research provides evidence that most Nigerian reclamation areas fail to conduct EIAs appropriately, placing the sustainability of the projects in jeopardy. Private investment was discovered to enhance housing quality in reclaimed land (WM = 3.0), contrary to earlier research showing no private sector involvement in affordable housing (Obinna et al., 2019; Adegun, 2020). While it's true that the private sector may determine the level of housing quality to be higher, it is usually relegated to more costly projects (Li et al., 2020). This gap raises the possibility that private sector involvement in South-South Nigeria is enhancing structural resilience without necessarily correspondingly improving affordability. In contrast to Obinna et al.'s (2019) claims that investors are discouraged from investing due to ambiguous land tenure laws, there has been a moderate increase in investment in recovered housing (WM = 2.6). This suggests that while investments are occurring, they may be concentrated in high-income developments rather than broad-based affordable housing initiatives. Findings in this study strongly align with literature that highlights affordability constraints, governance failures, and environmental risks associated with land reclamation.

Conclusion and Recommendations

Undoubtedly, land reclamation has increased land availability, but largely benefited high-end real estate, failing to improve housing affordability for the broader population. The environmental implications of reclamation, including biodiversity loss and increased vulnerability to flooding, also underscore the need for more robust policy guidelines and enhanced regulatory enforcement. In order for land reclamation to contribute meaningfully to sustainable housing development, greater policy intervention, increased private and community investment, and a concerted focus on environmental sustainability alongside urban growth are recommended.

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