

Spatial Analysis of Hazards, Vulnerability and Risk Characterisations of Markets on the Highway in the South-south Geopolitical Zone of Nigeria

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ABSTRACT: The study examined the spatial analysis of hazards, vulnerability and risk characterizations of markets highway in the South-south geopolitical zone of Nigeria. Thirty four markets along the East West way were purposively selected for the study and three hundred and forty four copies of questionnaire were used for the data collection. Observations and interview were done to have the good understanding of each market with respect to hazard and vulnerability factors which are used to determine the risk levels of individual markets using multi-criteria analyses. Descriptive statistics were used for data analyses. The results showed that 8.8% of markets are encountered with low hazard, 61.8% are encountered with moderate hazard and 29.4% of the total markets are encountered with high hazard in the study area. The total vulnerability levels of the markets shows that 35.3% were ranked lowly vulnerable, 58.8% were ranked moderately vulnerable and 5.9% were ranked highly vulnerable. It was recorded that 23.5% of total markets were classified to be lowly risky, 61.8% were moderately risky and 14.7% were highly risky. The study concluded that markets at high risk included Akumani, Mbiama, Amukpen Junction-Sapele, Santana and Ologbo-Okha. It was recommended among others that markets on the highway should be relocated to better and safe locations to avert loss of lives and properties whenever there is any road accident or fire accident; and periodic studies should be done and extended to minor roads which can call for future comparative studies in any location.

Keywords: Hazards, Vulnerability, Risk, Multi-criteria, Markets, South-south

I. INTRODUCTION

Road network as one of the most oldest foundation involves huge locality in modernisation, sustainable development turn of events, and day by day exercises in antiquated and present day times (Al-dami, 2015). Accordingly, excellent roads and

great connectivity would improve public economic yield, decrease trip time and cost, and make the planning areas all the more financially appealing and viable (Ogunsanya, 2016). Reports that a market is key to the financial, social, religious and political existence of individuals; focusing further that, regardless of poor recognition given to showcase advancement in the post-independence time frames, it promotes the integration of production and utilization platforms of the economies on which they stand (Ayo-Odifiri et al., 2017). Roads are expanding globally at an exceptional rate, both in total length and spatial extent (Laurance and Balmford, 2013; Laurance et al., 2014; Alamgir, et al., 2017). The length of legally sanctioned roads has increased by 12 million km world-wide since 2000 (Dulac, 2013), with a further 25 million km of additional paved roads expected by 2050 (Dulac, 2013; Alexander, 2014). To support this dramatic expansion, the G20 industrial nations have asserted that US\$70 trillion in funding will be needed by 2030 for new roads and other infrastructure, which would more than double global investments in infrastructure to date (Alexander, 2014).

Market as indicated by World Bank (2009) is portrayed as any organizations, framework, social relations, methodology and foundation set up to empower businesses sell their merchandise, services and work in return of cash to individuals. Market is fundamental in the financial existence of individuals, and they are essential in the conveyance of commodity. Notwithstanding, commercial exercises are fundamental in the sustenance of any town or city of today, which anyway makes market irreplaceable. Exchange between individuals is practical on the grounds that it makes life go on (Fakere and Fadamiro, 2012).

Fadamiro (2005) and Osoja (2019) thought that the quick development of metropolitan focuses has created various management issue, which some can be followed to its origin. The most

importance of this issues are the infringement of open market spaces and well-being related issues which incorporate solid waste management challenges, water supply, gridlock, housing and water contamination respectively. Fadamiro (2005) recognizes open spaces and roads by market focuses infringement as probably the greatest challenges tormenting Nigeria metropolitan centres in recent times. It is subsequently critical to take note of that these difficulties can be followed to lack of common sense of market climate. Numerous markets sectors spring up in heedless way in closeness to major roads in the urban areas, which anyway obstruct the free progression of traffic, consequently upsetting metropolitan functionality and aesthetic qualities in the urban settings. Fakere and Fadamiro (2012) additionally settled that proper siting and arranging of business sectors will massively extend the picture of the city, and furthermore empower free progression of business exercises. Gbadamosi (2004) recognizes the huge significance of transportation in every day exercises of person, and it is hard to consider a circumstance where transportation doesn't assume huge part in the existence of any person. Subsequently, transportations help in the accomplishment of the essential goals of living in the city which includes the utilitarian productivity of land uses, services and improvement, infrastructure in the personal satisfaction. The horizontal and vertical spreads of any city are reliant upon the nature and capacity of transportation framework. Hence, the spread and the nature of transportation between land uses and places in communities and inseparably bound with the vehicle system, which is likewise directly connected with planning framework (Osoja, 2019).

Risk can be understood as the probability of adverse effects, and (disaster) risk management is thus seen as the reduction of that probability in order to minimize or prevent those adverse effects.

The way in which different research communities and stakeholders define risk dictates how risk management is addressed. Slovic (1999) stated that whoever controls the definition of risk controls the rational solution to the problem at hand. If risk is defined one way, the one option will rise to the top as the most cost-effective or the safest or the best. If it is defined another way, perhaps incorporating qualitative characteristics and other contextual factors, one will likely get a different ordering of action solutions. According to Adeleye and Olayiwola (2016), cities and towns like any human settlement are subject to various types of forces, physical, economic, social and administrative which influence their forms and structure. The application of town planning tools such as contained in the building regulations and subdivision bye-laws of the local government could help to coordinate the various forces and consequently ensure a disaster free environment. Studies on the hazard, vulnerability and risk of market situated on the road have been carried out in few corridors of academics especially in the Niger Delta Region. Therefore the study examined the spatial analysis of hazards, vulnerability and risk characterisations of markets on the highway in the South-south Geopolitical Zone of Nigeria

II. MATERIALS AND METHODS

The study area lies within the South-south region of Nigeria. The South-south region comprises the area covered by the natural delta of the Niger River and the areas to the East and West, which also produce oil. The region is located between latitudes $4^{\circ}10'N$ and $7^{\circ}35'N$ and longitude $5^{\circ}30'E$ and $9^{\circ}25'E$ (Figure 1). The zone is approximately 112,110sq km and consists of 6 States namely; Bayelsa, Rivers, Akwa Ibom, Cross River, Edo and Delta States (BRACED).



Figure 1: Study Area States in South-south Region of Nigeria

The climate of the area could be classified as humid because it is found within the humid tropics (Abam, 2001). The key climate variable is rainfall which has spatial variation in the study area. There are two seasons; wet and dry. The dry season is from November to February, while the wet season is between March and October (Musa et al., 2014). During the rainy season, the rainfall could be very high and amounts to over 3500mm per annum (Okhakhu, 2013; Solomon-Ayeh et al., 2015). The area experiences heavy rainfall with storms that are conventional in nature due to the region's proximity to the Equatorial Belt. The South-South Region experiences a double rainfall maximum characterized by two high rainfall peaks with a short dry season and a longer dry season falling between and after each peak. The first rainy season begins around March and lasts to the end of July with a peak in June, this rainy season is followed by a short dry break in August known as August break which is a short dry season lasting for two or three weeks in August. This break is broken by the short rainy season starting around September and lasting till mid-October. The ending of the rainy season is followed by long dry season which starts from late October and lasts till early March with peak dry conditions between early December and late February. Annual rainfall totals vary from 2400 to over 4000mm in the region (Okafor, 2010). Relief of the South-south Region of Nigeria is generally that of lowland flood plains classified as the coastal Margins and swamps that lie adjacent to the seas. This runs along a coastal strip of land below 30m made of recent deposits of sands, clay and mud. The region is also drained by the Niger River (Iloeje, 2001; Areogheore, 2010). The topography of the South-south region is gently sloping lowland which is less than 10° in most areas and the highest part of the lowland which is well drained from mosaic with altitude between 15 and 25 meters (Musa et al., 2014).

The South-south Region of Nigeria consists of soils of Southern Belts of forest soils and a zone of alluvial soils. Soils in the South-South Region of Nigeria are characterized by humid tropical forest climate zone of the south with wet season and dense forest cover. The coastal area of the South-South Region of Nigeria is dominated by a zone of alluvial soils found on the flooded plains and deltas of river Niger. It is made up of the fresh-water soil of grey to white sand, grey clay and sandy humid topsoil (Iloeje, 2001; Areogheore, 2010). The South-south Region is densely populated with over 30 million people, majority of who reside in the urban centers. It has more than forty ethnic groups, some of which are Ijaw, Efik,

Kalabari, Annang, Urhobo and Itsekiri. Between them they speak close to 250 languages (Okhakhu, 2013). Prior to the advent of crude oil and gas explorations which paved way to urbanization, occupational focus in the region was mainly agriculture, highlighted by fishing. Farming, Fishing and coastal trading were the main occupation of the people of the area providing a means of livelihood (Okhakhu, 2013). Presently, the presence of the industries dealing in oil and gas have dominated and created a wide range of other occupations associated with the industry. According to Ukiwo (2009) unemployment is rated at about 8.8%, while underdevelopment level is about 26.2%. Due to the increase in population, some social challenges such as pipeline vandalism, robbery and kidnapping confront the region (Watts, 2008). The hazard and vulnerability mapping were generated through the observation and general interview method which are later reclassified to high, moderate and low for the hazard, vulnerability and risk. The total number of markets that fell into each of the classes in hazard, vulnerability and risk were aggregated using multi-criteria analysis and their percentage were computed and reported.

III. RESULTS AND DISCUSSIONS

Hazards Characterisation Rates of Roads in the Entire Study Area

The descriptions of individual hazard component used in assessing the road are presented in this section. Table 1 reveals the road work or construction which may serve as hazard along the road for the markets located on the highway. Of the total market, it was observed that 50% had the potential of having the hazard of road construction and 50% did not have. Concerning the tendency of being affected by floods, 82.4% of the total markets were observed to be affected while 17.6% would not be affected. Incessant traffic accident presents that 41.2% of the markets always experience this hazard while 58.8% rarely experience it. Hazard caused by blockages from the storm or heavy rainfall is shown that 94.1% of the markets would encounter this problem while 5.9% will not have the problem. Accidents with hazardous goods revealed that 88.2% of markets are liable to be confronted with this hazard and 11.8% may not. Analysis showing that pot holes or physical collapse along the road may constitute a hazard for the smooth operation of markets along the highway and it is being realized that only 38.2% of the total market may face this problem while 61.8% may not. For the bridge openings, it is shown in that 32.4% of markets may encounter this hazard in a

lowly way while 67.6% may be affected in a highly way. Tyre blowout is another hazard and the analysis reveals that 64.7% would have lowly hazard and 35.3% of total markets would be rarely or moderately affected. The total number of vehicles per market day can constitute hazard for the market and it is presented in Table 1 that 73.5% of the markets would be on low hazard while, 14.7% would be on moderate hazard and 11.8% would be on high hazard. The types of vehicles also are observed to constitute hazard on the market day and the analysis reveals that 2.9% of the markets would be affected by bicycles in which the hazard rate was low while cars and buses were to be encountered by 79.4% and are ranked to have moderate hazard and large trucks and trailers are going to be encountered by 17.6% of the markets and are ranked to be high hazards. The type of road with respect to dualised or not dualised is shown in Table 1 and it is revealed that 88.2% of the markets were found in the good dualised portion of the east west road while 2.9% were found in the single type of road and 8.8% were found in the dualised road

type that are not in good condition. Furthermore, in terms of speed limit around individual market, it is shown in Table 1 that the speed limit maximum of 40 km/hr. is found in 38.2% of the markets and are ranked low hazards while 8.8% were found between 41 and 60 km/hr. and are ranked moderate hazard and 52.6% of the markets would experience between 61-80 km/hr. and are ranked high hazard. This may be possible because of the larger portion of the road that is being dualised. The number of vehicles in relation to their appearances and age shows that vehicles are categorized into different classes based on their look and possible number of years they might have been put on the road for use. The analysis showed that 8.8% of the markets are witnessing the presence of vehicles that had been on the road since last 20 years while 91.2% of the markets witnessed the presence of vehicles that had been subjected for use in the road since last 10 years which are ranked to be moderate hazard because of the limited speed that the driver can subject that kind of vehicle to.

Table 1: Road work/ Construction

Response	Frequency	Percentage (%)	Hazard Rate	Hazard Value
No	17	50.0	Low	1
Yes	17	50.0	High	2
Total	34	100.0		
Tendency of Floods	Frequency	Percentage (%)	Hazard Rate	Hazard Value
No	6	17.6	Low	1
Yes	28	82.4	High	2
Total	34	100.0		
Incessant Traffic Accident	Frequency	Percentage (%)	Hazard Rate	Hazard Value
Rare	20	58.8	Moderate	1
Always	14	41.2	High	2
Total	34	100.0		
Visibility problem due to haze or fog	Frequency	Percentage (%)	Hazard Rate	Hazard Value
Yes	34	100.0	High	2
Total	34	100.0		
Blockage caused by storms heavy rainfall	Frequency	Percentage (%)	Hazard Rate	Hazard Value
No	2	5.9	Low	1
Yes	32	94.1	High	2
Total	34	100.0		
Accidents with hazardous goods	Frequency	Percentage (%)	Hazard Rate	Hazard Value
No	4	11.8	Low	1
Yes	30	88.2	High	2
Total	34	100.0		
Physical collapses/pot holes	Frequency	Percentage (%)	Hazard Rate	Hazard Value

No	21	61.8	Low	1
Yes	13	38.2	High	3
Total	34	100.0		
Bridge openings	Frequency	Percentage (%)	Hazard Rate	Hazard Value
No	11	32.4	Low	1
Yes	23	67.6	High	3
Total	34	100.0		
Tyre Blowout	Frequency	Percentage (%)	Hazard Rate	Hazard Value
None	22	64.7	Low	1
Rare	12	35.3	Moderate	2
Total	34	100.0		
Number of vehicles per market day	Frequency	Percentage (%)	Hazard Rate	Hazard Value
0-20	3	8.8	Low	1
21-40	22	64.7	Low	1
41-60	5	14.7	Moderate	2
61-80	2	5.9	High	3
81-100	2	5.9	High	3
Total	34	100.0		
Types of Vehicles	Frequency	Percentage (%)	Hazard Rate	Hazard Value
Bicycles	1	2.9	Low	1
Cars	8	23.5	Moderate	2
Buses	19	55.9	Moderate	2
Large Trucks	3	8.8	High	3
Trailers	3	8.8	High	3
Total	34	100.0		
Road Type	Frequency	Percentage (%)	Hazard Rate	Hazard Value
Dualised	30	88.2	Low	1
Single	1	2.9	Moderate	2
Dualised but not good	3	8.8	High	3
Total	34	100.0		
Speed Limit (km/hour)	Frequency	Percentage (%)	Hazard Rate	Hazard Value
0-20	1	2.9	Low	1
21-40	12	35.3	Low	1
41-60	3	8.8	Moderate	2
61-80	18	52.9	High	3
Total	34	100.0		
Number of vehicles in relation to their appearances	Frequency	Percentage (%)	Hazard Rate	Hazard Value
Used in Nigeria for 20 years	3	8.8	Low	1
Used in Nigeria for 10 years	31	91.2	Moderate	2
Total	34	100.0		

Hazard Rate of Each Market in the Study Area

The analysis in Table 2 reveals that markets such as Alakahia, Choba, and Rumuosi would be encountered with low hazard while Elele Alimini Market, Ikot-Ikom Market, Ikot Osute Market, Ediene Ikot Iyang Market, Ndon Eyo

Market Eket and Afaha Akai Market are placed to be on moderate hazard and Ugbenu Market, Sapele, Ologbo Market Okha and Santana Market are placed to have high hazard. These are also reflected in Figure2. In the summary as highlighted in Table 3 it is shown that 8.8% of markets are encountered

with low hazard, 61.8% are encountered with moderate hazard and 29.4% of the total markets are encountered with high hazard in the study area.

Table 2: Hazard Rate of Each Market in the Study Area

S/N	Location	Hazard Rate
1	Ahoda	High
2	Alakahia	Low
3	Choba	Low
4	Elele Alumini	Moderate
5	Oil-mill	Moderate
6	Rumuji	Moderate
7	Rumuokoro	Moderate
8	Rumuosi market	Low
9	Mbiama Market	High
10	Akumani	High
11	Amukpen Junction, Sapele	High
12	Efurun Market Warri	Moderate
13	Mami Market Warri	Moderate
14	Mosoghar Garri Market	Moderate
15	Ogor Market, Ughelli	Moderate
16	Patani Market	Moderate
17	Ugbenu Market, Koko Junction, Oghara	High
18	Ukan Market Agbarho	Moderate
19	Ikpoba-Oregbeni Market	Moderate
20	Oba Market Ekioba	Moderate
21	Ologbo Market, Okha	High
22	Santana Market	High
23	Uselu Market	Moderate
24	Ikot-Ikom Market	Moderate
25	Ikot Osute Market	Moderate
26	Ediene Ikot Iyang Market	Moderate
27	Ndon Eyo Market Eket	Moderate
28	Afaha Akai Market Ikot Nkebek	Moderate
29	Udua Uka Market Eket	High
30	Oron Market	Moderate
31	Oron Shore Market	Moderate
32	Ukot Akan Market	Moderate
33	Timber Market	High
34	Aduwawa	High

Table 3: Summary of Total Hazard Rates

Rate	Frequency	Percentage (%)
Low	3	8.8
Moderate	21	61.8
High	10	29.4

Total 34 100.0

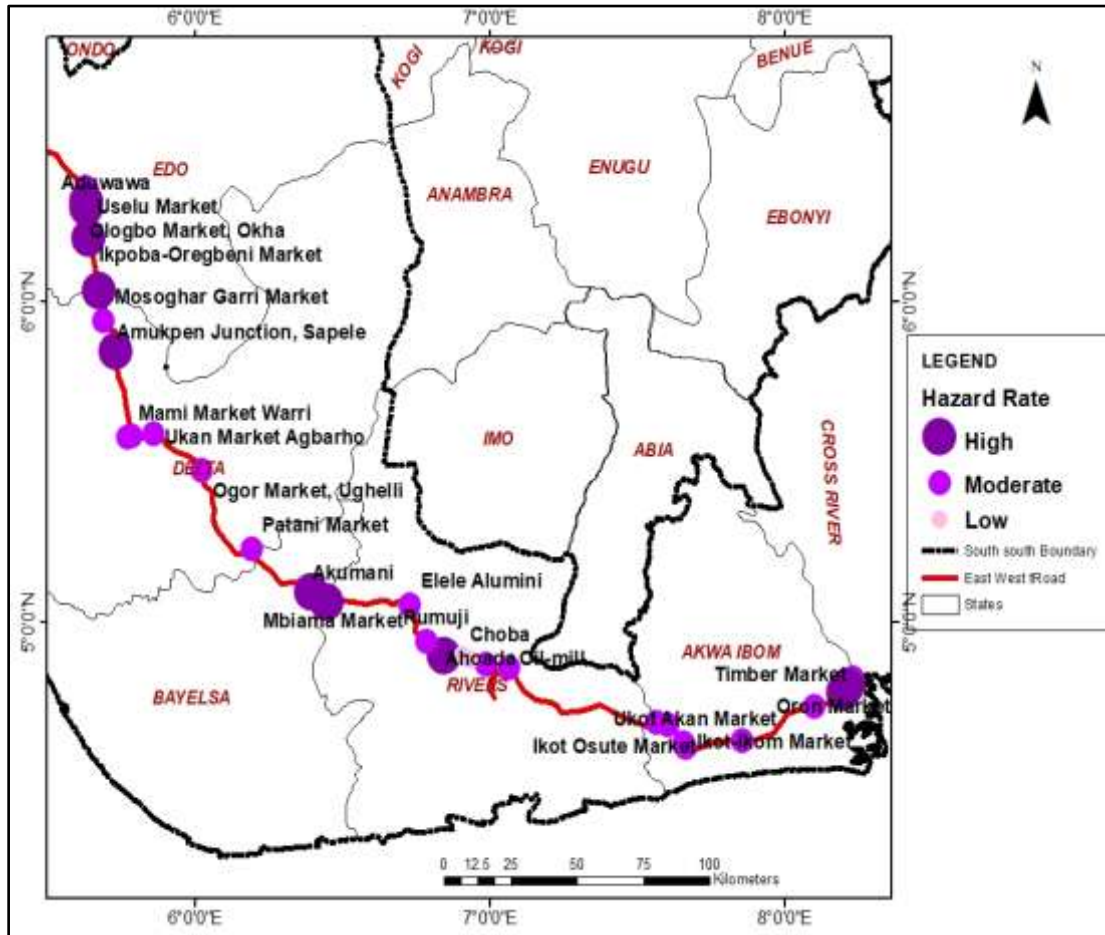


Figure 2: General Hazard Rates of Markets along the East West Highway

Vulnerability of Markets on the East West Highway

The vulnerability levels of different factors are discussed in the section. It is shown in Table 4 that 8.8% of the markets had a distance that was a bit far from the highway and they are categorized to low vulnerability while 41.2% were moderately vulnerable because they are just close to the road while 50% were very close to the road and they are classified to be highly vulnerable.

However, 8.8% of market had no congestion and they are ranked to be low vulnerability, 41.2% were rarely experiencing traffic congestion and thus they are franked to be moderately vulnerable and 50% always experience traffic congestion and they are ranked to be highly vulnerable. The presence of heaps of refuse can subject a market to be highly vulnerable to problem. Also, in this regards, analysis in Table 4 showed that 67.6% are ranked to be lowly

vulnerable while 32.4% were ranked to be highly vulnerable. The infrastructural facilities in the market are found to constitute certain vulnerability depending on their level of provision. As a result, 82.4% of the markets are not adequately provided with necessary infrastructural facilities and they are ranked moderately vulnerable while 17.6% did not have any infrastructural facilities (Table 4). The information concerning the poor road regulation and enforcement in the analysis shows that it was fair with 85.3% of the markets which are ranked moderately vulnerable. However, 8.8% of the markets were ranked have good assessment with respect to the road regulations and they are ranked lowly vulnerable while 5.9% are poor and are ranked highly vulnerable. The presence of potholes are found in the study area saw 85.3% of the market free from having pot holes around them but they are ranked lowly vulnerable while 14.7% had pot holes and they are ranked highly

vulnerable. The design of the market which tends to regulate the functions of the market is found in the analysis and it is shown that 17.6% of the markets were adequately designed and they are ranked with low vulnerability, 73.5% were not adequately designed and they are ranked moderately vulnerable while 8.8% were not designed at all and they are ranked with high vulnerability. The rate of rehabilitation of road around the markets on the highway is taken as one of the factors of vulnerability which is being revealed in the analysis. It is observed that 11.8% do not really

encounter with rehabilitation and they are ranked lowly vulnerable. Furthermore, 73.5% of the markets were rarely experiencing road rehabilitation and they are ranked moderately vulnerable while only 14.7% of the markets always experience road rehabilitations and they are ranked highly vulnerable. The parking facility analysis reveals that 5.9% of the markets had parking spaces while 94.1% did not have. This shows that the lower proportion of the markets have parking space and this have made the roads to be always filled with cars on the highways during the market days.

Table 4: Factors of Vulnerability

Distance to Highway	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
Far	3	8.8	Low	1
Close	14	41.2	Moderate	2
Very close	17	50.0	High	3
Total	34	100.0		
Traffic Congestion	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
No congestion	3	8.8	Low	1
Rare	14	41.2	Moderate	2
Always	17	50.0	High	3
Total	34	100.0		
Presence of heaps of heaps	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
None	23	67.6	Low	1
Yes	11	32.4	High	3
Total	34	100.0		
Infrastructural facilities	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
Not adequately found	28	82.4	Moderate	2
Not Found	6	17.6	High	3
Total	34	100.0		
Presence of pot holes	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
Not present	29	85.3	Low	1
Present	5	14.7	High	3
Total	34	100.0		
Market Designs	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
Adequate	6	17.6	Low	1
Not adequate	25	73.5	Moderate	2
No design	3	8.8	High	3
Total	34	100.0		
Rate of Road Rehabilitation	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value
No rehabilitation	4	11.8	Low	1
Rare	25	73.5	Moderate	2
Always	5	14.7	High	3
Total	34	100.0		
Presence of	Frequency	Percentage (%)	Vulnerability Rate	Vulnerability value

Parking Facility			Rate	
Present	2	5.9	1	Low
Not present	32	94.1	0	High
Total	34	100.0		

The vulnerability level of individual market is shown in Table 5 and it reveals that markets like Ahoada, Alakahia, Choba, Rumuosi, Effurun, Mami Market Warri, Mosghar Garri Market, Ukan Market and Oba Market, Ekioba are

lowly vulnerable. Markets such as Ogor Market in Ughelli, Patani Market, Ugbenu Market, Oghara, Elele Alimini, Oil mill and Rumuji are moderately vulnerable while Mbiama and Akumani Markets are highly vulnerable.

Table 5. Vulnerability of each Market in the Study Area

S/N	Location	Vulnerability
1	Ahoada	Low
2	Alakahia	Low
3	Choba	Low
4	Elele Alumini	Moderate
5	Oil-mill	Moderate
6	Rumuji	Moderate
7	Rumuokoro	Moderate
8	Rumuosi market	Low
9	Mbiama Market	High
10	Akumani	High
11	Amukpen Junction, Sapele	Moderate
12	Efurun Market Warri	Low
13	Mami Market Warri	Low
14	Mosoghar Garri Market	Low
15	Ogor Market, Ughelli	Moderate
16	Patani Market	Moderate
17	Ugbenu Market, Koko Junction, Oghara	Moderate
18	Ukan Market Agbarho	Low
19	Ikpoba-Oregbeni Market	Moderate
20	Oba Market Ekioba	Low
21	Ologbo Market, Okha	Moderate
22	Santana Market	Moderate
23	Uselu Market	Moderate
24	Ikot-Ikom Market	Moderate
25	Ikot Osute Market	Moderate
26	Ediene Ikot Iyang Market	Moderate
27	Ndon Eyo Market Eket	Moderate
28	Afaha Akai Market Ikot Nkebek	Low
29	Udua Uka Market Eket	Moderate
30	Oron Market	Moderate
31	Oron Shore Market	Moderate
32	Ukot Akan Market	Low

33	Timber Market	Moderate
34	Aduwawa	Low

The total summary of total vulnerability levels of the markets along the East-West Road is given in Table 6 whereby 35.3% were ranked lowly

vulnerable, 58.8% were ranked moderately vulnerable and 5.9% were ranked highly vulnerable.

Table 6. Summary of Total Vulnerability Rates

Rate	Frequency	Percentage (%)
Low	12	35.3
Moderate	20	58.8
High	2	5.9
Total	34	100.0

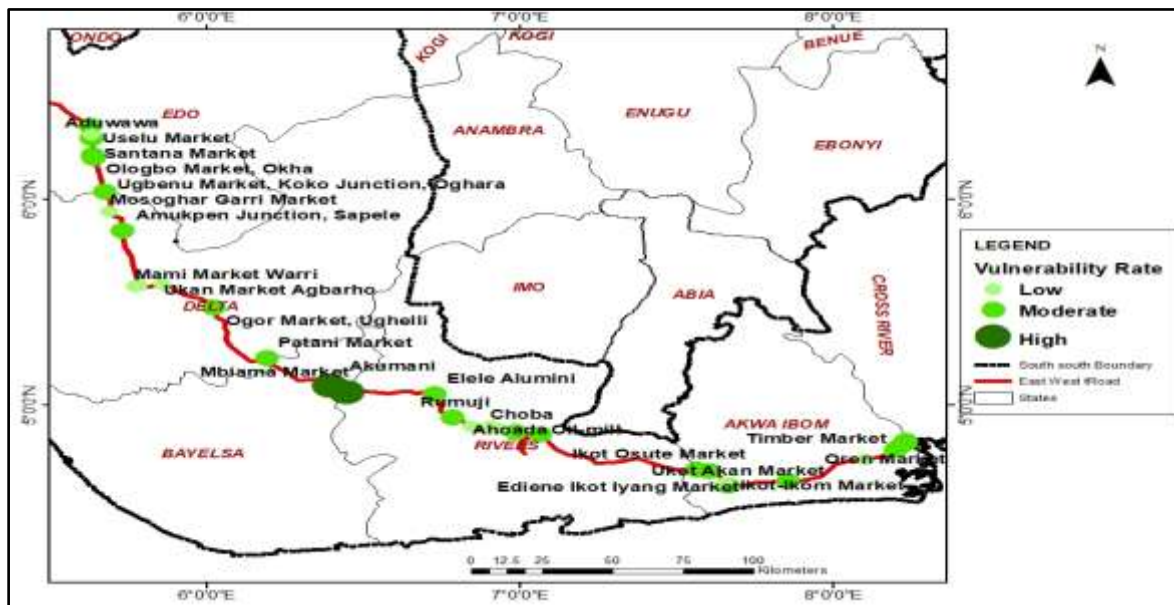


Figure 3: Total Vulnerability Levels of Markets–West in the East Highway

Risk Levels of Markets on the East West Highway

The total risk level of markets along the road is presented in Table 7 whereby markets like Alakahia, Choba, Rumuosi, Efurun Market, Mami Market, Ukna Market and Afaha Akai Market were

lowly risky, Elele Alimini, oil Mill, Rumuji, Rumuokoro, Mosoghar, Ogor, Patani, Ugbenu and Uselu were classified as moderately risky while Akumani, Mbiana, Amukpen, Ologbo Market and Santana were highly risky.

Table 7: Risk Analysis of Individual Market in the Study Area

SN	Location	Risk
1	Ahoda	Moderate
2	Alakahia	Low
3	Choba	Low
4	Elele Alumini	Moderate
5	Oil-mill	Moderate
6	Rumuji	Moderate
7	Rumuokoro	Moderate

8	Rumuosi market	Low
9	Mbiama Market	High
10	Akumani	High
11	Amukpen Junction, Sapele	High
12	Efurun Market Warri	Low
13	Mami Market Warri	Low
14	Mosoghar Garri Market	Moderate
15	Ogor Market, Ughelli	Moderate
16	Patani Market	Moderate
17	Ugbenu Market, Koko Junction, Oghara	Moderate
18	Ukan Market Agbarho	Low
19	Ikpoba-Oregbeni Market	Moderate
20	Oba Market Ekioba	Moderate
21	Ologbo Market, Okha	High
22	Santana Market	High
23	Uselu Market	Moderate
24	Ikot-Ikom Market	Moderate
25	Ikot Osute Market	Moderate
26	Ediene Ikot Iyang Market	Moderate
27	Ndon Eyo Market Eket	Moderate
28	Afaha Akai Market Ikot Nkebek	Low
29	Udua Uka Market Eket	Moderate
30	Oron Market	Moderate
31	Oron Shore Market	Moderate
32	Ukot Akan Market	Low
33	Timber Market	Moderate
34	Aduwawa	Moderate

However in Table 8, it is recorded 23.5% of total markets were classified to be lowly risky along the East West Highway, 61.8% were moderately risky and 14.7% were highly risky.

Parts of those that are highly vulnerable included the Akumani and Mbiama which is always obvious in the market days.

Table 8: Summary of Risk Rate of Market

Risk Rates	Frequency	Percentage (%)
Low	8	23.5
Moderate	21	61.8
High	5	14.7
Total	34	100.0

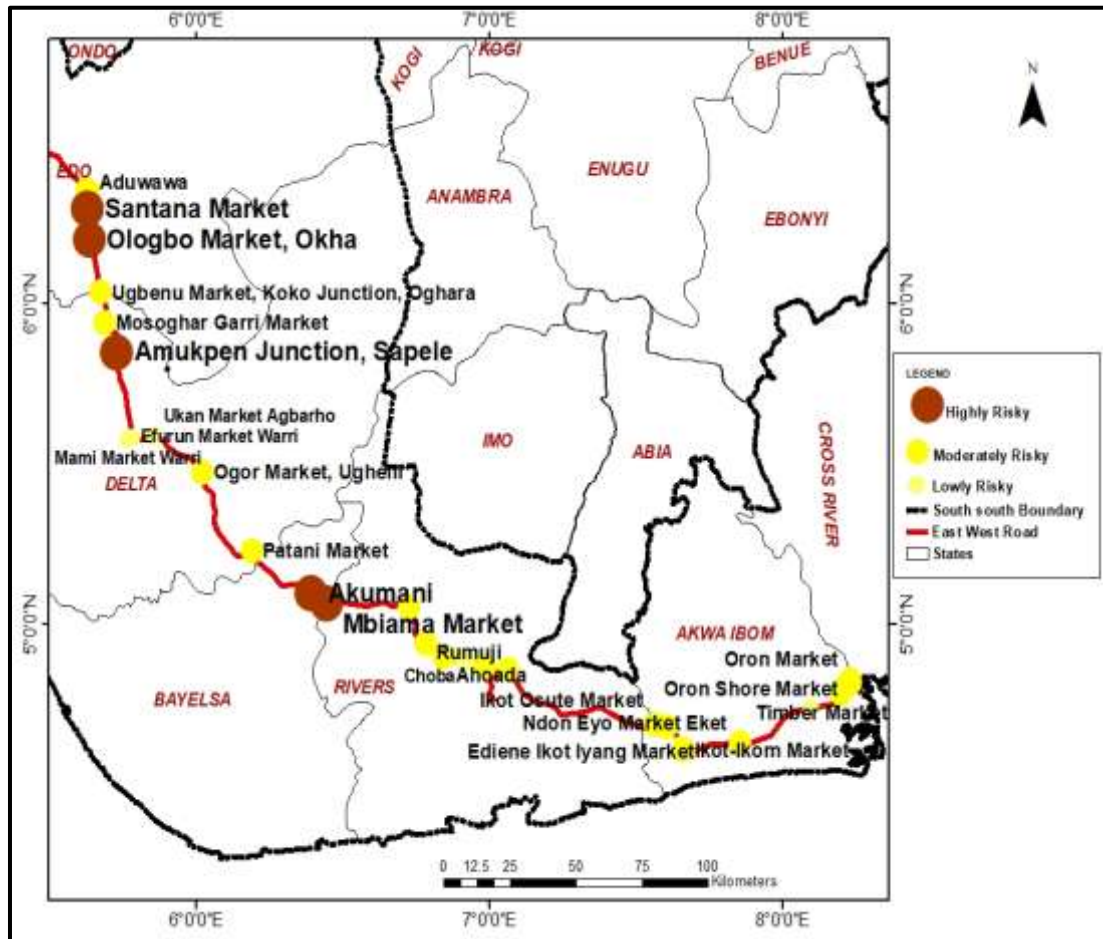


Figure 4: Total Risk Levels of Markets in the East–West Highway

IV. CONCLUSION AND RECOMMENDATIONS

The study can be concluded that the market place is made up of petty theft and robbery. Markets at high risk included Akumani, Mbiama, Amukpen Junction-Sapele, Santana and Ologbo-Okha.

Based on the findings, the study recommended that the markets on the highway should be relocated to better and safe locations to avert loss of lives and properties whenever there is any road accident or fire accident; the environmental health of the markets should be brought to a better one by making provisions for the poorly found facilities such as firefighting, evacuation plan, lighting, emergency preparedness plan, parking facility, wall, fire extinguisher, health post, security presence, water supply, toilets, tall trees and bathrooms. Also, all other facilities such as pedestrian walkway, street nomenclature, surrounding cleanliness, that are fairly present in the markets should be adequately provided and periodic studies should be done and extended to

minor roads which can call for future comparative studies in any location.

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