Journal of Contemporary Research in the Built Environment ISSN: 2636-4468
Volume 1, Number 2, September 2017

ASSESSMENT OF EFFECTS OF ROAD CONNECTIVITY PATTERN ON THE PHYSICAL DEVELOPMENT IN AKWA IBOM STATE

Victor Umoren[1] and Usen Inyangmme[2]
[1&2]Department of Urban and Regional Planning, University of Uyo, Uyo, Nigeria

ABSTRACT

Purpose: Assessing the general circulation system in Akwa Ibom State cannot be overemphasized. This study aimed at assessing the effect of road connectivity pattern on the physical development in the study area.
Design/methodology/approach: To achieve this, two sets of data on road connectivity and physical development were collected. These involves data on the length of roads in each local government area were computed i.e. the independent variable (x) and data on the level of physical development in each local government area was collected. This centered on physical infrastructure available in these areas which was considered on 16 measurable variables i.e. dependent variables (y): data collected were analysed using descriptive statistics and Pearson Product Moment Correlation.
Findings: The result revealed that there is positive relationship between road connectivity and physical development. This means that as connectivity increases M = 1.0727, physical development also increases M = 35.267. It indicates that the relationship is statistically significant r = 0.898 $p < 0.05$, R^2 0.86 indicates about 86% of the variation in physical development is related to road connectivity.
Originality/value: It was conclude that road connectivity level has a positive relationship with physical development in Akwa Ibom State. It was also established that about 86% of the growth that occurs in the physical development in the study area is derived from the increase in the road connectivity level in the study area. It was observed that there were some lagging areas in road connectivity. The study recommended that there should be increased in road connectivity in the lagging areas to increase physical development in the area.

Keywords: Road; connectivity; physical development; effects

1. INTRODUCTION

Transportation is a vital element in the regional development of any country, state or city. It is an important part of societal development (Gauthier, 1973). The level of transportation facilities of any nation determines the potency of the socio-economic wellbeing of that nation. Man, nations, regions and the world would be severely limited

[1]vicmoor2000@yahoo.com

in physical development without transportation, which is a key factor for physical and economic growth (Oyesiku, 2002). Property and land values tend to increase in areas with expanding transportation networks, and increase less rapidly in areas without such improvements. Rapid and continued rise in housing and land prices are expected in cities with transportation improvements and rapid economic and population growth (Goldberg, 1970).

According to Bailey, Mokhtarian and Little (2008), transportation route is part of distinct development pattern or road network and mostly described by regular street patterns as an indispensable factor of human existence, physical development and civilization. The route network coupled with increased transport investment result in changed levels of accessibility reflected through Cost Benefit Analysis, savings in travel time, and other benefits. These benefits are noticeable in increased catchment areas for services and facilities like shops, schools, offices, banks, and leisure activities. Road networks are observed in terms of its components of accessibility, connectivity, traffic density, level of service, compactness, and density of a particular road. Level of service is a measure by which the quality of service on transportation devices or infrastructure is determined, and it is a holistic approach considering several factors regarded as measures of traffic density and congestion rather than overall speed of the journey (Mannering, Walter and Scott, 2004). The length of motorable roads in Nigeria was 3,200 kilometres in 1914. By 1962 the length of all categories of roads had risen to 71,870 km from 44,000 km in 1957 and later on to 114,768 km in 1980. By 1988 the total length of roads in Nigeria was estimated to be 193,200km, out of which the Federal Government controlled 34,123 km, approximately 18% of the road network was developed and controlled by the Federal Government, (Umoren, 2008).

In Akwa Ibom State, when assessing the level of regional growth and the development of roads, there is a clear indication that the level of physical development is dependent on the level of accessibility and also that over time, the existing roads will not be able to play its role as it would be over-utilised in some areas. This could be due to limitation in terms of capacity, functionality, connectivity and linkages. And as such many activities in the area would be hindered and limited to the level of road connectivity in the area. This explains why despite many research efforts on road development studies further research endeavours will still be needed to accommodate the differences in nodes and the relationship between connectivity and physical development. It is against this background that the study aim assessing the effect of road connectivity on physical development in the study area.

1.1. Objectives of the study

The objectives of the study were to:

i. To determine the level of road connectivity in the study area.
ii. To examine the relationship between road connectivity and physical development in the study area.

1.2. Research hypotheses

To achieve the objectives of the study one hypothesis was postulated which states that:

H_i: There is no significant relationship between road connectivity and physical development.

1.3. Area of the Study

Akwa Ibom State, is one of the states in the south-south geopolitical zone of the country, it is bounded on the north by Abia State, on the south by the Atlantic Ocean, Cross River State on the east and Rivers State on the west. It is located on the sandy coastal plain of the Gulf of Guinea. It is bordered on the south by the Atlantic Ocean which stretches from Ikot Abasi to Oron - a sprawling volume of water seemingly kissing the skyline from flank to flank (Binu, 2012). Akwa Ibom State lies between latitude 4°32' and 5°53' North, and Longitudes 7°25' and 8°25' East. In terms of structural make up, Akwa Ibom is triangular in shape and covers a total land area of 8,412 km^2, encompassing the Qua Iboe River Basin, the western part of the lower Cross River Basin and the Eastern part of the Imo River Basin. With an ocean front which spans a distance of 129 kilometres from Ikot Abasi in the west to Oron in the east (Bassey, 2005). It has a short dry season starting from mid-November to mid-March and a long wet season. The rainfall averages 2,500mm. The soil type is sandy loam – well-drained and only subtle difference in texture and colour make separation possible. The population of the state is put at 3,920,208 (NPC, 2006).

2. LITERATURE REVIEW

2.1. Road Connectivity

The term "road connectivity" suggests a system of streets with multiple routes and connections serving the same origins and destinations. Connectivity also refers to the density of connections in path or road network and the directness of links. A well-connected road or path network has many short links, numerous intersections, and minimal dead-ends (cul-de-sacs). As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, creating a more accessible and resilient system (Hayens 1989). Connectivity is achieved by providing connections within individual developments, between developments and by having a well-planned collector road network to compliment the arterial highway network. Connectivity of an area can be measured using a connectivity index - commonly defined as the ratio of links to nodes. To achieve network connectivity, one guideline is to have arterials spaced approximately ½ kilometre apart and collectors every ¼ kilometre (Harrison, 2004). Providing a strong connected network of roads and pedestrian facilities can help distribute traffic, reduce travel distances and times, improve routing for transit and reduce walking distances. Good connectivity also provides better routing opportunities for emergency and delivery (solid waste, recycling, mail) vehicles. All of these effects can play a positive role in reducing congestion on the street network. Advocates of New Urbanist and neo-traditional planning concepts include street connectivity as a key component for good neighborhood design. Street networks that are more grid-like are preferred over networks that include many cul-de-sacs and long blocks, thus increasing distances between destinations (Rodrigue, 1998). Connectivity not only relates to the number of intersections along a segment of street, but how an entire area is connected by the transportation system (Harrison 2004).

2.2. Road Network Development in Akwa Ibom State

Akwa Ibom State under the former South Eastern State/ Cross River State had few roads and many foot paths .In 1987, the area was constituted into a state with ten Local

Government Areas. The number of Local Government Areas has increased to thirty-one in 2000. With these developments, new roads were constructed, old ones rehabilitated and some of the earth roads tarred. Today, all the Local Government headquarters are linked by tarred roads (Ekpeyong 2010).

In a nutshell, one can say that the political history of Akwa Ibom State is largely the story of the opening up of its vast areas by network of roads resulting in economic growth, which in turn stimulates the demand for transport. The networks of roads are single lane. The dual carriageways are found only within Uyo capital city. Most of the Local Government Councils in the State are not involved in road construction. This has serious implications on the accessibility of different parts of the state (Ekpeyong, 2010).

It is obvious from the foregoing that, our future challenge should be that of tarring more roads especially those linking rural communities and the dualisation of those linking major Local Government headquarters like Eket, Ikot Abasi and Okobo (Ekpeyong 2010)..

3. METHODOLOGY

In carrying out this study, two sets of data on road connectivity and physical development were collected from the study area. Data on the length of roads in each Local Government Areas were computed, these data was obtained from the Directorate of Civil Engineering, Akwa Ibom State Ministry of Works. The data was used as the independent variable (road connectivity) and was used to compare with the level of physical development in each of the Local Government Areas. These were the dependent variables (Y) while the data required for dependent variables (Y) which centred on physical infrastructures available considered 16 measureable variables as indicated in Table 1. In analysing the data the Pearson's Product Moment Correlation was adopted for this study using the SPSS software. This was done to investigate the relationship between road connectivity and physical development. (See Table 2).

Table 1: List of dependent variables (y) and units of measurement

S/N	Variables	Units of Measurement
1	Nursery/ Primary School	Number
2	Secondary Schools	Number
3	Postal Agencies	Number
4	Health Facilities	Number
5	Police Post	Number
6	Banks	Number
7	Hotels	Number
8	Recreational Facilities	Number
9	Filling Stations	Number
10	Bore Holes	Number
11	Churches	Number
12	Factories	Number
13	Motor Parks	Number
14	Shops	Number
15	Daily Markets	Number
16	Work Shops	Number

Note:

1. Nursery / Primary schools: The total count of nursery and primary schools (both public and private) in the area.
2. Secondary school: Total count of both public and private secondary schools.
3. Postal Agencies/Offices: Total counts of postal offices in the area
4. Health facilities: The total count of both public and private hospitals, clinics, health centres and medicine shops.
5. Police post: Total number of police stations, sub stations and police post
6. Banks: Total counts of commercial banks in the area
7. Hotel: The total number of hotels and guest house (private and public)
8. Recreation Centres: Total count of civic centres, playgrounds, sit outs, event centres, parks and organised open spaces (both public and private).
9. Filling Station: The total number of filling stations.
10. Public Borehole: Total number of boreholes.
11. Church: Total number of Christian worship centres.
12. Factories: This includes the presence of all forms of small scale industrial activities which include bakery, palm oil processing, cassava processing, rice processing, garri production, paint production etc.
13. Motor Park: The total number of motor parks available.
14. Shops: The total number of general provision and specialized shops, boutiques, restaurants supermarkets and other small commercial outfits.
15. Market: Total numbers of markets (daily and weekly).
16. Workshops: Total count of technical services and skill acquisition workshops such as carpentry, mechanic, tailoring, saloons and traditional craft workshop.

These data were computed and the mean value was obtained and used as a measure of physical development.

4. PRESENTATION AND DISCUSSION OF RESULTS

Data obtained from the field for the study as indicated in table 2 were collated on road lengths in the various local government area and also physical infrastructure available in the area as described in the methodology. The results of statistical analysis carried out are presented as follows:

4.1. Determining the Level of the Road Connectivity in the Area

Descriptive results of the level of variation in the road lengths in the thirty one (31) local government areas of the state as shown in table 2. The result in table 2 indicates that Uyo local government area has the highest length of road development of 308km, closely followed by Ikot Ekpene with 267.8km of road development and the least in terms of road development in the study area was Eastern Obolo with only 17.7km of road development. The variability level in road development in the study area is indicated in table 2, the road development level in the area is an indication of the real connectivity level.

Table 2: Road network and physical development

S/N	Local Government	Road network length in kilometres	Rank	Physical Development
1.	Abak	167.2	7	44
2.	Eastern Obolo	17.7	30	14.1
3.	Eket	190.1	4	50
4.	Esit Eket	77	18	27.2
5.	Essein Udim	174.8	6	46
6.	Etim Ekpo	137.8	9	40
7.	Etinan	74.4	20	27.5
8.	Ibeno	29.7	27	37
9.	Ibesikpo Asutan	31	26	28.6
10.	Ibiono Ibom	178.6	5	47.8
11.	Ika	66.7	25	18.5
12.	Ikono	83.6	16	22.3
13.	Ikot Abasi	71	22	34.2
14.	Ikot Ekpene	267.8	2	80
15.	Ini	29.6	28	25
16.	Itu	211.8	3	58.1
17.	Mbo	90.4	14	26.5
18.	Mkpat Enin	29	29	29
19.	Nsit Atai	89	15	25.7
20.	Nsit Ibom	76	19	26.7
21.	Nsit Ubium	97.8	13	27.7
22.	Obot Akara	70	23	20.6
23.	Okobo	72	21	21
24.	Onna	67	24	26.8
25.	Oron	112	10	47.8
26.	Oruk Anam	98	12	45
27.	Udung Uko	29.7	27	26
28.	Ukanafun	83	17	21.6
29.	Uruan	158	8	41.6
30.	Urue Offong Oruko	98.8	11	26
31.	Uyo	308	1	81

Source: Author's Data Analysis, (2017)

4.2. Determining the physical development and its relationship with road connectivity in the study area

The descriptive results of the physical development in the study area. Table 3 presents the different local government and the extent of the physical development in each of them. The physical development was measured in terms of the mean number of physical structures developed in each local government area. Sixteen (16) variables were selected and used in analyzing the physical development in the area as indicated in the table 3.

The primary objective of this study is to compute the number of the facilities and compare them with the extent of the road network development. It is to assess if the increase

in road network development has a corresponding increase in physical development of the areas.

The study revealed that areas with high road network tend to have a higher number of physical development as compared to areas with lower length or road development. This indicate that an increase in the area covered by road network also has a corresponding increase in the number of physical development.

Table 3: Weighted Data from the Field

S/N	Primary Nursery/ School	Secondary School	Health Facility	Postal Agency	Bank	Public Borehole	Police Post	Recreational Centre	Motor Park	Hotel	Workshop	Shops	Market	Church	Factory	Petrol Station	Total	Mean
Abak	39	27	25	1	18	71	1	36	1	47	18	177	25	116	68	27	697	44
Eastern Obolo	19	11	6	1	0	12	0	1	0	0	3	98	1	74	0	0	226	14.1
Eket	41	21	31	12	19	29	6	47	1	37	47	197	9	211	59	33	800	50
Esit Eket	37	18	6	0	3	36	1	17	1	17	33	89	11	121	43	3	436	27.2
Essein Udim	22	18	38	3	8	38	2	24	1	32	37	112	7	187	53	13	541	36
Etim Ekpo	41	27	16	0	0	66	4	47	2	0	6	187	28	178	29	10	641	40
Etinan	38	13	19	3	4	34	1	17	1	17	34	117	6	90	38	11	441	27.5
Ibeno	35	26	40	0	6	73	3	34	1	44	36	107	7	102	61	11	586	37
Ibesikpo Asutan	37	16	19	0	3	9	1	11	1	9	17	87	5	196	47	11	458	28.6
Ibiono Ibom	58	33	29	0	3	0	87	67	1	12	66	129	36	157	87	4	765	47.8
Ika	6	5	1	0	0	15	3	7	1	11	12	69	3	79	77	7	296	18.5
Ikono	23	16	27	1	0	11	3	22	1	5	19	86	7	88	48	8	357	22.3
Ikot Abasi	33	17	46	4	13	19	8	41	4	39	49	213	36	207	36	32	548	34.2
Ikot Ekpene	79	55	59	4	17	36	9	49	6	57	77	278	28	326	207	48	1285	80
Ini	17	11	8	0	0	37	1	54	1	3	8	55	33	79	87	4	398	25
Itu	47	32	39	2	12	48	4	27	3	39	110	117	19	288	122	22	931	58.1
Mbo	36	17	12	2	2	36	2	42	4	16	47	105	13	47	37	6	424	26.5
Mkpat Enin	46	21	34	17	6	37	6	56	2	31	21	144	19	79	32	9	430	29
Nsit Atai	18	13	22	0	0	29	2	26	3	17	33	103	6	97	39	11	411	25.7
Nsit Ibom	38	12	12	0	0	38	0	13	0	7	37	97	16	114	31	6	428	26.7
Nsit Ubium	37	21	21	1	5	29	8	27	1	26	13	114	17	88	29	7	444	27.7
Obot Akara	23	17	13	1	0	19	3	6	0	0	38	78	6	97	29	6	336	20.6
Okobo	22	17	13	0	0	39	1	17	0	6	18	78	17	93	13	12	339	21
Onna	28	17	22	0	3	18	2	29	1	16	56	99	12	76	47	14	430	26.8
Oron	47	36	36	7	11	46	7	46	3	46	62	197	14	187	87	17	796	47.8
Oruk Anam	44	32	37	3	4	77	3	34	7	35	31	117	21	211	66	6	728	45
Udung Uko	27	16	19	1	0	39	0	36	0	13	23	89	21	87	41	4	416	2.6
Ukanafun	31	21	17	0	0	18	1	17	0	12	27	77	6	79	31	9	346	21.6
Uruan	39	21	26	9	11	47	7	57	3	23	43	218	19	88	47	7	665	41.6
Urue Offong Oruko	22	16	14	0	0	47	2	33	2	11	37	89	6	114	17	3	413	26
Uyo	117	66	18	1	41	76	3	66	3	79	97	319	23	327	136	76	1296	81

Table 4: Summary of correlation analysis on the relationship between Road Connectivity and Physical Development

Variables	N	Mean	SD	r-value	r-critical	P.value	Remark
Road connectivity	31	1.0727	70.60	0.898	0.361	0.05	Significant
Physical development	31	35.267	16.18				

Correlation is significant at the 0.01 level (2-tailed)

The Table 4 above shows the results of the correlation analysis that was adopted to determine if there is any significant relationship between road connectivity and physical development. The Table revealed that there is a positive relationship between road connectivity and physical development. This means that as connectivity increases (M=1.0727), physical development also increases (M=35.267). It also showed that this relationship is statistically significant, $r = 0.898$, $P<0.05$, $R^2 = 0.86$, explaining that 86% of the variation in the physical development is attributed to road connectivity. The remaining 14% of the variation could be attributed to other factors e.g. compact nature of the area etc. The decision based on the result above, H_0 is rejected and H_1 is accepted. This indicated that the correlation coefficient (r) value did not occur by chance.

4.3. Implications of the Results

The study has revealed that the higher the road connectivity level of an area the higher the number of physical development and activities distributed along it. The implication of this is, as the areas are link with streets and multiple routes and connections its attract the development of physical infrastructure. As it is rightly said that road development is an engine of development because physical development develop along it. Statistically it has been established by this study that about 86% of the growth that occurs in the physical development in the study area is derived from the increase in the connectivity level of the area. On the other hand, the absence of adequate road connectivity in certain localities will invariably hinder growth and physical development in such areas. The study also revealed an uneven geographical spread in the provision and development of road and its implication on physical development in the study area.

5. CONCLUSION AND RECOMMENDATIONS

The study revealed that there is a strong relationship between road connectivity and physical development in Akwa Ibom State. The study indicated that areas with high road connectivity level has equally experience higher physical development in such areas. The study indicated that the entire study area has a connectivity level of 48.3% which is low. From the findings road connectivity has a great positive influence on the locations and especially physical development in the study area. It was also discovered that areas with low road connectivity level had low pace of physical development. The study recommend that efforts should be gear towards addressing the lagging areas in terms of road connectivity level to fast track physical development in such areas.

REFERENCES

Bailey, L, Mokhtarian, P. L., and Little, A. (2008). *The Broader Connection between Public Transportation, Energy and Greenhouse Gas Reduction.* Gas Reduction. Report prepared as part of TCRP Project J-11/ Task 3 Transit Cooperative Research Program. Available at: http://apta.com/research/online/land_use.cfm#i. accessed on 17 April, 2013

Bassey, J. R (2005). Efik-Ibibio Relations in Historical Perspective In Uya et al (Eds). *The Efik and their Neighbours, Historical Perspectives,* Cats Publishers and Clear Lines Publications Ltd, Calabar.

Binu. E. (2012). *Akwa Ibom State*. Available at: http://www.Akwaibomstategove.com accessed on 10 June, 2013.

Ekpenyong, R. (2010). *Transportation and Communication.* In: Usoro and Akpan (Eds): *Akwa Ibom State, A Geographic Perspective,* Immaculate Publication Ltd, Enugu.

Gauthier, H (1973). *Transportation and Development*. Macmillan Press, London.

Goldberg, M. A. (1970). Transportation, Urban Land Value and Rents: *A Synthesis a Land Economics*, Vol.46, No.2, pp 153-162. Available at: http://www.transportation/ History.com. accessed on April, 20, 2013.

Hayens, D (1989). *Models in Transportation.* Available at: http://www.phg.sagepub. com/content/130/1/107.refs. accessed 12th March, 2012.

Harrison, I. B. (2004). The Book of Inventions. National Geographic Society, Washington D. C. p277. Available at: www.britannica.com/./History/harrison. Accessed 16 February, 2012.

Mannering, F. L., Walter, P. K., and Scott, S. W. (2004). *Principles of Highway Engineering and Traffic Analysis.* 3rd ed. John Wiley and Sons, New Jersey.

Oyesiku, O. O. (2002). From Worm to Tomb. 24th Inaugural Lecture at Olabisi Onabanjo University on 27th August, 2002, Olabisi Onabanjo University Press, Ago-Iwoye.

Rodrigue, J. (1998). *The Geography of Transport System.* Hofstra University, Heapstead, U.S. A.

Umoren, V., (2008). Impact of Road Transport on Soco-Economic Development in Akwa Ibom State. Unpublished Ph.D Thesis, Department of Geography and Regional Planning, University of Calabar, Nigeria.