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Analysis of Road Transport Infrastructure in Rural Communities of Akwa Ibom State, Nigeria

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Abstract
Road transport Infrastructure is fundamental to economic development and poverty reduction. This study analysed the existing road transport infrastructure in rural communities of Akwa Ibom State, Nigeria with a view to determining if there was a significant difference in their provision as well as providing a compendium on it to aid efficient policy making. Data on road transport infrastructure in the study area were obtained from field observation and map analysis. Spatial sampling framework was employed as a political map of the State was divided into 930 quadrates (grid cells). To sample the communities, a table of random numbers was applied and 93 (10%) out of 930 spatial units were selected. The result from the study revealed that available road transport infrastructures in rural communities of Akwa Ibom State were grossly inadequate to stimulate socio-economic development in rural settlements. For instance, only one mini motor park and two roundabouts were available in the entire studied communities. Furthermore, a total of 50 (53.76%) communities did not have any length of paved road surface in their communities, while the remaining 43 communities had between 0.1km and 3.4km of their available road surfaces paved To determine if the distribution of road transport infrastructure in the study area was significantly different, 17 road transport infrastructure variables were subjected to Chi-square statistical analysis. The result revealed the Chi-square value of 1368.69 with an associated significance level of .94. However, since the value of .94 is greater than the Alpha value of .05, the null hypothesis which states that 'the distribution of road transport infrastructure in the study area is not significantly different' was accepted. Based on the research findings, it is recommended that quality road transport infrastructure should be provided in the area; and such provisions should be tailored to meet the specific needs of the rural populace.

Keywords: Road Transport Infrastructure, Rural Communities, Rural Development

1. Introduction

Man's priority in the last few decades has been to create for himself a comfortable living environment; an environment that possesses all the amenities required for comfortable habitation such as reliable electricity, clean water supply, good roads, and adequate healthcare facilities. This shift in priorities reflects humanity's ongoing effort to improve the quality of life by ensuring that the basic infrastructure and services required for daily living are not only available but also maintained at high standards. Infrastructure refers to the basic economic and social amenities required for the functioning of a society and its economy (Udoudo and Udoidem, 2017) [34]. It forms the backbone of any organised community, facilitating a wide range of activities across social and economic spheres (Israel, 2015) [16]. Development economists often refer to infrastructure as "social overhead capital" due to its foundational role in supporting economic activity and enhancing the quality of life (Adger, 2015) [4]. Infrastructural facilities are essential elements that define the functionality and suitability of a place for human habitation. These facilities are crucial for the day-to-day operations and long-term development of societies (Ojekunle, 2016) [25].

Of all infrastructural facilities required for comfortable living, road infrastructure is unique in that it provides man with access to benefit from other facilities; hence its importance in a living environment cannot be over-emphasised (Akpan, 2019) [6].

There are different conventional modes of transport: roads, air, rail, water and pipelines. These modes of transport and their associated infrastructure are all important in one way or the other. For instance, rail is widely used in the transportation of commodities, although its comparative advantage is only applicable to bulk movements over long distances. For long-distance transportation of valuable commodities and passengers, air transport is more efficient. The benefit of using water transportation is that it can convey large amounts of material across great distances at a lower cost than other modes of transportation (Faajir and Zidan, 2016) [14]. Unlike other mode of land transport (rail, air, water and pipelines), road transport is the foremost and most widely used mode of transportation in the Nigeria today (Olorunfemi and Adenigbo, 2017) [27]. The flexible nature of road transport plays a crucial role in rural development. By permeating remote areas, road transport enhances accessibility, which in turn stimulates socio-economic activities (Umoren *et al*. 2020) [36].

For instance, the items of trade (whether manufactured goods or raw materials) need to be transported from the areas where they are produced to the places where they are demanded. Farm products are usually produced in the rural communities and sold majorly in urban areas. Once there is a good transport link between the producing areas (rural areas) and the market, the prices of goods are reduced. On the other hand, in the absence of a reliable transportation system, the cost of these goods decreases in rural areas where they are produced but increases in urban areas where they are demanded due to the actions of middlemen who take advantage of the inadequate transportation infrastructure to drive up the cost of agricultural products (Faajir and Zidan, 2016) [14]. When this happens, the income of rural dwellers is affected adversely as well as their poverty status.

Road transport infrastructure comprises of all category of roads and structures used for both passenger and freight transportation. Road infrastructure encompasses a comprehensive range of components - structures, markings and signage, facilities, electrical systems, safety features and so on - designed to ensure safe and efficient traffic flow (Akpan, 2019) [6]. Road transport and its infrastructure enable movement of people as well as materials - raw materials, semi-finished and finished products - from the point of origin to that of destination. Road transport infrastructure is seen as a necessary ingredient in all facets of social and economic development. Road infrastructure is essential for putting land into production, selling agricultural products, growing businesses, increasing trade, running health and education initiatives, and exchanging ideas (Olawole *et al*. 2010) [26]. Road infrastructure affects the flexibility of the workforce in accepting employment offer in some areas, which in turn affects employment level and the standard of living in such areas. Thus, poor access to road infrastructure could add a new challenge toward jobs creation and poverty alleviation (Lusting *et al*. 2005) [21]. Furthermore, the degree to which the road infrastructure is developed has an impact on several other areas, such as the development of tourism, regional development and integration as well as influx of foreign investments (World Economic Forum, 2012) [39].

Road infrastructure has a very high economic impact on the rural integration. For instance, when roads, culverts, bridges, and other infrastructure are destroyed by a natural disaster or civil unrest, this truth becomes painfully clear. Communities in such situations have drastically worse quality of life and productivity because they find it difficult to relate to one another (Owei, 2018) [30]. Thus, providing road infrastructure to meet the demands of households, communities, businesses and other users is central in any development effort because of its importance in enhancing the living standard of the people. In fact, there is a widely accepted consensus that the development of transport infrastructure plays a pivotal role in fostering economic growth, reducing poverty, and enhancing social inclusion through connectivity and access to opportunities and services (Ravallion, 2016) [32].

Umoren (2008) [36] observed that in Akwa Ibom State, heavy investment has and is still being made by successive government in the area of new road construction and rehabilitation of existing ones. This may be as a result of government understanding of the importance of road transport infrastructure in enhancing economic activities in the State. However, documentary information on the distribution of road transport infrastructure among the rural communities of Akwa Ibom State to aid efficient policy making remains vague in the public domain, hence the need for this study to fill the observed knowledge gap.

2. Conceptual Clarifications and Literature Review

2.1. Concept of Sustainable Road Infrastructure Development

According to CRISP (2000) [12], infrastructure development encapsulates planning, developing, designing, producing, modifying or maintaining of essential facilities in the built environment for human liveability. Beneficiaries of infrastructure development includes; producers and dealers of materials, clienteles, contractors, consultants and users of the final product. Therefore, Sustainable Infrastructure Development can be seen as a subset of sustainable development, which encompasses issues such as infrastructure planning and organization, material selection and procurement, as well as waste management for the benefit of the people.

According to the New Climate Economy Report sustainable infrastructure is the only option to construct human settlements with better air quality and connectivity, resilient ecosystems, and energy systems that can slow down climate change. In addition to being seen as a means of supporting sensible economic growth, sustainable infrastructure is also seen as a means of improving citizens' quality of life by protecting the natural resources and encouraging only effective and efficient use of both natural and financial resource (Montgomery, 2015) [22]. This increased emphasis is due to the financial and economic advantages of sustainable infrastructure, which are usually attained through better infrastructure design that uses fewer materials with high quality efficiency (Montgomery, 2015) [22].

Similarly, Kibert (1994) [18] construed the idea of Sustainable Infrastructure Development as the construction and conscientious management of infrastructural facilities based on resource conservation and sound environmental principles. Sustainable infrastructure considers approaches, strategies, and investments that reliably provide quality infrastructure over an extended period of time with adequate use, maintenance, and replacement programme put in place

(Krishna and Jun, 2011) [19].

Dakyes and Ogbuli (2012) [13] further tailored down the concept of sustainable infrastructure development to that of Sustainable Road Infrastructure Development. Dakyes and Ogbuli (2012) [13] conceived Sustainable Road Infrastructure Development as Designing, constructing, operating, maintaining and deconstructing road infrastructure components in a manner that strikes a balance between the social, economic, and environmental issues required to maintain diversity, human fairness, and healthy natural environment. This study therefore hinges on the concept of sustainable road infrastructure as it seeks to correlate road infrastructure with poverty level of rural dwellers in Akwa Ibom State. More so, recommendations from the study if implemented will also be useful in balancing the societal, economic and environmental concerns of rural dwellers in Akwa Ibom State.

Pompigna *et al*. (2022) [31] viewed sustainable road infrastructure development from the perspective of smart road infrastructure. Smart road infrastructure according to Pompigna *et al*., (2022) [31] refers to road infrastructure that enhances road operating capacity to address the significant problem of integrating people, cars, and other infrastructure in a way that is intelligent, efficient, safe, and sustainable. This concept requires the use of Information and Communications Technologies (ICT) in road infrastructure provision, operation and maintenance. Such infrastructure can transfer data in real time to avoid traffic delays and accidents.

More so, smart road infrastructure makes use of intelligent materials to detect damage in road pavements (Pompigna, 2022) [31]. Intelligent materials are defined as materials that are automatically monitored and maintained proactively, in order to reduce carbon emissions and energy consumption thereby making it to be environmentally sustainable. For instance, materials sensitive to light and temperature have been created and used in painting road pavements while materials with the self-restoring or self-healing capabilities have been produced for road pavements.

The concept of smart road infrastructure encapsulates the application of intelligent (ICT) materials such as sensors, drones, satellite systems, cameras, among others; carefully installed in different elements of road infrastructure to transmit relevant information that will aid in safe movement of people and goods on that road. For example, they can be installed in pavement to monitor temperature, moisture, slope, subsoil and structural damage on roads (Litman and Burwell, 2006) [20]. More so, they can also be used to monitor and manage traffic flow and give traffic managers feedback (Pompigna *et al*., 2022) [31]. This concept is considered appropriate for this study especially in making recommendations for sustainable infrastructure provision in the study.

2.1.1. Challenges of Road Transport Infrastructure in Nigeria

The Central Bank of Nigeria Bulletin shows the state of highways in Nigeria. The survey reported the poor condition of the roads in all parts of the country especially the northeastern and southeastern part of Nigeria. The roads and bridges are dilapidated with many potholes because of lack of rehabilitation many years of their construction. The importance of transport infrastructure to the overall development of a country cannot be over-emphasized. The agriculture, health, social and economic development activities are rested primarily on adequate infrastructure. Investment activities also depend to a large extent on infrastructure, which is also an important requirement for socio-economic growth of any nation (WIR, 2013) [38]. Generally, growth in Nigeria from all indications has been adversely affected by the poor delivery of infrastructure. Development and livability of any community can best be measured in terms of adequate and efficient provision of infrastructure. The major difference between developing and developed nations is the level of infrastructural development that is available. No doubt, a major factor for assessing economic and social development of any country is the quality infrastructure services available for the people (WIR, 2013) [38].

According to Oni and Okanlawon (2008) [28], poor maintenance culture and abandonment of projects are what is affecting the state of road infrastructure in Nigeria. According to Abdullahi (2023) [1], our roadways are marked by potholes, cracks, depressed surfaces among other issues. Also, most of the major roads are congested as business operation and population increases. The pressure on these highways brings to the fore the need for rapid construction of more roads and maintenance of the existing ones in order to relieve the traffic congestion in the most industrialized and densely populated areas. In view of the above, Road construction contracts are being awarded by government throughout Nigeria, but the entire system is marred by corruption on the part of government officials awarding such contracts. This was observed by Adegbibe when he asserted that public officials frequently commit acts of corruption by misappropriating part of monies intended for road infrastructure provision for their own personal use. As a result, substandard road transportation infrastructures are provided, Commuters on such roads in the long run may experience delays in traffic for more than two hours for trips that ought to take no longer than ten minutes. Sometimes business operations are paralyzed, employees return to work late because of traffic delays, productivity and output rates decline, all of which have an impact on overall economic activity, particularly in metropolitan areas (Jacoby *et al.*, 2008) [17].

Rural communities also have their own problems of road transport infrastructure. For instance, agricultural enterprises thrive in rural areas but the rural areas do not have access to adequate road infrastructure and vehicles to convey farm products to commercial markets. Even in areas where there is access to vehicles, transport fares are usually high due to poor nature of road surfaces. Thus, goods become very expensive as a result of high cost of transportation. Oni and Okanlawon (2008) [28] supported the aforementioned viewpoint when they suggested that the problems caused by Nigeria's poor road transport infrastructure are more easily visualized and seem insurmountable.

Addressing the above challenges requires good knowledge of existing road infrastructure in the area and how they are distributed. This is what this study seeks to achieve.

2.1.2. Rural transportation problem in Nigeria

Rural areas in Nigeria are faced with different degrees of transportation problems. These problems of transportation in rural areas have inhibited rural development efforts in the country as many rural areas are disconnected from neighbouring larger settlements from which they would have

enjoyed higher order socio-economic services. This has resulted in the high rate of poverty and the persistent fall in the standard of living experienced by rural dwellers (Aderamo and Magaji, 2010) [2]. In Nigeria, the main issues with rural transportation are providing access to natural resources such as minerals, agriculture, and forestry, as well as enabling the rural populace to access higher order services at reasonable costs.

Findings by Adewole (2015) [3] have shown that the movement of freight and passengers within rural settlements in Nigeria are comparatively smaller than those of intra-urban movement. People in rural areas rarely travel compared to their urban counterparts and this is not independent of the absence of affordable and reliable means of motorized public transport in rural areas. Giving that most rural villages are small and compact, the distance within rural areas over which motorized transport is necessary is comparatively shorter. Rural transportation problem is exacerbated by the dispersed spatial derivation of traffic; this is caused by bulkiness and perishable nature of rural products, imbalance in input and outflow, and considerable unpredictability in demand for transportation.

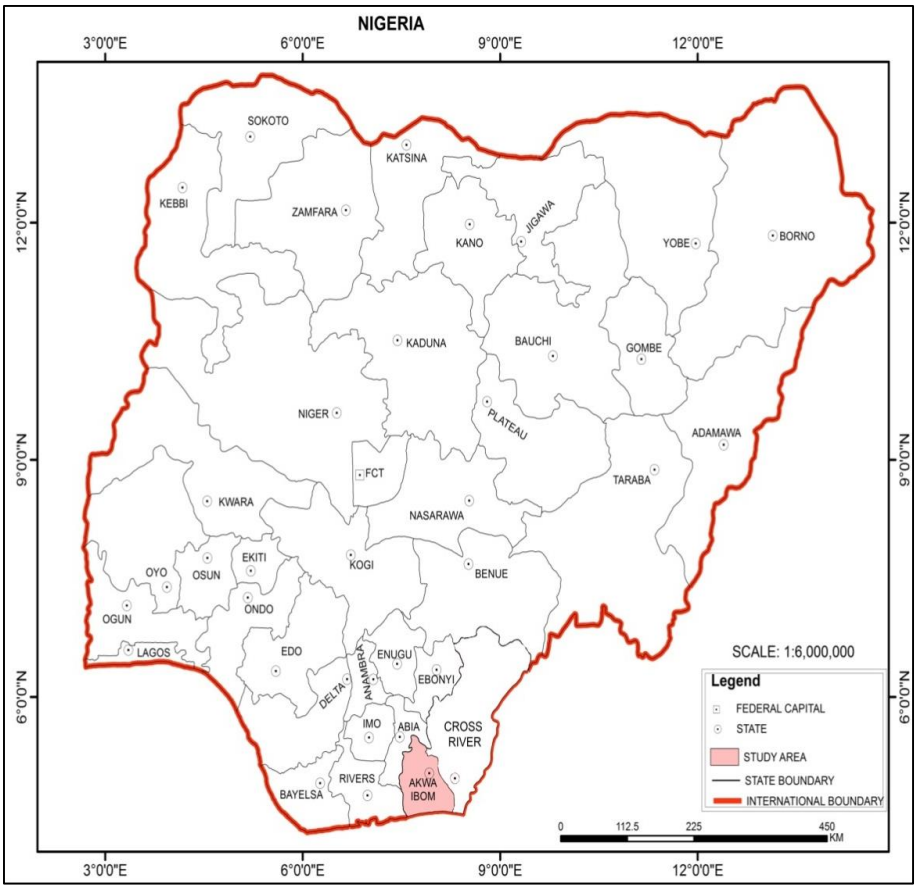
The volume and direction of rural transport is influenced by the periodic nature of market system in rural areas. As a result, the volume of traffic between dependent villages and the main metropolitan centre typically varies according to the timing of the local periodic markets. There seems to be a periodic pattern in the availability of local agricultural and forest products that aligns with the demand cycle for rural transportation (Ovubude, 2000) [29].

3. The Study Area and Method

3.1. Location Setting

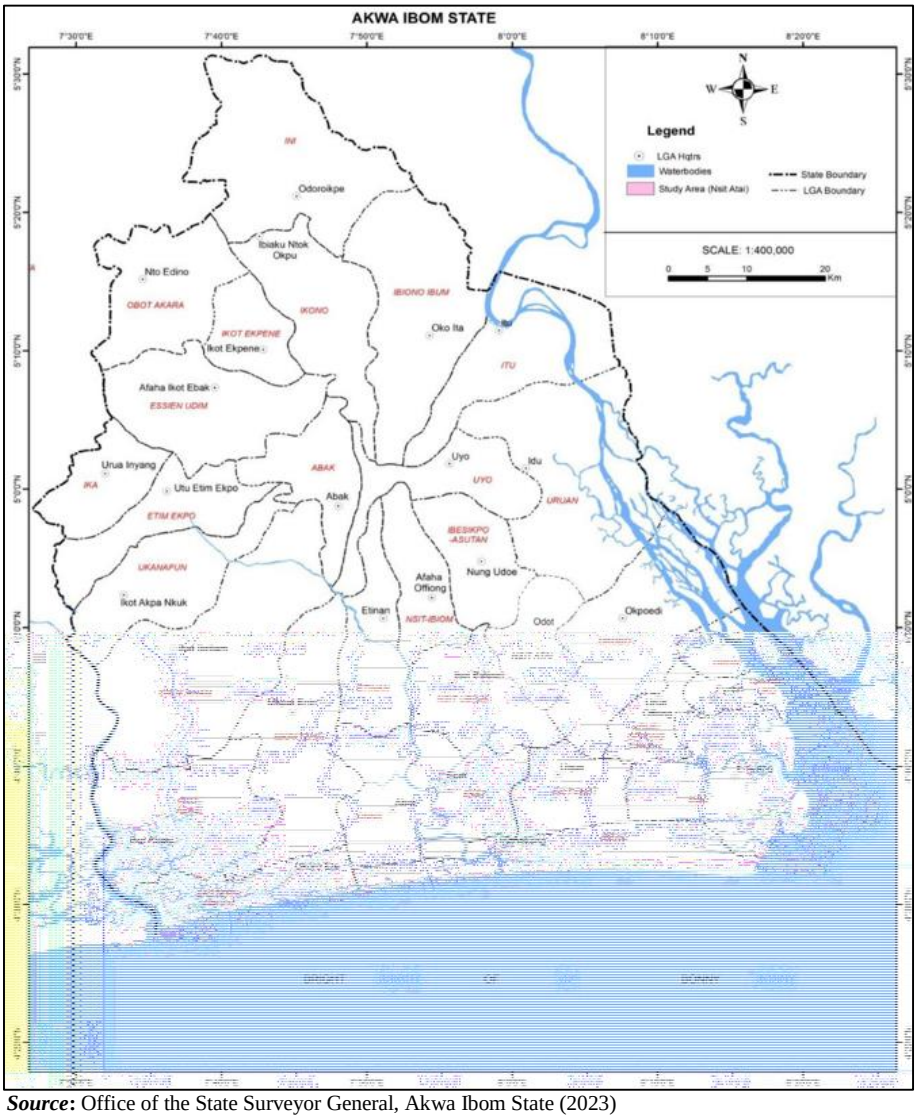
Akwa Ibom State is located in the southern part of Nigeria. It lies between latitudes 4^0 3` and $5^0$ 32' North of the equator; and longitude $7^0$ 25` and 8^0 30`East of the Greenwich Meridian. It is bordered on the north by Abia and Cross River States. In the south, the State is bordered by the Atlantic Ocean and on the south-west and west by Rivers and Abia States respectively (Akwa Ibom State, 1989) [7]. Figure 2.1 shows the location of Akwa Ibom State on the map of Nigeria.

Akwa Ibom State is one of the naturally endowed areas in Nigeria. It has a landmass of 8.412sq Kilometres (Akwa Ibom State, 1989) [7]. The State was created on 23rd September, 1987 from the former Cross River State by General Ibrahim B. Babangida led Administration. Akwa Ibom State is administratively divided into 31 Local Government Areas (LGAs) with Uyo serving as the state capital city.



***Source*:** Office of the State Surveyor General, Akwa Ibom State (2023)

Fig 1: Akwa Ibom State on the Map of Nigeria



***Source*:** Office of the State Surveyor General, Akwa Ibom State (2023)

Fig 2: Map of Akwa Ibom State showing Local Govt. Areas

3.1.1. Sampling Design

Spatial sampling framework was employed in the study. The selection of the rural communities for the study was facilitated by drawing a map of Akwa Ibom State on a scale of 1cm to represent 1km, and dividing same into grid squares (quadrates) of 0.25km^2 which were clearly and serially numbered. A total of 930 quadrates were arrived at. The quadrates system allows for random selection of the needed number of cases or points within a quadrate (Harvey and Reed, 2004: Atser, 2008 and Ayadu, 2021) [15, 8, 10]. A table of random numbers was thereafter used to select rural communities as units of observation from sampled quadrates because the grid maps contain the names of communities thus; it was easy to know the communities within each quadrate.

In the light of the foregoing, where a quadrate contains two or more communities, only one with the highest population was selected to represent such quadrate. This method is similar and in line with the study of Ayadu (2021) [10], Udoh (2012) [33] that produced accurate results using grid squares as the unit of observation. The study adopted 10% (Ayadu, 2021; Uzoagulu, 1998) [10, 37] sample fraction and a total of 93 out of 930 quadrates were randomly selected using the table of random numbers. Table 1 encapsulates the 93 communities that were studied as the result of the application of quadrates method from the map of Akwa Ibom State.

Table 1: Showing the selected communities and their local Govt. Areas

S/N	Assigned No	Names of Villages	L.G.A
1.	457	Ikot Akpanya	Etinan
2.	639	Ikot Umiang Ede	Etinan
3.	701	Akpasak Efa	Etinan
4.	583	EkpeneUkpa	Etinan
5.	550	Ikot Ananga	Etinan
6.	215	Atan Aya	Ibiono
7.	242	AfahaNsai	Ibiono
8.	168	Ikot Idem	Ibiono
9.	266	Ikot Ada Idem	Ibiono

10.	933	Usuk Aka	Ibiono
11.	244	OdiokItam	Itu
12.	198	Ikot Anuten	Itu
13.	199	Ikot Offiong	Itu
14.	195	Ikot Ukap	Itu
15.	224	Ikot Nya	Itu
16.	114	Ndiya Etuk	Ikono
17.	092	Itak Ikot Akpan Edem	Ikono
18.	117	Ikot Ossongg	Ikono
19.	163	EkpeneObomNkuoro	Ikono
20.	138	Ikot Ette	Ikono
21.	061	Etok Iton	Ikono
22.	210	Utu Edem Usuk	Ikot Ekpene
23.	049	NdotNkpe	Ini
24.	048	Ibam Edet	Ini
25.	109	Obot Ndom	Ini
26.	327	Atanukwuk	Ini
27.	032	Edem Idim	Ini
28.	645	IdikpaNsit	Nsit Atai
29.	558	Ikot Uyo	Nsit Atai
30.	709	Ikot Okpudo	NsitUbium
31.	516	Minya ntak	MkpatEnin
32.	586	Minya	MkpatEnin
33.	763	Ikot Etefia	MkpatEnin
34.	461	Ikot Annung	IbesikpoAsutan
35.	431	Ikot Obio Odongo	IbesikpoAsutan
36.	285	Ikot Akpasia	IbesikpoAsutan
37.	868	Odio	Eket
38.	835	EsitUrua	Eket
39.	768	Ikot Abia	Eket
40.	870	Nditia	Eket
41.	285	AfahaEsang	Abak
42.	264	Ikot Obioko	Abak
43.	314	Ikwek	Abak
44.	341	Ikot Akpa Edem	Abak
45.	443	Ikot Udobong	Etim Ekpo
46.	359	NtoObio	Etim Ekpo
47.	360	Ikot Akpapan	Etim Ekpo
48.	474	Ndot	Etim Ekpo
49.	237	Ikot Abiat	Essien Udim
50.	205	NtoNsek	Essien Udim
51.	261	Ikot Akpan Essang	Essien Udim
52.	236	Ikot Ntuen	Essien Udim
53.	228	Ikot Akpan	Essien Udim
54.	284	Mkpatak	Essien Udim
55.	831	Abat	Onna
56.	117	Ikot Ossong	Onna
57.	678	UrueIta	Okobo
58.	468	Esuk Inwang Ekeya	Okobo
59.	563	EbighiAnwa	Okobo
60.	562	Eyo Nko	Okobo
61.	010	Nda	Okobo
62.	749	Ikot Abia	Obot Akara
63.	717	Uda	Mbo
64.	813	Asak Ikang	Mbo
65.	847	Iyesin	Mbo
66.	384	Ibete	Mbo
67.	903	Ikot Inyang	Ika
68.	567	Mkpanak	Ibeno
69.	605	EsukMbiam	Oron
70.	483	Obianga	Eastern Obolo
71.	791	Ikot Osudu	Ikot Abasi
72.	827	Ikot Akpaidiang	Ikot Abasi
73.	792	Atan Obom	Ikot Abasi
74.	063	Ikot Ukpong Ekwere	Ikot Abasi
75.	478	Akan ObioUruan	Uruan
76.	510	Ikot Akpa Idem	Ukanafun

77.	713	Afaha Obo	Ukanafun
78.	684	Ubodung	UrueOffong
79.	692	Oyo Eyekip	UrueOffong
80.	686	Eyonsek	Udunguko
81.	773	Ekpene obo	EsitEket
82.	742	Uquoisoedoho	EsitEket
83.	838	Ineukpana	EsitEket
84.	810	Ntak Inyang	EsitEket
85.	806	Akwata	EsitEket
86.	393	Ibesitokpokoro	Oruk Anam
87.	610	Itung	Oruk Anam
88.	609	Eteben	Oruk Anam
89.	756	Mbiaso	Oruk Anam
90.	940	Ikot Inuen	Oruk Anam
91.	482	Ntak Obio Akpa	Oruk Anam
92.	759	NtakIbesit	Oruk Anam
93.	682	Offot	Oruk Anam

***Source*:** Author's Data Analysis (2023)

4. Result and Discussion

Discussion on road surface condition of any community gives a picture of ease of movement within such a community. Umoren (2008) [36] noted that only paved road surface is all weathered road. This implies that roads that are not tarred may not be passable or usable all year round. From the field data collected as shown in Table 2 shows that 50 villages representing 53.76% have no tarred road surface in their communities. The table further shows that out of 43 villages with tarred road surface, 2 villages have a paved road surface of less than 1km, while 29 villages have a paved road of between 1.1km and 2km only. Similarly, 9 communities have a tarred road surface of between 2.1km and 3km while 3 communities namely: Ikot Ossong, Mkpanak and Ikot Okpudo have between 3km and 4km of their total road surface paved. On the whole, none of the sampled communities have up to 50% of their entire road surfaces paved. Most of the sampled villages with tarred roads only have it by virtue of their location along state and federal road corridors. That explains the reason for the shortness of the length of such roads as they only traverse such communities sometimes at the periphery.

This explains in part the reason for the high cost of transportation vis-a-vis high level of poverty experienced in those communities. This position is supported by Dakyes and Ogbuli (2012) [13] when they drew similar conclusion in their study that improvement in transportation especially road development was a pre-requisite for enhancement of socio-economic activities as well as income of the people in their study area – Gwagwalada Area Council, Abuja.

Furthermore, it was discovered from the study that in the entire study area, there were only 16 communities with fuel station although some of them were either abandoned or without products. The fuel stations were located in the following communities: Ikot Akpanya, Ekpene Ukpa, Ikot Ada Idem, Ndiya Etuk, Ikot Akpan Edem, Ikot Ossongg, Utu Edem Usuk, Ikot Obio Odongo, Ikwek, Asakikang, Iyesin, Mkpanak, Ikot Ukpong Ekwere, Uquoisoedoho, and Akwata. Some of the filling stations have been abandoned by their operators due to bad roads and low patronage. This further shows that the people of the study area may have challenge in getting petroleum products to power their machines and generating set for business purposes. More so, this development has led to increase in transport fare in the area which has an adverse effect on the profit margin of farmers and those doing businesses in the study area. This position of very expensive transport fare in the area was asserted to by 1,019 respondents representing 89.23% of total respondents. To address this challenge, there is a need for investment in road transport infrastructure (supply) to be increased so that the transport fare (price) can be reduced as explained by market theory.

Table 2: Distribution of Tarred Road

Tarred Road	No. of Villages	Percentage
0	50	53.76
0.1 - 1km	2	2.15
1.1 – 2km	29	31.18
2.1 – 3km	9	9.68
3.1 – 4km	3	3.23
Total	**93**	**100**

***Source*:** Researcher's Field Data Analysis (2023)

Other road transport infrastructures observed in the area were fuel station, kerbs, median, culvert and roundabout and road signs/signage. All these facilities team up to ensure safe movement of people and good from one point to another (Litman and Burwell, 2006) [20]. From Table 2, only 15 communities have fuel station even as Mkpanak in Ibeno has 2. Furthermore, 6 communities have roads with kerbs while 10 communities have roads with median. These facilities add value in defining the lanes and traffic corridors. Their presence in a community helps to minimise accidents and ensure safety of road users.

Similarly, Table 2 also shows that 86 communities have culverts while there were only 2 communities - Ikot Ukpong Ekwere and Ntak Inyang - with roundabout in the study area. It was observed that some of the culverts were done locally through communal efforts and as such were of low quality. These were often constructed in places that were rendered impassable by flood or streams. From the study, as shown in Table 2, 18 communities representing 19.35% of the study area do not have road signage while the remaining 75 communities representing 80.65% do not have road signage. This implies that visitors may not be attracted to such communities as the streets are not named, no signage to show direction where a particular road leads to, sharp bends and other warning signs are not also displayed. This situation further portrays the level of development that is available in such communities.

Pedestrian walkways are clearly defined paths for pedestrians. It ensures safety of pedestrian even as they go

about their normal businesses. The study reveals that only 7 villages representing 7.52% of the study area have this facility in their communities. The presence of walkways in 7 of the 93 communities is too weak to create any meaningful impact on the overall development of the study area.

Drains are facilities used to channel water into appropriate places. The study reveals that 82 villages representing 88.17% of the study area have this facility. Further investigation reveals that some of the channels were blocked while some are in dilapidated stages. Worthy of note is the fact that some of the drainage channels were made through communal effort that is why they are available in most communities. However, the absence of this facility in some villages can also be advanced as one of the reasons why some of their roads are not accessible especially during raining season. The resultant effect is high cost of transportation in those communities as well as difficulty in getting transport means to move their farm produce to places where they are needed for consumption. This in turn affects the income of the farmers adversely thereby contributing to the increase in poverty level of the people.

In addition to the above, Table 1 also revealed that only 1-Eyonsek- community has mini motor park while others have none. Implicit in this is the fact that transporting bulky and perishable farm produce to urban areas where they are needed (Olorunfemi and Adenigbo, 2017) [27] may be difficult or delayed leading to wastage and loss of income. Similarly, 42 communities have places were motorcycles station to pick up passengers. The implication is that about 54 villages do not have fixed locations where people can go and get transport means for their movements without booking for such means in advance. This type of movement arrangement cannot support meaningful social-economic development in the area. Road marking includes those markings along the roads that control and guide traffic. The study reveals that roads in 8 villages alone are marked for traffic reasons while 11 communities have drop off. Implicit on this is the fact that other communities without road markings and drop off do not enjoy their benefits such as visual impact and safety of the road users. This may also be used to explain the level of development currently experienced in the study area which corroborate what Akpan (2019) [6] said that rural dwellers represent the most marginalised groups in our society.

Table 3: Distribution of Road Infrastructure (n-93)

Road Infrastructure	No. of Villages	Percentage
Fuel Station	15	1.31
Kerbs	6	6.45
Median	10	10.75
Culvert	86	92.47
Roundabout	2	2.15
Road signs / signage	18	19.35
Pedestrian walkway	7	7.52
Drains	82	88.17
Motor Park	1	1.07
Motorcycle station	42	45.14
Road markings	8	8.60
Drop off	11	0.96

***Source*:** Researcher's Field Data Analysis, 2023

Details of the road transport infrastructure available in the study area are shown in table 4.

Table 4: The Distribution of Road Transport Infrastructure in the Study Area

S/N	Villages	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17
1	Ikot Akpanya	5.3	1.5	3.8	0.5	1	2	1	2	0	5	2	8	0	1	0	1	2
2	Ikot Uminag Ede	4.9	0	4.9	0.4	0	0	0	1	0	0	0	4	0	0	0	0	2
3	Akpasak Efa	5.6	0	5.6	0.5	0	0	0	2	0	0	0	3	0	1	0	0	2
4	Ekpene Ukpa	6.3	1.8	4.5	0.8	0	2	1	6	0	4	2	6	0	1	1	0	3
5	Ikot Ananga	4.8	0	4.8	0.3	0	0	0	4	0	0	0	2	0	0	0	0	2
6	Atan Aya	4.9	0	4.9	0.4	0	0	0	2	0	0	0	4	0	1	0	0	2
7	Afaha Nsai	5.2	0	5.2	0.6	0	0	0	2	0	0	0	4	0	0	0	0	2
8	Ikot Idem	4.4	0	4.4	0.7	0	0	0	3	0	0	0	3	0	0	0	0	2
9	Ikot Ada Idem	6.7	2	4.7	1.8	1	2	1	1	0	3	2	2	0	1	4	1	4
10	Usuk Aka	4.5	0	4.5	0.6	0	0	0	2	0	0	0	3	0	1	2	0	3
11	Odiok Itam	6.6	2.1	4.5	1.3	1	2	1	3	0	4	2	4	0	0	2	1	2
12	Ikot Anuten	4.1	0	4.1	0.4	0	0	0	4	0	0	0	3	0	1	0	0	3
13	Ikot Offiong	5.3	0	5.3	0.7	0	0	0	2	0	0	0	2	0	1	0	0	1
14	Ikot Ukap	5	0	5	0.6	0	0	0	2	0	2	0	2	0	1	0	0	4
15	Ikot Nya	4.8	0	4.8	0.5	0	0	0	1	0	0	0	1	0	1	0	0	2
16	Ndiya Etuk	5.2	1.6	3.6	0.9	1	0	0	2	0	0	0	2	0	0	1	0	2
17	Itak Ikot Akpan Edem	4.4	0.9	3.5	0.8	1	0	0	0	0	2	0	2	0	0	0	0	2
18	Ikot Onwong	4.9	0	4.9	0.6	1	0	0	2	0	2	0	2	0	0	0	0	3
19	Ekpene Obom Nkuoro	5.1	0	5.1	0.6	0	0	0	2	0	0	0	2	0	0	0	0	3
20	Ikot Ete	4.8	0	4.8	0.5	0	0	0	0	0	0	0	0	0	0	0	0	3
21	Etok Iton	4.6	0	4.6	0.4	0	0	0	2	0	0	0	0	0	0	0	0	3
22	Utu Idem Usuk	7.4	2.3	5.1	2.3	1	2	1	0	0	3	2	2	0	1	3	0	4
23	Ndot Mkpe	4.9	0	4.9	0.6	0	0	0	3	0	0	0	2	0	0	0	0	3
24	Ibam Edet	4.7	0	4.7	0.4	0	0	0	3	0	0	0	4	0	1	0	0	1
25	Obot Ndon	4.2	0	4.2	0.4	0	0	0	4	0	0	0	4	0	0	0	0	2
26	Atan Ukwuk	4.4	0	4.4	0.3	0	0	0	2	0	0	0	3	0	0	0	0	2
27	Edem Idem	5.1	0	5.1	0.5	0	0	0	3	0	0	0	6	0	0	0	0	2
28	IdikpaNsit	6.3	1.7	4.6	1.3	0	0	0	4	0	1	0	4	0	0	0	0	2
29	Ikot Uyo	5	0	5	1.1	0	0	0	3	0	0	0	2	0	0	0	0	2
30	Ikot Okpudo	7.1	3.4	3.7	1.2	0	4	2	2	0	3	2	2	0	1	1	0	3
31	Mniya Ntak	7.5	3	4.5	1.4	0	4	2	0	0	4	4	4	0	1	3	0	4

32	Mniya	6.6	2.4	4.8	1	0	6	3	5	0	4	4	1	0	1	4	0	3
33	Ikot Etefia	5.9	1.6	4.3	0.9	0	2	1	4	0	3	2	2	0	1	3	0	2
34	Ikot Annung	6.4	1.6	4.8	2.7	0	4	2	0	0	2	2	3	0	0	2	0	4
35	Ikot Obio Odongo	6.1	1.7	4.4	2.6	1	4	2	0	0	1	2	1	0	1	2	0	2
36	Ikot Akpasia	6.1	0	6.1	1.8	0	0	0	1	0	0	0	2	0	0	0	0	3
37	Odio	4.8	0	4.8	0.3	0	0	0	5	0	1	0	3	0	1	0	0	1
38	Esit Urua	6.2	1.9	4.3	1.6	0	4	2	7	0	1	4	4	0	1	4	0	3
39	Ikot Abia	5.9	1.7	4.2	1.4	0	2	1	1	0	0	2	2	0	1	2	0	4
40	Nditia	5.1	0	5.1	0.9	0	0	0	3	0	1	0	4	0	0	0	0	2
41	Afaha Esang	6.4	1.8	4.6	1	0	0	0	2	0	0	0	2	0	1	0	0	3
42	Ikot Obio Oko	4.8	0	4.8	0.8	0	0	0	1	0	0	0	2	0	1	0	0	2
43	Ikwek	5	1.6	3.4	0.9	1	0	0	2	0	1	0	1	0	1	0	0	4
44	Ikot Akpaden	4.6	0	4.6	0.7	0	0	0	0	0	0	0	3	0	1	1	0	3
45	Ikot Udobong	6.1	1.6	4.5	1.3	0	2	1	1	0	3	2	4	0	0	2	1	4
46	Nto Obo	6.3	1.9	4.4	1.1	0	2	1	2	0	1	2	3	0	0	1	1	3
47	Ikot Akpakpan	5	0	5	0.8	0	0	0	1	0	0	0	1	0	0	0	0	2
48	Ndot	4.9	0	4.9	0.9	0	2	1	2	0	1	2	0	0	0	0	0	1
49	Ikot Abiat	4.6	0	4.6	0.9	0	0	0	1	0	0	0	2	0	0	0	0	3
50	Nto Nsek	5.1	0	5.1	0.8	0	0	0	2	0	0	0	2	0	0	0	0	2
51	Ikot Akpan Essang	6.3	1.5	4.8	1.6	0	0	0	0	0	0	0	0	0	1	0	0	2
52	Ikot Ntuen	5.4	0	5.4	1.4	0	0	0	1	0	0	0	0	0	1	0	0	3
53	Ikot Akpan	5.1	1.4	3.7	1.3	0	2	1	0	0	0	2	0	0	0	0	0	2
54	Mkpatak	5.8	1.8	4	1.8	0	0	1	1	0	1	0	3	0	0	1	1	2
55	Abat	7.1	2.5	4.6	1.5	0	2	1	2	0	0	2	3	0	1	0	0	2
56	Ikot Onwon	6.9	3.1	4.8	2.1	0	0	0	4	0	3	0	4	0	1	0	0	2
57	Urue Ita	5.7	1.6	3.9	0.4	0	2	1	1	0	1	2	6	0	0	1	0	4
58	Esuk Inwang Ekeya	6.3	2.2	4.1	0.9	0	4	2	3	0	2	4	0	0	1	0	1	1
59	Ebighi Anwa	4.6	1.5	3.1	0.6	0	0	0	1	0	0	0	2	0	0	0	0	2
60	Eyo Nko	4.2	0	4.2	0.4	0	0	0	0	0	0	0	2	0	0	0	0	3
61	Nda	4.7	0	4.7	0.3	0	0	0	2	0	0	0	3	0	0	0	0	2
62	Ikot Abia	5	0	5	0.5	0	0	0	0	0	2	0	2	0	1	0	0	2
63	Uda	5.9	1.9	4	0.5	0	2	1	5	0	0	2	4	0	1	0	0	1
64	Asakikang	4.9	0	4.9	0.3	1	0	0	2	0	0	0	0	0	0	0	0	2
65	Iyesin	5.7	1.6	4.1	0.4	1	2	1	2	0	1	2	2	0	1	1	0	3
66	Ibete	4.8	0	4.8	0.3	0	0	0	3	0	0	0	4	0	1	0	0	1
67	Ikot Inyang	5.1	0	5.1	1.1	0	0	0	1	0	0	0	2	0	0	0	0	1
68	Mkpanak	6.9	3.2	3.7	2.6	2	6	3	4	0	0	4	4	0	1	3	1	1
69	Esuk Mbiam	3.5	0	3.5	0.3	0	0	0	3	0	0	0	2	0	0	0	0	3
70	Obianga	2.8	0	2.8	0.2	0	0	0	4	0	0	0	5	0	0	0	0	0
71	Ikot Osudu	5.8	1.7	4.1	0.7	0	2	1	2	0	2	2	2	0	1	0	0	3
72	Ikot Akpaidiang	6.1	1.9	4.2	0.8	0	0	0	1	0	3	0	3	0	1	0	1	2
73	Atan Obom	6.9	1.8	4.1	1	0	0	0	2	0	1	0	2	0	0	0	0	1
74	Ikot Ukpong Ekwere	7.1	2.2	4.9	2	1	2	1	1	1	2	2	3	0	0	0	0	3
75	Akan Obi Uruan	3.6	0	3.6	0.2	0	0	0	3	0	0	0	2	0	0	0	0	1
76	Ikot Akpa Idem	5.2	0	5.2	0.6	0	0	0	2	0	0	0	3	0	0	0	0	2
77	Afaha Obo	6.1	2.2	3.9	0.8	0	2	1	1	0	1	2	2	0	0	0	0	3
78	Ubodung	3.9	0.7	3.2	0.6	0	0	0	2	0	0	0	3	0	0	0	1	2
79	Oyo Eyekip	4.8	0	4.8	0.5	0	0	0	0	0	1	0	2	0	0	0	0	2
80	Eyonsek	5.4	0	5.4	0.7	0	0	0	2	0	0	0	5	1	1	0	0	3
81	Ekpene Obo	6.5	2.3	4.2	1.1	1	2	1	3	0	0	2	4	0	1	3	1	2
82	Uquoisoedoho	5.1	1.9	3.2	0.8	0	0	0	2	0	1	0	6	0	0	3	0	2
83	Ineukpana	3.1	0	3.1	0.5	0	0	0	4	0	0	0	5	0	0	0	0	1
84	Ntak Inyang	5	1.9	3.1	0.9	0	2	1	3	1	0	2	8	0	1	0	0	1
85	Akwata	5.1	1.8	3.3	0.7	1	2	1	4	0	3	2	3	0	1	1	0	3
86	Ibesit Okpokoro	4.9	0	4.9	0.6	0	0	0	1	0	0	0	3	0	1	0	0	3
87	Itung	5.3	0	5.3	0.7	0	0	0	4	0	0	0	2	0	0	0	0	2
88	Eteben	5.7	0	5.7	0.9	0	0	0	2	0	0	0	3	0	0	0	0	2
89	Mbiaso	4.8	0	4.8	0.5	0	0	0	2	0	0	0	2	0	0	0	0	2
90	Ikot Inuen	4.3	0	4.3	0.6	0	0	0	1	0	0	0	2	0	0	0	0	3
91	Ntak Obio Akpa	5.6	2	3.6	1	0	2	1	0	0	0	2	3	0	1	1	0	4
92	Ntak Ibesit	4.8	0	4.8	0.8	0	0	0	1	0	0	0	2	0	0	0	0	2
93	Offot	5.9	1.4	4.5	0.9	0	4	2	0	0	2	4	4	0	0	2	0	2

***Source*:** Authors' Data Analysis (2023)

X 1= Total length of road; X2 = Tarred road; X3 = Untarred road; X4 = Road density;
X5 = Fuel Station; X6 = Kerbs (Curbs); X7 = Median (Camber); X8 = Culvert; X9 = Roundabout;
X10 = Road signs/Signage; X11 = Pedestrian Walkway; X12 = Drains; X13 = Motor Park;
X14 = Motorcycle Station; X15 = Road Markings; X16 = Drop-off; X17 = Connectivity Index.

4.1. Testing of Hypothesis

In order to determine whether the distribution of road transport infrastructure was significantly different in the study area, a contingency chi square test was performed on road transport infrastructure data set in the study area. In Chi-square test, it is established that the Pearson chi-square value is not significant if the p value is greater than .05 (Atser and Ujene, 2016) [9]. In line with this, Table 5 revealed the Chi-square value of 1368.69 with an associated significance level of .94. For the result to be statistically significant, the p value ought to be either .05 or smaller than .05. However, since the value of .94 is greater than the Alpha value of .05, the null hypothesis which states that 'the distribution of road transport infrastructructure in the study area is not significantly different' is accepted.

Table 5: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1386.694[a]	1472	0.944
Likelihood Ratio	1245.589	1472	1.000
Linear-by-Linear Association	0.731	1	0.393
N of Valid Cases	2174		
a. 1508 cells (95.4%) have expected count less than 5. The minimum expected count is .01.			

***Source*:** Researcher's Field Data Analysis (2023)

4.1.1. Implications of Findings

The inadequate road transport infrastructure in the study area has a lot of Planning and Environmental Implications. Some of the implications are:

1. The study area will not be attractive to Investors as it will not support good business investment. Such developments would have led to increase in the socio-enonomic activities of the area as well as increase in the revenue base of the government through payment of taxes and levies by business operators in the study area. Such internally generated revenue could have been used to enhance the environmental quality of the area through planning and provision of infrastructure.
2. Absence of coordinated drainage facilities in most villages has rendered their roads impassable especially during rainy season. More so, some portions of farmland are usually submerged in water during rainy seasons. The implication is that such an environment cannot support a meaningful farming activity which is the mainstay of the rural populace. The resultant effect is poor yields and low income to farmers which is reflected in this study as their poverty level. A typically poor person pays greater attention to survival means than healthy living environment.
3. Availability of sixteen filling stations in the entire area implies that the area is under-developed. The said filling stations are sited along paved roads. It can therefore be inferred that if more roads are paved, socio-economic activities will be triggard, and more filling stations and allied facilities will be developed along such roads. This will inevitably bring about reduction in transport fare and increase in the profit margin of businessmen and farmers in the area. The end result will be reduction in poverty level of the people living in the rural communities.
4. The absence of motorcycle stations in most communities (51) and the presence of Motor Park in one community have a lot of planning implications. First people living in such environment cannot get mobility means at all times. They may have to wait for hours before securing transportation means to take them to their destinations. This usually leads to colossal waste of manpower hours which would have been redirected into other productive activities aimed at combating poverty. More so, some people in such communities may have to make advance arrangement for their movement by booking a cyclist. Such movement arrangement is not tenable in cases of emergency. This calls for deliberate effort on the part of government to provide motorcycle stations and motor parks in rural areas to ease movement from one place to another.

5. Conclusion and Recommendations

5.1. Conclusion

The need to examine road transport infrastructure available in rural communities of Akwa Ibom State cannot be overemphasised especially considering the claims by successive Administrations in the State that a lot has been done in area of road transport infrastructure provision. The bane of this study was to examine the extent to which road transport infrastructure was extended to the rural communities of Akwa Ibom State and to provide a compendium that will not only aid efficient policy formation but also serve as a guide in efficient road transport infrastructure provision rural communities.

The study has revealed that a lot of road transport infrastructure available in urban areas such as overhead bridge, flyover, traffic light, street light, standard motor park, underground pipe jacking drainage system and so on were not extended to the rural communities. However, that the few ones extended to the rural communities were relatively too few to stimulate sustainable development in the area. This therefore calls for concerted effort – beyond the minimum critical level – to be made by government and other development partners in the area of road transport infrastructure provision in the study area as failure to do so will further compound the woes of rural areas and also widen the already existing gap between urban and rural areas in terms of road transport infrastructure provision.

5.1.1. Recommendations

The findings from this study have shown that there is a positive correlation between road transport infrastructure and poverty level in rural communities of Akwa Ibom State. The inadequacy of road transport infrastructure has led to increase in transport fares, increase in prices of goods and services, reduction in profit margins of farmers and business operators in the study area which has resulted in poor standard of living for the people of the area. Since poverty is a multidimensional problem that requires multidimensional approach in addressing it. The study therefore recommends:

1. Road transport infrastructure should be consciously provided in the rural areas. Their designs should be

tailored to suit the peculiarity of the communities especially the riverine communities. This is based on the findings from this study that the existing road transport infrastructure in the area is poor and grossly inadequate to stem-up development and reduce poverty. When this is done, the utilitarian value of such investments in enhancing the living standard of rural populace will be enormous.

2. Road transport infrastructure should not be seen in the light of paved road surface alone; other associated infrastructure should be provided along with paved roads. For instance, provision of roundabout, walkway and drop off will ensure safety of road users while provision of drains, cambers and culverts will help in elongating the life span of such roads.
3. When road transport infrastructure is to be provided, the Locals who are the major beneficiaries of such project should be contacted and allowed to make input on which road in their communities they desire to be worked on first based on their scale of preference. This will constitute what is called in Town Planning Parlance 'planning with the people'. Their input should thereafter be evaluated professionally and the needful done.
4. The need to carry out viability and feasibility studies on every road project should be emphasised. This will enable the professionals determine the economic value of roads at conception stage, before going into design and execution. This will enable the rural dwellers to derive maximum benefits from road construction.

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