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Assessment Of Infrastructural Provision And Adequacy In Nigeria/Benin Border Towns Of Ogun State: Using Confirmatory Factor Analysis

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Abstract: The state of infrastructural provision determines wellbeing, progress and development of both governments and citizens. Due to the declining level of infrastructures, researchers are devising empirical methodologies to assess state of these services in border communities to inform policy formulation by government in these countries. In this vein, the current study examines the level of infrastructural facilities provision in border communities between Nigeria and Benin-Republic through the application of Confirmatory Factor Analysis (CFA). This was applied to data obtained from a scientific sample of 280 respondents via a structured questionnaire instrument. The outcome of the analysis reveals that residents of the investigated border communities are faced with acute supply of infrastructural facilities while the available ones are in critical or poor conditions. The study urges the governments in developing countries to formulate and execute effective developmental policies that will improve the level of infrastructures in border communities and other areas in order to provide sustainable living environment for the citizen.

Keywords: Infrastructure, Provision, Adequacy, Border Town, Benin, Nigeria

1. Introduction

Infrastructure provision is very crucial to developing countries. It proves standard of living and reduces health risks. The provision of adequate infrastructure facilities in border settlements along Nigerian. Benin Republic is very important in adhering socio-economic activities of the area. According to [1] infrastructure categories into: power telecommunications transportation and water and Sanitation. All mentioned have effects on the economic development of a settlement. The growth of border towns' worldwide poses major challenges for professionals in the built environment when considering growth and development of socio-cultural and political activities. [2] the factors affecting infrastructural development in Nigeria is associated with social, Technology. Infrastructure provide strength to economic development by increasing productivity through the provision of basic services, this increases the provision of conducive environment for both commercial activities and human living standard. The Nigerian-Benin Republic border is one of the important border region in West Africa because the two Countries depends on themselves in terms of cross – border trade both legal and illegal [3]. Therefore, these activities depend on road and others infrastructure to provide enabling environment. In developing Countries, adequate infrastructure does not only strengthen economic growth but also reduce poverty through economic empowerment. The study investigated infrastructural provision and present condition in international border towns of Ogun State in order to formulate policies that will improves living condition through conducive environment. Infrastructure provision in border towns needs urgent attention due to its importance in a particular environment. The appropriate laws and conduction guiding provision of infrastructure is not favourable to the area, misappropriation of fund and zoning strategy of policy makers do not favour border areas. The area is low in population and also considering the voting strength during elections. Incompetence of the expert responsible for the provision and lack modern technology in provision of these services. Physical Planning in border communities always been the affairs of family decision in allocation plot and determine layout. The proper standard and guideline in settlement planning is lacking. Lack of involvement of professionals in the built environment contributed to the unplanned environment uncontrolled growth, resulting inappropriate locations of infrastructure in border areas. Border towns are growing and developing with opportunities from neighboring countries, the activities increases commercial activities and human population. The activities have negative impact on the available infrastructure and unconducive living environment.

2. Literature review and Theoretical Framework

[4] described infrastructure development as a means of increasing economic growth of a country and sustained increase in the country's per capita income to produce higher labour force. [5]; [6] opined that infrastructure has always played a key role in integrating economies within a region. Well developed and efficient infrastructure is essential for a region's economic development and growth. In a dynamic concept, infrastructure is seen as a regional public good that moves factors of production within and across countries, thus helping the region attain higher productivity and growth. [7] sees infrastructure as one of the most critical factors for economic development because it interacts with the economy, through the production processes and changes in the quality of infrastructure available for production. This will greatly have impact on the production and performance of an organisation's. Therefore, increase the levels of output, income, profits and employment creation in the economy. [8] summarized three ways to finance infrastructure projects: public financing, private financing and public-private partnerships (PPPs). Therefore, each method has its associated costs, benefits and no single approach dominates

the others in all situations. A number of countries do not have the fiscal budget required to fund necessary infrastructure improvements but engage in public- private partnership to reduce government expenses. Infrastructure is the backbone of economic development and has impact on human development. [9] opined that at the policy level, there are two major economic justifications for regional cooperation between two or more countries: (i) the need to deal with project-related additionalities and positive and negative externalities and (ii) the potential to derive economies of scale in pursuit of national goals. By pursuing these, all participating countries benefit from regional cooperation. Regarding the first justification for regional cooperation, cross-border projects may bring additional concessional and non-concessional funds. Positive externalities like benefits such as time and cost savings, environmental protection, trade facilitation and negative externalities, costs such as environmental pollution, trafficking, and the spread of communicable diseases, arise when the consequences of one or more countries' actions spill over national borders. Conclusively, infrastructure is important in different contexts and the level of its importance have not been fully appreciated by developing countries, therefore, governments resources have been expended on the provision of infrastructure with marginal success because of a lack of commitment and corruption.

Challenges of infrastructural provisions

The challenges relating to infrastructure provision are numerous in developing countries including Nigeria, scholars in various field pointed out the causes which include finance, modern technology for infrastructure development, maintenance and design of the project, quality requirements of projects to meet international standard and to be sustainably developed. Design and implementation of regulatory mechanisms. Lack of data on population and spending, environmental effects. Dearth of visionary leader, Demand and supply, procurement method and corruption, non-adherence to principles of project management [10; 2; 6; 11]. Lack of infrastructure create inefficiencies in areas of economic growth and on land value at the border settlements [12;13]. Enhancement of efficiency at border towns needs adequate services for competitiveness [14]. Sufficient services can be enhanced by financial support and attitude of the government relating to the provision [15]. In Nigeria as other Africa countries, sustainable infrastructure is not only needed to increase socioeconomic growth, but also to strengthen inhabitant's empowerment and aids poverty reduction in order to elevate standard of living [16]. Development of border communities with infrastructural facilities is a major step towards stemming the tides in smuggling contraband goods and the long-term effect will be effective management of subsequent crisis in the border areas [17]. [18] examined the borderland livelihood strategies in West Kalimantan, Indonesia. They discovered that underdevelopment of border towns caused by poor infrastructure and illegal activities poses a national threat. [19] studied sub-Saharan African cities functionality and infrastructure provision. He advocated for practical answers for enhancing impromptu and underserviced settlements. [20] found that, infrastructure development like roads, electricity, and water provisions, reduces the services and hygiene within the territory if they are inadequate, or absent in the areas. Development takes place in line with industrialization, population increase, and changing settlement patterns therefore, governments need to provide basic infrastructure for the new change [21].

Theoretical Framework

Life-Cycle Model of Neighbourhood Change

The model of neighbourhood life-cycle change was developed by [22] to demonstrate invasion or succession life stage developments processes that a district or an area even neighbourhood passes through. According to [23] these development stages are development, transition, downgrading, thinning out and renewal. The development stages are very essential for transitional development and advancement of districts or areas both urban and suburbs. In particular, the stages are more important for housing units in suburbs and rural areas of developing countries like Nigeria. The availability of infrastructural facilities will certainly serve as essential part of housing living conditions and ultimately improve the status of neighbourhood and its environment. When basic infrastructural and urban services are lacking in neighbourhoods a strain is imposed on the physical well-being of the occupants [24]. Consequently, the provision of infrastructural facilities provides impetus for neighbourhood development processes. However, extant literature [25]; [24]; [26]; [27] has documented poor state of infrastructural facilities in the urban areas of developing countries like Nigeria. The situation may be worst in rural areas. In other words, the relevance of the model can be associated with housing infrastructural facilities developments in suburb and rural areas as the present poor situation transit to improved conditions. More importantly, the model provides framework for assessment of physical characteristics of infrastructural facilities that explain features and nature of social structure of the inhabitants' environment. This is because neighbourhood itself cannot function without the consideration of other features such as availability of infrastructural facilities, housing units and social structure.

3. Methodology

This study was conducted in Idiroko town an international border town between Nigeria and Benin-Republic. The population of the study area as at 1996 was 20,965 (National Population Census, 1996) with no other reliable or published data available till the current period. Hence, the study used Malthusian Growth Model (MGM) to estimate current population of the study area. According to [25] Malthusian Growth Model (MGM) predicts an exponential increase in the population with time. MGM is estimated using this equation:

$$P_n = P_o e^{rt}$$

Where P_o = the initial population (base year)
P_n = Current population (required population)
r = growth rate (average population growth rate); e = exponential; t = time interval (years)

The average population growth rate at state level, local government level and towns that make up Ogun State is estimated at 3.35% (0.0335) by [28] while the time interval between base year population and current year population estimation is 22 years. In other words, the current population of the study is estimated at 43,806 people. [30] advanced that the average household size in the study area is 6.5.

Therefore, the number of households in Idiroko in 2018 would be approximately, 6739. Following this procedure, the study estimated the number of residential buildings in the study area by dividing the total number of households by the household size average of 6.5 and arrived at 1,036 buildings.

The study applies two way statistical approach recommended by [31] for finite population given the study population of 1,036 dwelling buildings. The sample sizes were calculated by a two stage formula. Firstly, by formula for calculating sample size when the population is infinite this is given as thus:

$n_0 = \frac{z^2pq}{e^2}$ ..... equation 1

Where, n_o is the sample size, z is the selected critical value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q = 1 - p and e is the desired level of precision [31]. The study assumes the maximum variability to be 50% (p =0.5) and taking 95% confidence level with ±5% precision, the calculation for required sample size will be as follows;

p = 0.5 and hence q =1-0.5 = 0.5; e = 0.05; z =1.96

So,

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$$

$n_0 = 384$

Given the fact that no derived is greater than 5% of the population size (6,103), however, brings the need to use correction formula to calculate the final sample size. The theorist, Cochran, pointed out that if the population is finite, then the sample size can be reduced slightly. This is due to the fact that a very large population provides proportionally more information than that of a smaller population[31]. He proposed a correction formula to calculate the final sample size which is given below as:

$n = \frac{no}{1+\frac{(no-1)}{N}}$ .....equation 2

Here, n_o = 384 is the sample size derived from equation (1) and N = 1,036 is the population size.

By interpolation, equation (2) becomes:

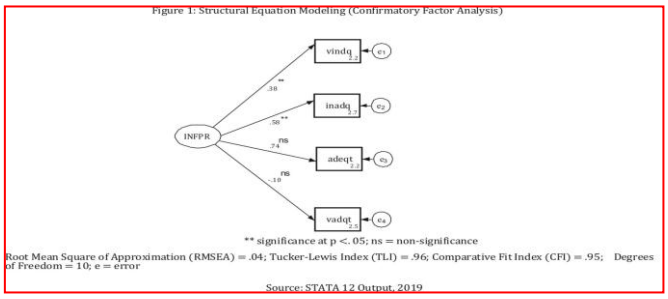
$$n = \frac{384}{1+\frac{(384-1)}{1,036}}$$

n = 280

Thus, in this case the representative sample size for the study is 280. This represents the number of households that will be selected for the current study. The households here are conceptualized as a person or group of persons that live together typically under one building or roof or in the same compound with a head of household. In the main, the heads of each household that would be selected serve as the units of analysis. A multi-stage sampling procedure was employed to select the samples for the study. The first stage involved selection of buildings through simple random sampling and second stage was carried out for household selection via same sampling procedure. A random sampling was employed to select 70 buildings and 4 households randomly selected from each building. In all, 280 households were sampled and administered structured questionnaire to obtain opinions and perceptions about the housing conditions. Moreover, to further ensure fair representation of respondents, weights were attached to each selected observation in each household of the study area. The weights are determined by taking the inverse of probability of observation inclusion in the survey process; however, weight derived depends on the relative size of the household. The opinions and perceptions obtained were rated on a 5-Likert scale. The level of provision of infrastructural facilities in the area were rated from inadequate to very adequate which was analysed through Confirmatory Factor Analysis (CFA) method. CFA corresponds to the measurement model of SEM and as such is estimated using SEM software (Albright, 2008). The use of such technique is driven by the study interest to measure latent variable (in this case, level of provision of infrastructural facilities) which cannot be measured directly. The measurement model specifies the relationships that suggest how measured variables represent a construct that is not measured directly [32]. In this research, the measurement model was assessed using the goodness-of-fit (GOF) tests. The basic index of this test is Chi-square ($\chi 2$) statistics, degree of freedom (df), and significance level (p-value). Moreover, Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA).

Presentation, Interpretation and Discussion of Findings

The output of analysis using STATA 12 software are presented in Figure 1 and Table 1. The current study used the Structural Equation Modelling (SEM) software STATA 12.0 version to perform a Confirmatory Factor Analysis (CFA) based on data from 245 households (total received from 280 administered questionnaires) residing in the study area, Idiroko town. At initial stage of the analysis, a total number of 15 data was removed from the data set because some participants failed to follow directions as specified. The final sample size analysed for the study was 230. In addition, the study chose maximum likelihood estimation because the observed data were normally distributed. The data came from twenty questions on four Likert-scale surveys measuring the level of infrastructural provision. The theoretical model of the study is presented in Figure 1.



The study hypothesized one -factor model to be confirmed in the measurement portion of the model. In order to examine possible violation of the CFA, the stability of the results was determined through the sample size adequacy. In general, the consensus is that 10 per estimated parameter appear to be the norm for sample size adequacy. The study specifies 4 regressions and 4 variances to be estimated totalling 8 parameters. Based on the initial sample size of 230, there is an acceptable ratio of 28.75 participants to 1 parameter estimated. Moreover, the study evaluated the assumptions of multivariate normality and linearity through STATA 12. There was no presence of univariate or multivariate outliers as indicated through box plots and Mahalanobis distance. From the output in Figure 1, Root Mean Square Error of Approximation (RMSEA) .04; Tucker-Lewis fit index (TLI) value of 0.96 and the Comparative Fit index (CFI) figure of

.95 indicate a good fit between the model and the observed data. This implies that the hypothesized study model is a good fit for the observed data. More so, standardized parameter estimates are provided in Figure 1 while unstandardized estimates are shown in Table 1.

Table 1: *Confirmatory Factor Analysis (CFA) Results*

Observed Factors	Latent Factor	Standardized Coefficient (β)	Unstandardized Coefficient (B)	Standard Error (SE)
Very Inadequate (VINDQ)	Infrastructure Provision Level (INFPR)	0.38	1.10	0.07
Inadequate (INADQ)		0.58	1.70	0.08
Adequate (ADEQT)		0.74	2.70	0.10
Very Adequate (VADQT)		-0.10	-2.51	0.07

Source: *Author's Computation from STATA 12 Output, 2019*

The standardized result from figure 1 indicates that housing infrastructural facilities are both very inadequate (.38) and inadequately (.58) provided in the study area. These results were found significant at 5% level of significance. However, the perception of the participants in terms of inadequacy of infrastructural facilities in the town was higher and significant.

Plate 1: Construction of shops on drainage area

Plate 2: *Condition of existing road*

The pictorial view in plate 1 shows the existing shops for commercial activities along Nigeria- Benin Republic road, the shop was built without considering minimum setback to the existing road, therefore, the shops obstruct the flow of foul water due to the construction on area for drainage system while the plate 2 depict the condition of internal accessibility taking over by grass and shrubs.

Plates 3 and 4 shows the types and condition of existing accessibility to the neighbourhood, lack of sufficient drainage facilities contributed to frequent erosion taking place in the study area. The functionality road network is hindered and also affects dwelling status. The plate 5 and 6 shows indiscriminate dumping of refuse that affects the physical planning of the environment and likely affect the health status of the residents.

Plate 7-10 depicts the effect of erosion on existing accessibility to each dwelling, it was observed that, this situation reduces vehicular movement and damages to buildings foundation.

Plate 3: *Existing road with obstruction*

Plate 4: *Effect of erosion on existing road*

Plate 5: *Dumping along the road*

Plate 6: *Indiscriminate dumping*

On the other hand, the result shows that infrastructural facilities are insignificantly adequate or very adequately provided in the study area. Lastly, the study did not conduct

any post-hoc modifications for the analysis because the good-of-fit indexes and residual analysis gave no concerns.

Plate 7: *Building without setback*

Plate 8: *Existing road condition*

Plate 9: *Effect of Erosion*

Plate 10: *Erosion preventive strategy*

Discussion and Implications of Findings

The focus of the current study analysis is to empirically examine the degree of level of housing infrastructural facilities provision in the neighbouring town between two developing countries with specific attention on Nigeria and Benin-Republic. From the standard result, it was discovered that such facilities were very inadequately provided in the study area. In terms of empirical comparison, the perception of participants that housing infrastructural facilities are inadequately provided in the area was higher and significance. The interpretation of this outcome is that basic infrastructure that support the existence of mankind and economic development is still lacking in the study area. This outcome is consistent with previous findings by [6]; [18]; and [15]. The findings of the current have important implications. One of these is that the current state of infrastructural facilities is more likely to impede the development of border communities between Nigeria and Benin-Republic. More importantly, poor or very inadequate infrastructures pose threats to national security of the two neighbouring countries with increased level of insecurity risks. The significance of the current study stems from the fact that it specifically focused on an international bordering town which has few standards housing and substandard or slum settlements. This brings out the difference compared to previous studies which either focused on urban housing or slum settlements. More importantly, the outcome provides a framework for assessing level of infrastructural facilities provision at international border community in the area of road network, drainage system, pipe-borne water, electricity, communication system, and health facilities. Further, the use of Confirmatory Factor Analysis (CFA) clearly ensures the uniqueness of the current study compared to previous studies in regional and environmental fields. However, more research that will guarantee general consensus on most efficient means for evaluation of state of infrastructural facilities provision in countries and regions is still needed.

Conclusion and Policy Recommendation

The state of infrastructural provision determines wellbeing, progress and development of both governments and citizens. Due to the discerning level of infrastructures in developing countries, researchers are devising empirical methodologies to access state of these services in border communities to inform policies formulation of government in these countries. In border communities between neighbouring developing countries, particularly Nigeria and Benin-Republic, residents are faced with acute supply of infrastructural facilities where the available ones are in critical or poor conditions. In line with the findings of the current paper, the researcher urges the governments in developing countries to formulate and execute effective developmental policies will improve the level of infrastructures in border communities. This will provide impetus for governments to cope with industrialization, demographic changes and changing settlement patterns that take place in neighbouring countries.

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