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January 2012

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An Analysis of Spatial Distribution of Primary and Secondary Schools in Bida Town, Nigeria

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Abstract

Educational Facilities location in Nigeria has been observed to be politically biased, so much that an area is over serviced at the expense of other areas in dire need of them. This should not be the case as it should be based on the principle of equity, accessibility and economic efficiency to every individual irrespective of economic status and geographical location. In effort to bridge the gaps to reduce the imbalances that this paper analyses the distribution of primary and secondary schools in Bida town to establish the spatial degree of inequality and concentration in the provision of basic educational facility. The study employed GIS techniques to show spatial distribution of primary and secondary school in Bida and statistical techniques (spearman rank correlation) to assess the degree of inequality in concentration of basic educational facility. The result reveals that provision of primary and secondary school in Bida town are not guided by population distribution in the wards as the calculated t-value, 1.28 falls below the critical t-value of 1.78. To assess the level of inequality using Lorenz Curve, It is observed that about 50% of the basic educational facilities in Bida town are enjoined by about 39% of the inhabitant. This implies that some areas in Bida are deficient in basic educational facilities and quite a number of the inhabitant have no adequate access to these facilities, and also further establish that population concentration in various wards were not considered in the distribution of primary and secondary schools in Bida town. The population and number of primary and secondary school distribution are in fair inequality level, indicates relatively some degree of inequality (Gini Coefficient value is 0.57).

Key Words: Basic Education Development, Spatial Inequality, Locational Quotient, Gini Coefficient.

INTRODUCTION

Western education has been one of the most outstanding instruments of modernization in tropical Africa. According to Onokerharaye, (1980), government has given little attention to educational development in most part of the region and Nigeria is one of the worse hit by this negligence. In realization of the significance of western education, parents nowadays have developed strong desire for their children to acquire western education so that they can easily be absorbed into the modern sector of the economy and be useful to the themselves and the society at large. Once a child goes to school, he/she is exposed to new ideas and values and the longer he or she remains at school to obtain higher degree certificate, the more likely it is that he will be assimilated easily into the modern sector of the economy.

Social economic development in a country like Nigeria would be retarded without a well articulated educational system that would eliminate illiteracy and develop the human resources which is an effective tool to facilitating such development. It is in this regard that the increase in school enrolment particularly primary schools must be accorded attention with corresponding increase in physical structure to curtail incidence of over stretching existing facilities for a result oriented education development.

Accessibility to basic education has been identified as a major indicator of human capital formation of a country or region, which is an important determinant of its future rate of growth and as a measure of development (Hanmer, 1998). As important as education is to a country's growth and development, access to

basic education in Nigeria in recent time is denied for reason of uneven distribution of educational facilities and high poverty incidence in the country. Although government have initiated programmes like the universal basic education(UBE) and millennium development goals(MDG) programme to enhance the development of basic education by making available funds to all the state of the federation, the gap still exist. However, the critical missing link in these programme initiative remains the lack of a coherent policy regarding the location of facilities and services coupled with the absence of an appropriate normative framework within which policy can be formulated and executed (Owoola, 2002).

The distribution of educational facilities may be the best single quantifiable index and potential for modernization of specific parts of tropical African countries and it has been used in studies of the spatial dimension of change in these countries, for example, studies in Uganda and Kenya have indicated that there is some relationship between regional imbalance in educational opportunity and spatial imbalance in the distribution of other indices like population, economic activities and location characteristics of the urban area. The provision and spatial distribution of educational facilities and services have been of vital importance in both developed and developing countries. The need to provide educational facilities and services for the purpose of promoting and sustaining growth and development is recognized world wide. As such, the private sector is commonly encouraged to work in conjunction with the public sector to provide necessary facilities and services where appropriate and feasible. The availability of these educational facilities and services has been responsible for physical, economic and social development of most communities in developed and developing countries like Nigeria.

Spatial inequality is an important feature of many developing countries that seems to increase with economic growth and development. At the same time, there seems to be little consensus on the causes of spatial inequality and on a list of effective policy instrument that may foster or reduce spatial inequality (Sukko, 2006). Nigeria being the country with the highest population of blacks in the world has huge human resource potential for growth and development, many of which have little access to quality education for many reasons and one of them is the uneven distribution of basic education facilities in most villages, towns and cities in the country. The objectives of this paper are to:

- i. Examines the distribution of educational facilities (primary and secondary schools) in Bida.
- ii. to ascertain inequality in primary and secondary schools distribution in Bida town, and
- iii. Assess the relationship that exists between spatial distribution of primary and secondary schools and population distribution in Bida town.

CONCEPT OF EFFICIENCY AND EQUITY

Mabogunje, (1974) drew attention to the physical aspect of urban centers in the provision of public facilities in Nigerian cities. According to him, the provisions of public services in urban areas of the country have not been reflecting the structural and spatial aspect. This is because physical planning efforts in the country have been characterized by laying emphasis on sectorial and financial planning almost to the neglect of spatial planning. Malczewski and Jackson (2000) have described spatial efficiency as typically operationalized in terms of the minimization of total average cost of travel (time or distance) from place of residence to places of education. They pointed out that there are several measures of equity available for evaluating spatial accessibility to

education facilities. One can for example, impose a standard such that the average (maximum) travel time to schools not to exceed a specified range. Alternatively the concept of equity can be operationalized by means of minimum criterion. This would involve minimization of maximum cost (time or distance) of travel from place of residence to educational facility.

Ayeni and Ruston, (1985) puts it that efficiency and equity are very important concepts not fully understood by planners and analysts, but which cannot be divorced in public facilities location. They further argued that issues of efficiency handled in isolation from equity have not done justice to spatial distribution of educational facilities. According to *Rawls principle of justice* as quoted by Malczewski and Jackson (2000), "educational services should be organized in a way remotely situated that maximizes individual within a school district." The equity concept can also be operationalized by minimizing variability of access to educational service. Variability can be measured in terms of the standard deviation or variance of residence to place of educational services.

Onokerhoraye, (1982) cited that input or output remains the parameters upon which equity is measured. Equity between districts in the facilities allocation determines equality of input. On the other hand, the equity of output is assessed in terms of the equality in the resultant effects of such input as the equality of the number of school age children attending various primary schools. This view has been persuasively presented by Morrill and Erickson (1969) who believe that while input and output could be used as a parameter to assess the measure of the standard for the provision of public facilities or services in an area, it is indeed a weak measure of equity. Nonetheless the issue of equity may be made operational by adopting some socially imposed minimum standard by which pattern of location of facilities could be considered. Onokerhoraye, (1982), further examined that equity becomes operational when one bear in mind that the pattern of the distribution of settlement is important both in the evaluation of fairness and in the assessment of ways in which distribution meet required threshold for facilities provision. It was further highlighted that in a spatial world, equity and efficiency are synonymous only when all people have equal income and information. They are also connected when the location of residents irrespective of their spatial position in on the earth surface guarantees convenience in social and economic engagement as greater distance and transport cost incurred in moving from one point to affect productivity.

CONCEPT OF ACCESSIBILITY AND EQUITY

A specific investigation by Funnel, (1976) observed that the problem of accessibility may be minimized by allocating most services to administrative areas rather than to specific location. Primary school for instance may be assigned to administrative areas or units on the basis of population/facility ratio. For instance, in Kenya the 1970-74 plans envisaged a network of health centers on the basis of one for every 20,000 persons. However, when the available facilities are limited obvious difficulties arise if an attempt is made to optimize the location in respect to current requirement, duplication or overlapping of facilities may ultimately arise. Funnel placed consideration on both in patients and out-patient and a fairly long distance was the eight kilometers to twelve kilometers band yet the hospital was proposed to which has a diameter over fifty kilometers. Similarly, McGlashan, (1972) as cited by Funnel, (1976) aimed at establishing the pattern of usage in relation to the estimated capacity of the facilities concerned. It was found that there exist wide discrepancies in the pattern of provision from the perspective of accessibility. Despite effort to minimize the cost of provision but maximize the availability of the appropriate treatment there is still evidence of inequality between certain areas where people live. The centers in which these facilities are located effectively provide for only a limited proportion of the surrounding population.

Generally, services provision becomes 'supply biased' with no much measures of demand considered. Thus, Onokerharaye, (1982) has amplified Christaller's central place theory that the average population required to support any facility be called 'threshold' and this value can be determined as the middle point of entry zone of that facility.

More recent studies on spatial accessibility by Malczewski and Jackson, (2000) noted that even though spatial accessibility may fail to account for economies of scale and operating efficiency in the provision of the educational facilities, the accessibility criteria should thus be a given area/population. The more schools, the closer each potential user is to the one serving him or her. On the other hand, with more location, the fewer will be the number sharing each with less advantage taken of economies of scale. Clearly, these two criteria must be traded of to determine the number, size and location of educational facilities in a given area. The conflict between accessibility criteria and scale economies is associated with the preference of the different

interest groups concerned with spatial organization of educational facilities. Broadly speaking, school administrators tend to stress the operating efficiency of few facilities, while the public is more concerned with the issue of equity.

THE STUDY AREA

Bida town, a local government headquarter in Niger State (Fig.1) lies at 9° 06' N and 6° 01' E on the Nupe sand stone formation which consists of plains with iron stone capped hills or mesas. The scenery is fairly uniform since lithology and rock structure are not greatly variable. The town is drained by the Chieyen and Munsu Rivers with the third River Land-zun, which flows right across the heart of the town. The importance of these Rivers is that they provide good irrigation opportunities for the inhabitants thus; they are both of economic and social importance. Bida town is also divided into fourteen (14) wards namely: *Bariki, Cheniyen, Dokodza, Kiari, Ladzun, Masaba "A", Masaba "B", Masaga "A", Masaga "B", Ndajiya, Nasarafu, UmaruMajigi "A", UmaruMajigi "B", and Wadataas*(Fig.2).

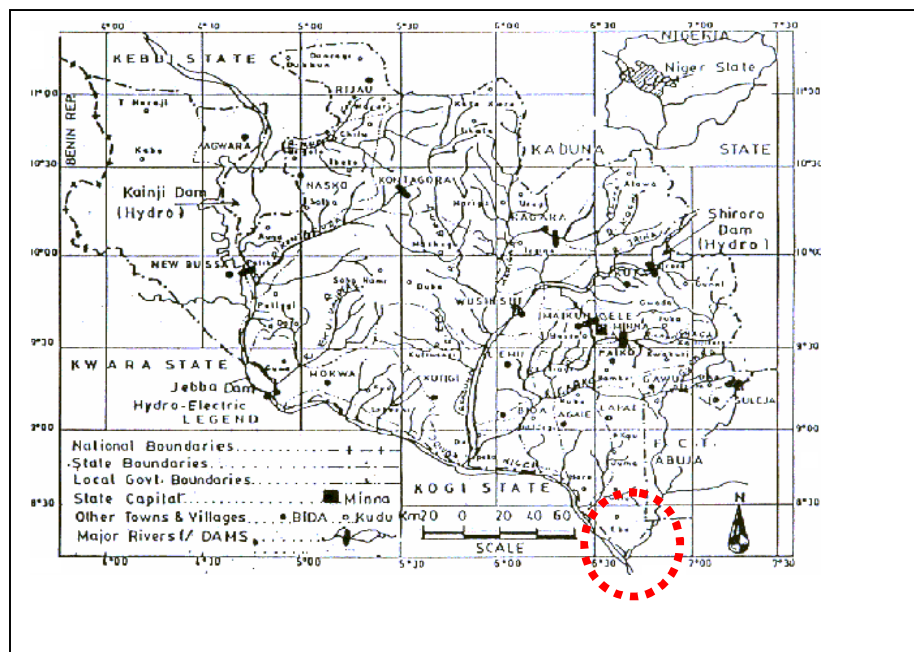


Fig. 1: Niger State Showing the Location of Bida

Bida town is bounded by Pichi in the west, Baddegi in the east, Gbazihi in the North and Doko in the south. The town is located to the north-east of the Federal Capital Territory Abuja with population of 172,898 in 1991, population of 188,181 in 2006 and projected population of 192,161 people in 2009.

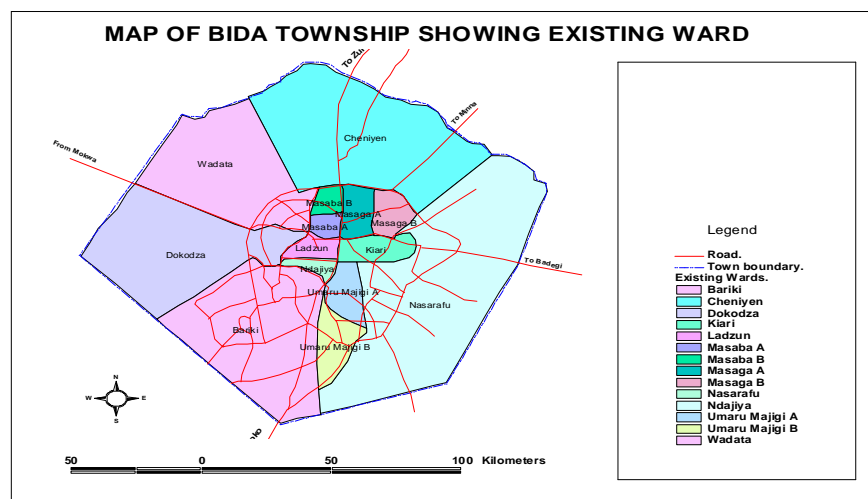


Fig. 2 Bida Town Showing the Existing Wards.

MATERIALS AND METHODS

Data used for this study was from the inventory of the existing private and public primary and secondary schools in the fourteen (14) wards in Bida town obtained from field survey with the aid of a Garmin 76cx hand held GPS receiver by moving round the town using Bida street map, google earth image and the inhabitants of the wards as guides. Bida street guide map obtained from Ministry of Land Survey and Town Planning was georeferenced and digitized using the ground control points (GCP) from GPS readings. Spatial location map of primary and secondary schools in Bida was created using Arcview GIS 3.2a software. The Population for 2009 was projected from census figure of 2006 obtained from National Population Commission (NPC) using the national growth rate of 3.5%. Gini Coefficient (G) and Locational Quotient (LQ) analysis was carried out to show the extent of spatial inequality and the degree of concentration of educational facility's distribution in the wards.

Gini Coefficient was computed by finding the percentage of existing primary and secondary school in each ward to the total in all wards. Then the expected number of primary and secondary school in each ward in relationship with the population of each ward was computed. The deviation of the expected from the existing educational facilities in each ward was calculated and the sum of the total deviation was used as input in the Gini Coefficient formula. Gini coefficient ranges from 0 to 1, therefore the higher the G, the greater the degree of inequality. Locational Quotient was computed by dividing the ratio of number of primary and secondary schools in each ward to total in all wards by the ratio of the population of each ward to the total population of all the wards. It also ranges from 0 to 1 and connotes that higher the Locational Quotients, the higher the fair share of the educational facilities. The data was further subjected to spearman rank correlation to establish the relationship between spatial distributions of schools and population distribution.

RESULT AND DISCUSSION

Measuring Spatial inequality

Research result of the field survey (table 1.1) shows the distribution of primary and secondary schools in Bida town. It reveals that 57% and 71% of primary school and secondary school in Bida town are public schools. This implies that majority of schools are owned by government, although individuals and cooperate organization hitherto have been contributing to basic educational development in Bida town. However, more effort is needed to complement government effort in the provision of primary and secondary schools.

As shown in table 1.1, Nasarafu which is the ward with the lowest population, has the highest concentration of primary and secondary schools with LQ value of 6.8 and 27.2 respectively for each schools (Fig.3 and Fig.4). This is significantly high compared to the situation in Kiari ward which has the highest population with very with education facilities less than a fair share (1- primary school and completely lack secondary school). Similarly, Dokodza, Ladzun, Masaba 'A' and 'B' and Ndajiya ward has no secondary school. Locational Quotient Value also reveals that Bariki and Cheniyen ward were provided with educational facilities more than their fair share, whereas Masaba 'A' with a population of 12,276 has no primary school. It is interesting to note that Masaga 'B', Umaru-Majigi and Wadata are the wards that enjoy perfect fair share of primary schools with LQ value of 1.0 indicating that they have a fair share of educational facilities provision based on population standard which could be a deliberate effort or a mere coincidence.

Table 1. Locational Quotient (LQ) of Primary and Secondary Schools in Bida Town

Ward	2009 Projected Population	Public Primary School	Private Primary School.	Total	LQ	Public Sec. Sch.	Private Sec. Sch.	Total	LQ	Grand Total
Bariki	16,013	7	7	14	1.9	2	0	2	1.1	16
Cheniyen	21,351	9	11	20	2.1	5	1	6	2.6	26
Dokodza	19,216	4	0	4	0.5	0	0	0	0	4
Kiari	27,756	3	1	4	0.3	0	0	0	0	4
Ladzun	5,338	0	3	3	1.2	0	0	0	0	3
Masaba A'	12,276	0	0	0	0	0	0	0	0	0
Masaba 'B'	10,675	3	1	4	0.8	0	0	0	0	4
Masaga 'A'	8,540	1	1	2	0.5	0	0	0	0	2
Masaga 'B'	7,473	2	1	3	0.9	0	0	0	0	3
Ndajiya	10,141	6	0	6	1.3	0	0	0	0	6
Nasarafu	2,674	3	5	8	6.6	5	3	8	27.2	16
Umaru-Majigi 'A'	14,946	2	1	3	0.4	0	0	0	0	3
Umaru-Majigi 'B'	13,344	3	3	6	1.0	1	0	1	0.7	7
Wadata	22,418	7	3	10	1.0	2	2	4	1.6	14
Total	192,161	50	37	87		15	6	21		108

Source: NPC, 2006 and projected by the Authors based on 3.5% growth rate, 2009

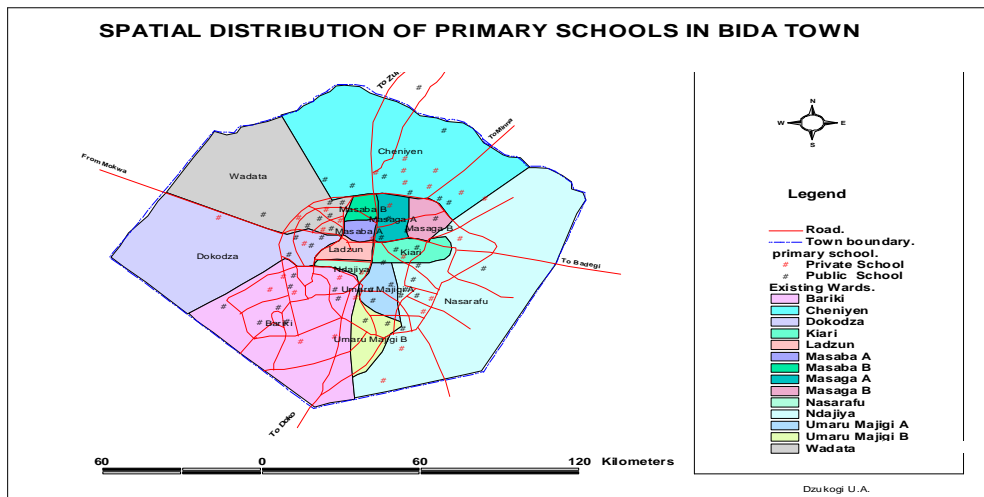


Fig.3: Distribution of Primary Schools within the Existing Wards in Bida Town

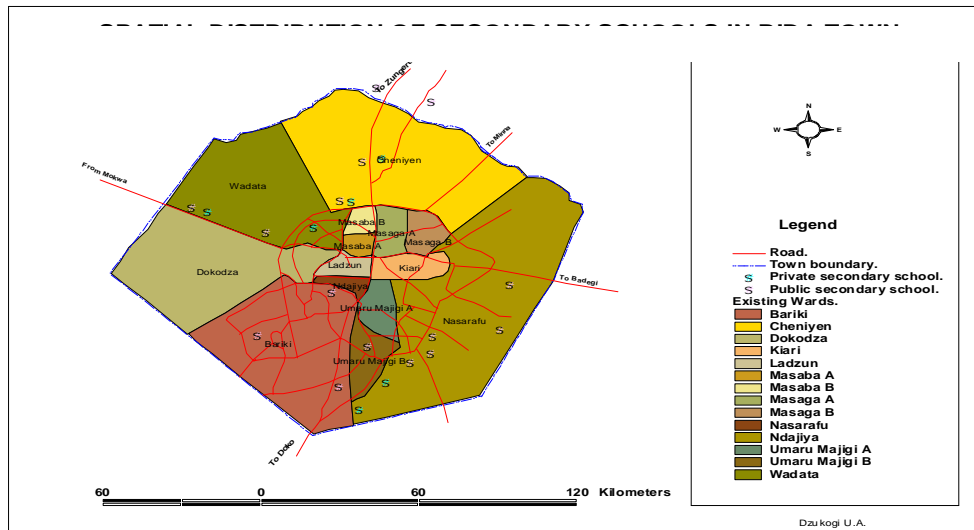


Fig.4: Distribution of Secondary Schools within the Existing Wards in Bida Town

The Spearman Rank Correlation (r_s) analysis was conducted (table 2) using the to test if the correlation between the existing population of the wards (Fig.5 and Fig 6) and educational facility provision and distribution is fair and positive. That is, the higher the population, the higher the number of educational facility provision and distribution. The result obtained for spearman rank correlation (r_s) is 0.42 and test for significant (t) gave 1.33. This indicates that there is no statistically significant relationship between educational facility provision and distribution and the existing population of the wards, given that the calculated t-value (1.33) is less than the critical t-value of (1.78).

Table 2: Spearman Rank Correlation for Distribution of Primary and Secondary Schools in Bida

Ward	2009 Projected Population	No. of Pry./Sec. Sch.	r ₁ (Pop)	r ₂ (Pry./Sec.)	d= (r ₁ -r ₂)	d ²
Bariki	16,013	16	5	2	3	9
Cheniyen	21,351	26	3	1	2	4
Dokodza	19,216	4	4	7	-3	9
Kiari	27,756	4	1	7	-6	36
Ladzun	5,338	3	13	10	3	9
Masaba "A"	12,276	0	8	14	-6	36
Masaba "B"	10,675	4	9	7	2	4
Masaga "A"	8,540	2	11	13	-2	4
Masaga "B"	7,473	3	12	10	2	4
Ndajiya	10,141	6	10	6	4	16
Nasarafu	2,674	16	14	2	12	144
Umaru-Majigi "A"	14,946	3	6	10	-4	16
Umaru – Majigi "B"	13,344	7	7		2	4
Wadata	22,418	14	2	4	-2	4
Total	192,161	108				299

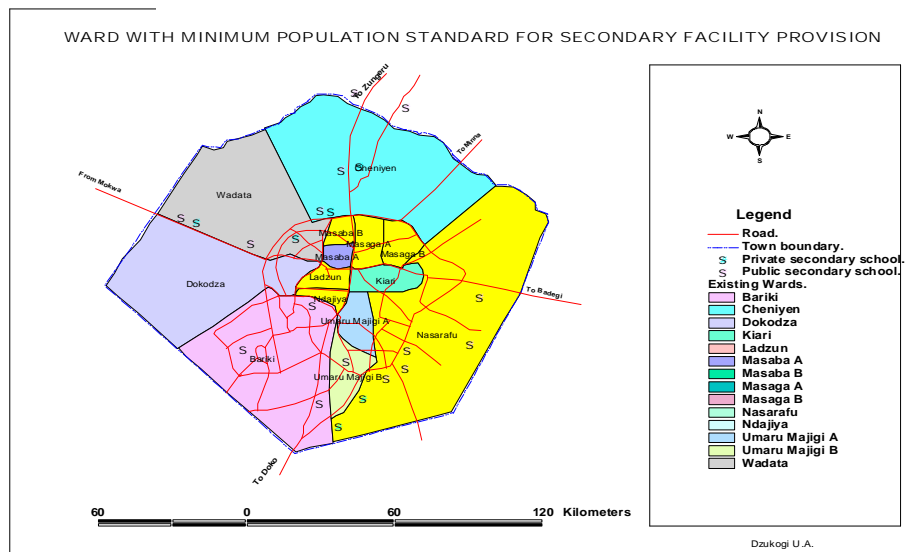
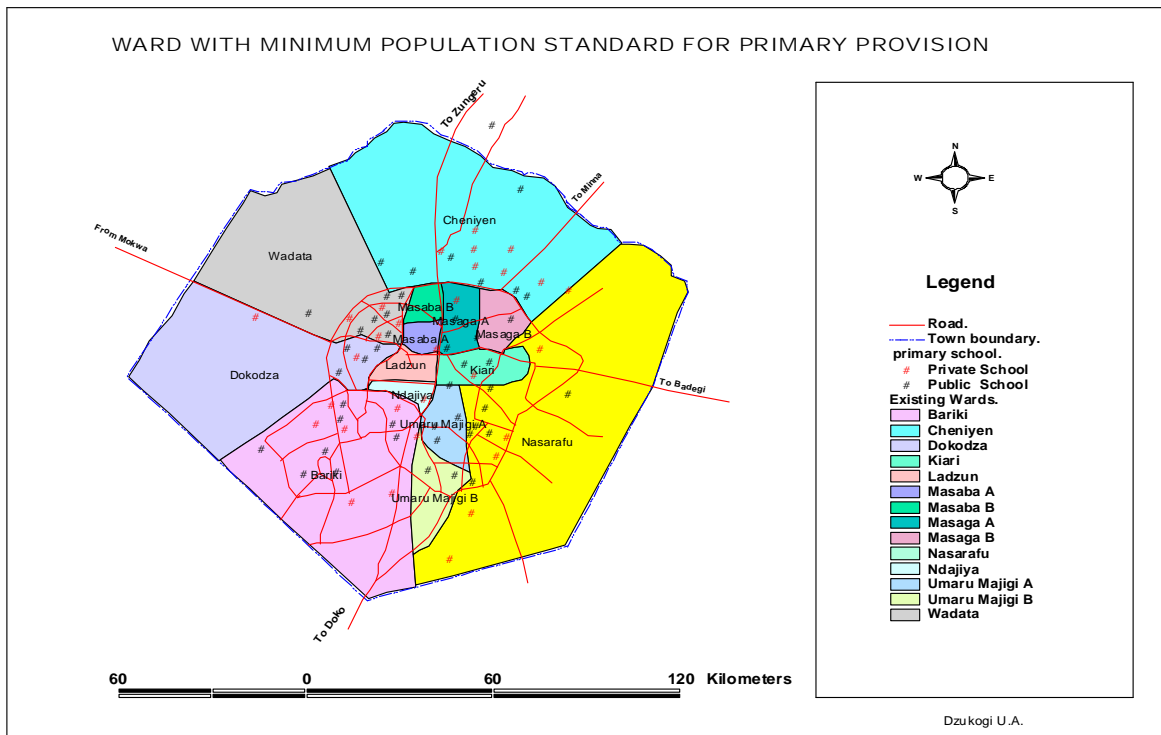


Figure 5: The Wards with Minimum Population and Fairly Adequate Number of Primary Schools (yellow shade)



1 Fig. 6. The Wards with Minimum Population and Fairly Adequate Number of
2 Secondary Schools (Yellow Shade)

Educational facility had been provided in the same proportion as the population, a perfect line (the diagonal) would have resulted. The deviation between the two sets of value is represented by the space between the plotted line and the diagonal in the figure. Also, if a line projected from point 50% on the vertical line to the curve and extended downward to touch the horizontal, the percentage of the elites group that controlling the majority of the educational facility distribution can be determined. It is observed that about 50% of the basic educational facilities in Bida town are enjoined by about 39% of the inhabitant. This implies that some areas in Bida are deficient in basic educational facilities and quite a number of the inhabitant have no adequate access to these facilities, and also further establish that population concentration in various wards was not considered in the distribution of primary and secondary schools in Bida town. The population and number of primary and secondary school distribution are in fair inequality level, indicates relatively some degree of inequality (Gini Coefficient value is 0.57).

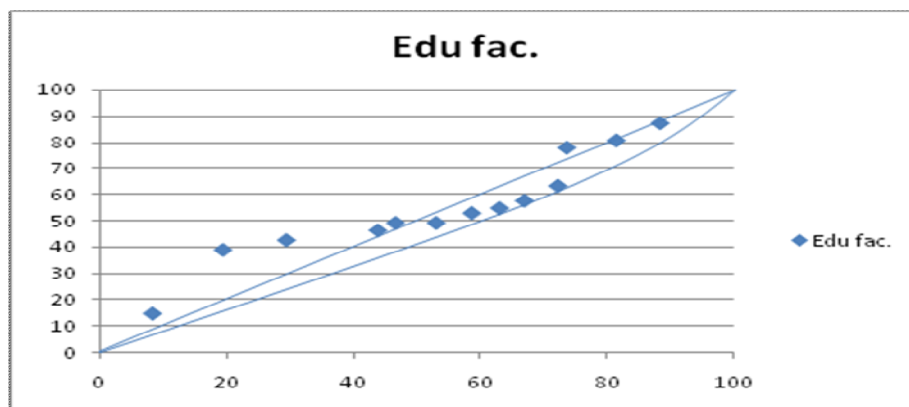


Fig ..7: Lorenz Curve of Population and Number of Basic Educational Facilities

Conclusion and Recommendations

The importance of investment in education as a determinant of economic growth and development is found to be associated with significant labour market gain for the individual in question such as higher post tax earning, higher participation in the labour market and improved employment probability (OECD, 2001). Education is the key ingredient in the 21st century recipe for growing the economy as such, there is urgent need for intervention in the education sector in Nigeria and Bida town in particular and purposeful efforts should address the problems of inadequate facilities especially the need for the construction of more schools and other ancillary facilities in places they are lacking to reduce overcrowding and stretching of existing ones in order to make learning conducive for Nigeria growing populace.

In view of the inadequacies unveiled in this study, one sure way that can help bring about equitability in the distribution of schools, reduce student travel time and enhance learning is to engage the service of settlement planners in planning for school location because they are masters of spatial ordering of all landuses and therefore, both government and private developers should consult and engage their services in planning for education facilities provision. In this way, wards in Bida town will not be over serviced or under serviced at the expense of one another as population distribution in each ward would be used to guide developmental efforts. The National Civic Registration (NCR) department should also have functional unit in all local government to take record of birth and death incidence which is recognize world wide as basic ingredient of intensive economy and physical planning. This can be achieved through proper enlightenment campaign using all the media to sensitize people on the need to report all birth and death cases to NCR and this will aid efficacious policy formulation, facilitate plan development and implementation.

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