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SPATIAL INEQUALITY IN ENVIRONMENTAL AMENITIES DISTRIBUTION IN BIDA, NIGER STATE, NIGERIA.

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Environmental amenities is a bundle of services that is important to individual existence, it could as well determine the wellbeing of the people. Spatial inequality in environmental amenities can undermine social and political stability due to the tensions and conflicts that they often engender. Therefore, this study examines the spatial inequality in the environmental amenities distribution in Bida, Niger State. Environment inequality in five (5) environmental amenities was assessed, the amenities are: school, water, health facilities, tarred road and open space. Both primary and secondary data were collected for the study and the data were analysed descriptively. Gini coefficients and Lorenz curve were employed as analytical tools to measure inequality and adequacy in the fourteen wards in Bida. The study reveals that there is a high unequal distribution (0.46) in environmental amenities distribution in Bida. There is variation in inequality among the identified amenities. Public School recorded the highest inequality index of (0.59), while public primary health care and open spaces recorded an inequality index of (0.57) and (0.54) respectively. The study, therefore, concludes that the provision of environmental amenities in the study area is not a function of population or area coverage, except for water and schools. It is recommended that the provision of environmental amenities should be matched with the population, review of policy and other obsolete criteria to improve general wellbeing of the people.

Keywords: Environmental Amenities, Inequality, Gini-Coefficient, Lorenz Curve

INTRODUCTION

There is a growing concern that spatial inequality is on the increase, globally and locally (UNDP, 2013). Infrastructure facilities are not evenly spread over space because of environmental factors. In recent years there is a global attention for the need to tackle inequality. Beyond the adverse implications of inequality for growth and wellbeing, spatial inequalities can undermine social and political stability due to the tensions and conflicts that they often engender (Stewart, 2010). Understanding and redressing the underlying drivers of spatial inequality is therefore critical both for preventing political instability and for maximizing the poverty reduction impact of economic growth. Recent studies have shown that, other than parks, green space, vegetal land, usually for recreational or aesthetic purposes, has also been recognized as an important neighbourhood amenity. Access to green spaces has been viewed as a principal factor to enhancing health and well-being (Li et al., 2010; Thompson et al., 2012). Inequality is far from being a temporal phenomenon, inequalities has remained a global reality, which has widen in many countries in recent years (Asian Development Bank, 2012). The phenomenon of inequality is widely recognized in Nigeria and many countries of the world, inequality is epitomized in the use of such terms as 'advantaged' and 'disadvantaged' 'privileged' and 'less privileged' (Adejola and Balus, 2014).

The importance of environmental amenities to human life can never be over-emphasized (Ogundare, 1992) cited in Sanni (2010). Researchers have likened environmental amenities to bundle of services, for instance Stewart and Srinivasan (2004) noted that environmental amenities are goods and services whose absence in the consumptions of a household, render the household poor.

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Stewart and Srinivasan (2004) maintained that the concern and attention that any government pays to environmental amenities could well determine the well being of the people. Empirical studies in both developed and developing countries have linked increasing avoidable and preventable deaths to inadequate access to environmental amenities (World Health Organisation, 1998).

In investigating the level of provision of central facilities, emphasis has shifted from mere provision to the degree of accessibility of people to these facilities. Barton et al., (2009) echoed this emphasis in their observation that "human beings are the centres of concern for sustainable development and they are entitled to a healthy and productive life in harmony with nature". Thus, a deficiency in the spatial distribution of the consumption of goods that are non-economic in nature is often neglected with the consequences of overlooking vital areas of differences in the quality of human welfare (Sanusi, 2007). Even where some analysts focus on spatial inequality, the attempt is to examine economic inequality as it differs from one place to the other without necessarily laying reasonable emphasis on consumption of certain amenities that relate to individuals within the society (Smith, 1979) cited in (Sanusi, 2007). The inundated focus on income inequality could partly be attributed to the common interpretation of poverty has always been on income which has universally acceptable threshold. However, in recent times, poverty has been seen as a multi-dimensional (UNDP, 2013), the definition should therefore, encompass these dimensions. To better appreciate inequality, attention should also be diversified and effort be made to focus on other aspects of poverty apart from income.

The problem of poverty becomes very worrisome, when considered within the context of inequality. This worry even becomes sensitive when the amenities with which households interact daily are taken into consideration. It is not unexpected, therefore, that the World Social Situation Report 2013 is titled, *Inequality matters* (UNDP, 2013) with emphasis on Economic and Social Affairs. Owing to this, it is the intention of this research to identify environmental amenities and assess spatial inequality in relation to consumption of some environmental amenities in Ibadan, Nigeria. The working definition for environmental amenities in this study is stated thus "Environmental amenities are amenities or facilities available to households within and around their houses. They are consumed directly or indirectly by households on a daily basis. The presence of these facilities adds to the comfort and general welfare of the households". The environmental facilities considered for this study are open spaces, access roads (tarmac), public primary schools, public bore holes, and public primary health care centres within the geographical boundaries of Ibadan, Niger State.

Concept of Spatial Inequality

Spatial inequality is terminology used by urban planners to offer explanation about how phenomenon of interest is or is spread over space. Many authors present different argument about what inequality entails in various ways but certain things are central to all. For instance Sanusi (2007) argued that "inequality is a situation of unequal possession of certain distributive amenity and demonstrates unequal gradients in the distribution continuum". He further noted that within this continuum, "while few people may not have at all, too many people may have too low and very few people may have too much". Thus, inequality represents a discernible imbalance in the relationship between people in respect of a particular subject. In related development, inequality has been referred to as a "condition in which different spatial or geographical units are at different levels on some variables of interest usually average income" (Lall and Chakravorty, 2004).

Spatial inequality is also viewed as "uneven distribution of economic and social indicators of human wellbeing within or among geographical units such as countries, cities, rural-urban areas and regions" (Aryeetey et al., 2009) cited in Poku-Boansi and Amoako work (2015). The author's perception about spatial inequality dwelled more on socio-economic state of wellbeing and condition relating a geographical unit and not the mere measurement and comparison of indicators depicting those states. In view of this, it is safe to view spatial inequality as the state of lop-sidedness in the distribution, possession, access and satisfaction derivable from phenomenon of interest under investigation.

Concept of Environmental Amenities

In environmental economics, an amenity is something considered to benefit a property and thereby increase its value (Carmichael, 2003). Carmichael classifies amenities in two; tangible and intangible amenity. Tangible amenities can include the number and nature of guest rooms and the provision of facilities such as elevators (lifts), wi-fi, restaurants, parks, communal areas, swimming pools, golf courses, health club facilities, party rooms, theatre or media rooms, bike paths or garages, while intangible amenities can include aspects such as well-integrated public transport, plentiful views, nearby activities and a low crime rate. Within the context of environmental economics, an environmental amenity can include access to clean air or clean water, or the quality of any other environmental good that may reduce adverse health effects for residents or increase their economic welfare (Barry and Martha, 2017).

Sansu, (2007) on the other hand argued that environmental amenities are "facilities available to households within and around their houses. They are consumed directly or indirectly by households on daily basis". The presence of these facilities adds to the comfort, joy and general welfare of the households. He argued further that among these facilities are "open spaces within housing units, habitable rooms, the size of the dwelling unit, the average size of rooms, the number of rooms with cross ventilation, number of toilets available to households, the distribution of bathrooms and kitchen among households". It is important to note that living standard is measurable, because socio-economic status of the people to a large extent depends on the quality of infrastructural facilities provided with good maintenance culture.

Amenities affect everyone in an urban area (Sansu, 2007). Terry (2002) went further to categorize amenities into two. These are: (i) Natural physical amenities (climate, humidity, temperature, water access overall natural attractiveness), and (ii) Constructed amenities: this include number of bigger institutions like research libraries, museums, small firms, bookstores, juice bars, bicycle events to mention but a few. In related development Idachaba (1995), further categorized amenities into three (3), namely: (i) Physical Infrastructures which comprises of Roads, Bridges, storage facilities, Dams, Irrigation, water facilities and other forms of processing facilities, (ii) Social infrastructure which include health, medical facilities, and educational facilities, (iii) Institutional infrastructure which consists of cooperative societies, unions, financial institutions like Banks, Agricultural extension and training services.

Inequality Measurement

Several inequality measurements exist, Coefficient of variation, Gini coefficient, Theil Index, generalized entropy, and Atkinson index. The three (3) most widely used index of inequality, Coefficient of variation, Gini coefficient, and Theil Index were discussed in this study.

Coefficient of variation (CV)

This measure of income inequality is calculated by the dividing the standard deviation of the income distribution by its mean (Campino 2006) More equal income distributions will have smaller standard deviations; as such, the CV will be smaller in more equal societies. Despite being one of the simplest measures of inequality, use of the CV has been fairly limited in the public health literature and it has not featured in research on the income inequality hypothesis. This may be attributed to important limitations of the CV measure: (1) it does not have an upper bound like the Gini coefficient, making interpretation and comparison somewhat more difficult; and (2) the two components of the CV (the mean and the standard deviation) may be exceedingly influenced by anomalously low or high income values. In other words, the CV would not be an appropriate choice of inequality measure if the study's data did not approach a normal distribution.

Atkinson index

Unlike the Gini coefficient, Atkinson index of inequality measurement is a more precisely labelled family of income inequality measure. The Atkinson index allows for varying sensitivity to inequalities in different parts of the distribution. This was important to Atkinson, who was concerned with the inability of the Gini framework to give different parts of the income spectrum varying weights. In his influential text *The Economics of Inequality*, Atkinson noted that inequality "cannot, in general, be measured without introducing social judgements. Measures such as the Gini coefficient are not purely statistical and they embody implicit judgements about the weight to be attached to inequality at different points on the income scale". Therefore, his index incorporates a sensitivity parameter (α), which can range from 0 (meaning that the researcher is indifferent about the nature of the income distribution), to infinity (where the researcher is concerned only with the income position of the very lowest income group). Atkinson argued that this index was a way to incorporate Rawls' conception of social justice into the measurement of income inequality.

Gini coefficient of inequality

The most widely used single measure of inequality is the Gini coefficient. It is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable (e.g. income) with the uniform distribution that represents equality. To construct the Gini coefficient, graph the cumulative percentage of households (from poor to rich) on the horizontal axis and the cumulative percentage of expenditure (or income) on the vertical axis. The diagonal line represents perfect equality. The Gini coefficient is defined as $A/(A+B)$, where A and B are the areas shown on the graph. If $A=0$ the Gini coefficient becomes 0 which means perfect equality, whereas if $B=0$ the Gini coefficient becomes 1 which means complete inequality. One of the major advantages of Gini Coefficient over other forms of inequality measurement are; direct comparison between units with different size population feasible as well as intuitive interpretation.

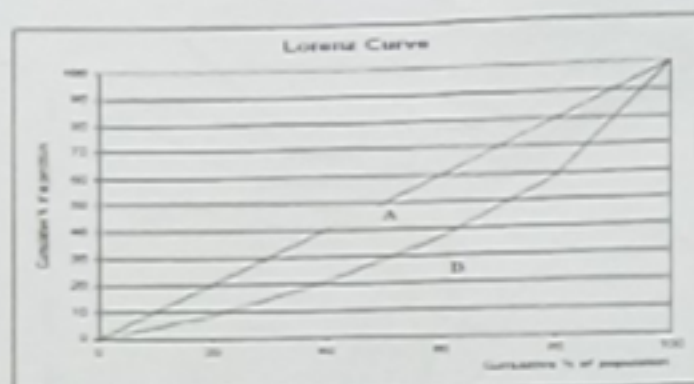


Figure 1: Lorenz Curve

RESEARCH METHOD

The study is an empirical study, it is a non-experimental research using survey. Qualitative and quantitative data were gathered from primary and secondary data source. The geographical location of the environmental amenities was collected with the aid of a geographical positioning system (GPS), except open space and tarred road. The area coverage of the open space and the length of tarred road were captured from high resolution image of Bida acquired from Ikonos. The location (latitude/longitude) of the identified environmental amenities were imported into ARCGIS 10.2 environment and mapped appropriately. The study also collected the projected ward population of Bida wards from the Malaria Consortium (2016). Gini-coefficient and Lorenz curve was adopted as analytical tool to measure inequality in the distribution of the environmental amenities. The data analysed were presented in tables and maps for easy understanding and interpretation.

RESULTS AND DISCUSSION

Distribution of Environmental Amenities

Distribution of Schools in Bida

Table 1 shows the number and distribution of public primary schools in Bida. The result shows that a total of 55 public primary schools were identified in Bida. The result shows that the largest proportion (12%) of the public schools in Bida is located in Nasarafi and Umaru Majigi B ward respectively. The result also reveals that the lowest proportion (4%) of the schools was identified in Masaga A, Masaga B, and Cheniyan ward respectively. Out of the fourteen wards, four wards (Nasarafi, Umar Majigi B, Landau and Umar Majigi A) share 52% of the total number of schools identified in Bida. This is an indication of inequality in the distribution of primary schools in Bida.

The spatial distribution of public schools in Bida is presented in Figure 2. The result shows a cluster distribution of public schools within the city core. The pattern of public school distribution also shows that the number of public schools decreases with increase in distance away from the city centre. Wadata, Dokuza, Cheniyan and Bariki ward have fewer numbers of public schools compared with wards closer to the inner core. Generally, the pattern of public school distribution in Bida is cluster.

Table 1: Distribution of Public Primary Schools in Bida

Ward	Schools	Percentage
Bariki	4	7
Cheniyan	2	4
Dokuza	3	5
Kyari	2	4
Landau	6	11
Masaha A	3	5
Masaha B	2	4
Masaga A	2	4
Masaga B	3	5
Mayaki Ndajiya	3	5
Nasarafi	8	15
Umaru Majigi A	6	11
Umaru Majigi B	8	15
Wadata	3	5
Total	55	100

Source: Authors Survey (2017)



Figure 2. Spatial Distribution of public Primary Schools Source: Authors Survey (2017)

Distribution of Primary Health Care Centres in Bida

Similarly, the number and distribution of primary healthcare centres in Bida is depicted in table 2. A total of ten (10) Primary Health Care (PHC) was identified in Bida. Wadata ward has the largest proportion (20%) of PHC facilities in Bida. Eight other wards enjoy 10% of the PHC respectively; the wards are Dokuzi, Kyari, Masaba A, Masaga A, Masaga B, Mayaki, Nasarafi and Umaru Majigi B. All other wards have no record of primary health care centres. The wards without records of PHC are Bariki, Chereyam, Landzu, Masaba B and Umaru Majigi A. The spatial distribution pattern of public healthcare centres in Bida is depicted in Figure 3. A dispersed pattern of distribution can be observed from Figure 3, which implies a random distribution pattern in the distribution of primary health care centres in Bida.

Table 2: Distribution of Primary Health Care Centres

Ward	PHC	%
Bariki	0	0
Chereyam	0	0
Dokuzi	1	10
Kyari	1	10
Landzu	0	0
Masaba A	1	10
Masaba B	0	0
Masaga A	1	10
Masaga B	1	10
Mayaki	1	10
Nasarafi	1	10
Umaru Majigi A	0	0
Umaru Majigi B	1	10
Wadata	2	20
Total	10	100

Source: Authors Survey (2017)



Figure 3. Spatial Distribution Pattern of Primary Health Centres

Distribution of Public Bore hole in Bida

Furthermore, the number of public boreholes identified in Bida is presented in Table 3. The result reveals that a total of twenty four (24) public boreholes were identified in Bida. All the wards have at least one public water facilities (Motorized and Manual borehole) except for Masaba A and Umaru Majigi A. It can be observed that Dokuzo, Masaga B and Kyari has the largest percentage (13%) of public water facilities in Bida respectively. The lowest percentage of public water facilities is recorded in Masaba B, Nasarafi, and Umaru Majigi B with 4% respectively. The result also shows that 39% of the public water facilities is shared by three wards: Dokuzo, Masaga and Kyari, while the other eleven (11) wards share the balance of 61%.

Figure 4. Shows the distribution pattern of public borehole within Bida. The result shows that the distribution of the public water amenities is random. It is also observed that the water points are clustered within some areas of the wards, while other areas are far further away from the amenity.

Table 3. Public Water Facilities in Bida

Ward	Number	Percentage
Kari	2	8
Cherem	2	8
Dokuzo	3	13
Kyari	3	13
Lameta	2	8
Masaba A	0	0
Masaba B	1	4
Masaga A	2	8
Masaga B	3	13
Mosaki Ndaryo	2	8
Nasarafi	1	4
Umaru Majigi A	0	0
Umaru Majigi B	1	4
Wabara	2	8
Total	24	100

Source: Author Fieldwork (2017)



Figure 3 Spatial Distribution of Public water. Source: Authors Fieldwork (2017)

Distribution of Tarred Road in Bida

Similarly, tarred roads in Bida were digitized from high resolution image of Bida acquired from IKONOS. The length of the roads was calculated using ARCOIS and recorded across the fourteen (14) wards. Table 4 shows the length of the tarred road in Bida. The analysis reveals that the total length of tarred roads in Bida is 53.8 hectares. Bariki ward enjoy 27.9% of the tarred roads, followed by Kyari (14.9%). Tarred road in Chenjyan account for 9.3%, Dokozu (9.0%), Umaru Majigi B (8.8%), and Umaru Majigi A (8.4%). All other wards have less than 8% of the total tarred roads in Bida respectively.

Table 4: Length of Tarred Road in Bida

Ward	Length (Ha)	Percentage
Bariki	15.0	28
Chenjyan	5.0	9
Dokozu	4.8	9
Kyari	8.0	15
Landru	0.7	1
Masulu A	1.0	2
Masulu B	1.2	2
Masugi A	0.5	1
Masugi B	0.3	1
Mayaki Ndejya	2.2	4
Nasuru	2.4	5
Umaru Majigi A	4.5	8
Umaru Majigi B	4.7	9
Walata	3.4	6
Total	53.8	100

Source: Authors Analysis (2017)



Figure 4 Distribution of tamed road
Source: Authors Analysis (2017)

Distribution of Green Areas in Bida

Green areas/open spaces in Bida were identified from the high resolution image. The area coverage of the green areas was calculated using GIS on ARCGIS 10.2 and recorded accordingly for all the wards. Total area of green areas identified in Bida is 93.3 hectares as depicted in Table 6. The largest proportion (39%) of the green areas is located in Chereyen, 20% in Dokoza, 12% in Kyari, while Bariki and Masaba B had 11% of the green areas respectively. The five aforementioned wards share 93% of the total green areas/open space, while the balance of 7% is shared by Masaba A, Masaga B, Landra, Nasarafi, and Umuru Majigi B in the following proportion 3%, 1%, 1%, 1%, and 1% respectively.

Table 5. Distribution of Green Areas and Open Space

Ward	Area(Ha)	Percentage
Bariki	10.3	11
Chereyen	36.3	39
Chereyen	18.6	20
Kyari	11.0	12
Landra	0.4	1
Masaba A	2.5	3
Masaba B	10.3	11
Masaga A	0.1	0
Masaga B	1.0	1
Mayaki Nibirya	0.2	0
Nasarafi	0.9	1
Umuru Majigi A	0.3	0
Umuru Majigi B	0.3	1
Wabata	0.3	0
Total	93.2	100

Source: Authors Survey (2017)



Source: Author Survey (2017)

Spatial Inequality Index of Environmental Amenities in Bida

The spatial inequality index of environmental amenities in Bida is presented in Table 7. The result shows that the composite index (GI) is 0.46, which implies moderate inequality in the distribution of environmental amenities. Public schools ranked 1st with an inequality index of 0.59, followed by primary health centres (0.57), and green areas (0.54). Public water amenities and tarred road record a GI of 0.31 respectively, which implies a moderate inequality in the provision of the amenities. The implication is that, more attention need to be paid to the provision and distribution of public schools, primary health centres and green areas in Bida. The distribution of public water amenities (borehole) and tarred roads in Bida is fairly equitable.

Table 6. Composite Inequality Index of Environmental Amenities

Environmental Amenities	Index	Rank	Remark
Public Schools	0.59	1	High
Primary Health Centres	0.57	2	High
Public Water Amenities	0.31	4	Moderate
Green Areas/Open Space	0.54	3	High
Tarred Roads	0.31	4	Moderate
Composite	0.46		Moderate

Source: Author Survey (2017)

CONCLUSION

Understanding that provision of environmental amenities is basic to economic development and wellbeing of the people, this study made an effort to bring into focus the types, number, and variation in environmental amenities in Bida LGA, of Niger State. These environmental amenities include schools, green areas, road, health centres and water amenities. It is evident that the environmental amenities are unevenly distributed over space. While some localities are having more than their average share of the environmental amenities over and above other areas, there exist many areas that are lagging behind. The environmental amenities are found to be localized in some wards at the expense of other wards in Bida.

This lopsidedness pattern of environmental amenities provision should be given more attention by adopting an objective investment in environmental amenities in favour of the disadvantaged areas and this will help not only to promote the spirit of distributive justice but also it will go a long way to foster regional balance in our developmental efforts in Bida. Therefore, all hands must be on deck towards ensuring adequate provision and proper distribution and siting of environmental amenities in Bida.

RECOMMENDATION

The study recommendation is as follows:

The government should ensure that the provision of environmental amenities in Bida is marched with the population of the wards to ensure equity in the distribution of the environmental amenities in Bida. It is not enough to have a fair share of the environmental amenities clustered within a ward a particular area in the wards, emphasis must also be paid to the walking distance to the amenities within the wards. The environmental amenities must be located within walking distance across Bida to avoid internal inequality.

Since it has been established that the number of schools available in Bida is adequate for the population, yet it records the highest inequality index. Therefore, attention must be paid to the

distribution of the schools to ensure that each ward enjoy a fair share of the schools as required by the population.

Government at all level should also pay attention to the spatial distribution pattern in the planning, provision and distribution of environmental amenities in Bida. Furthermore, considering the positive effects of environmental amenities on the lives of the people, and to avoid lopsided urban drift, there is the need for the provision of more primary health centres, and green areas. Governments at all levels should partner with other private organizations to undertake the provision of environmental amenities in order to meet the needs and aspirations of the people.

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