

POPULATION DYNAMICS AND VEGETATION CHANGE IN BENUE STATE, NIGERIA

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ABSTRACT

This study of population dynamics and vegetation change in Benue State was carried out primarily to analyse the trends in population growth and how the population increase has influenced vegetation degradation/change in the State. The data for the study were sourced and collected through direct field and visual observation and materials from journals, books, extracts from NPC's Office Makurdi. The study revealed that though records about vegetation degradation and population dynamics were less documented in the State yet vegetation is one of the primary suppliers of resources for human use in the State. Hence population size and its composition generate the demands for these resources and then impacting on the vegetation resources negatively. Finally, the study concluded that human population increase and non-sustainable production coupled with consumption patterns, is placed at the centre of vegetation change in the State.

Key words: *Population, Vegetation, Census, Resources, Benue State.*

INTRODUCTION

Globally, vegetation is known to be one of the most valuable and renewable ecological as well as socio-economic resources in the world containing over 60% of the world's biodiversity (Ositadinma 2006). Vegetation conserves soil and improves its fertility; ameliorates local climate through sequestration of carbon dioxide, transpiration cooling and enhanced air humidity; and provides habitat to several species of animals. Socio-economically, forest vegetation provides timber and non timber forest products (NTFPs) which are raw materials for many industrial products. As a result, vegetation plays a crucial role in the economic development of countries (Rawat et al 2004).

Observation of vegetation in Benue State revealed that it is under pressure from the increased human population that demand more land for food production and settlement. As explained by the United Nations Fund for Population Activities (1991), population growth and the resultant human activities generate pressures to the natural and as well as man-made environments. This assertion is however confirmed by the rapid decline in forests, increase grasslands and the conversion of forest regions to grasslands as experienced in Benue State and Nigeria at large.

While the world population has reached the 6.5 billion mark in 2007, Madulu (1999) viewed that the world natural resource base has continued to be at a diminishing state leading to change which is an ever-present aspect of natural environments. Vegetation Ecosystems for example are constantly affected by a variety of pressures and influences which shape their biotic and abiotic components at timescales of years, decades, or centuries. With increasing anthropogenic pressures at local, regional, and even global scales, an understanding of both the nature of change and the responses of natural systems to change is vital. Vegetation cover on the surface of the earth likewise population has never in the history of humankind remained static; as a result, it is always and constantly changing from one type to another (Kamagata et al 2006). These changes that vegetation undergoes are what authorities refer to as 'Vegetation change'.

At a global scale, vegetation change is principally determined by two interwoven factors; environmental and anthropogenic. The

environmental factors observed by World Conservation Monitoring Commission (1992) include soil, slope, aspect, topography and climate (e.g. temperature, rainfall, relative humidity and sunshine) while the anthropogenic factors include human activities, such as agriculture, urbanization, bush burning, road construction, mineral exploitation, industrialization among others as the driving processes of vegetation change.

In confirmation, Mugechi (2005) reiterated that population pressure; change in lifestyle, change in land tenure and climatic change are some of the factors attributed to vegetation in most African countries. Barrett (2001) also reported that Vegetation changes over time as a result of a combination of natural processes (for example, succession, growth, fire, insect and disease cycles, and climatic variation) and human-induced processes and activities (such as timber harvesting, grazing, road building, fire suppression, and introduction of exotic species).

The consequences of this as argued by Rawat et al (2004) are loss of species, destruction of species habitat and biodiversity, silting of streams and rivers, disruption of the water cycle and a significant contribution to the global warming. It is in recognition of the vital role of vegetation towards global environmental stability that the United Nations Framework Convention on Climate Change has listed vegetation among the key issues in reversing the current global warming (UNFCCC, 1997).

The rate of vegetation destruction and change in Benue State for example and most countries of the world are considerable due to rapid population growth and land use change (Myers, 1988). Adeola et al (2004) concluded that scientific studies of the vegetation in Nigeria illustrate the apparent effect of farming activities resulting in the modification of the original vegetation while some vegetation resources such as wildlife have gone to extinct. For example, recent estimates of vegetation by Nigerian Environmental Study/Action Team (1991) indicated that over 350,000 ha of vegetation in Nigeria are being lost annually due to farming alone.

The evidence above presents a significant and direct role of human activities culminating into vegetation change. It has also been established by SIGWA (2001) in an Environmental Impact Assessment of the imminent explosion of Lake Nyos in Cameroon and its consequences on the Benue valley that the highest rates of vegetation modification in the State occur

mostly on forest lands for subsistence and heavy dependence shifting agriculture. Related to that, over the past century, many scholars such as Myers (1989), Adeola et al (2004) and Madulu (2004) maintained the thinking that rapid population growth is the major cause of much vegetation resource degradation especially in developing countries like Nigeria.

Human beings generally have been viewed by (Madulu, 2004) as destructive intruders to natural ecosystems; hence, this suggests stringent rules and legislation that will protect the vegetation and its resource deposit. In as much as human beings are viewed this way, human population and the environment have a very strong complementary linkages or relationships. In actual fact, biodiversity conservation efforts especially vegetation can only be sustained if human beings give their support. It is based upon this context of population growth and its attendant impacts on vegetal resources that this study was carried out in order to establish the linkages that exist between population dynamics and vegetation change in Benue State.

This study was carried out specifically to: (i) analyze the trends in population growth in Benue State, (ii) identify the local government areas with higher population growth rates, and (iii) relate population growth to vegetation change in Benue State.

MATERIALS AND METHODS

Benue State lies between latitudes $6^{\circ} 25'$ and $8^{\circ} 08'$ N, and on longitudes $7^{\circ} 47'$ and $10^{\circ} 00'$ E in the central part of Nigeria called 'Middle belt' (Nyagba, 1995). The State shares boundary with Nassarawa State to the north, Taraba to the northeast, in the south by Cross River, while in the southwest is Enugu, Ebonyi and Kogi State to the west. A short international boundary with the Republic of Cameroon is shared around Kwande Local Government Area (Figure 1).

Climatically, the State belongs to the Koppen's Aw climate group and experiences seasonal wet and dry seasons. The rain falls for seven months from April to October with total annual amount ranging between 12,000 - 20,000mm while dry season sets in November and ends in March (Ologunorisa and Tersoo 2006; Nyagba, 1995). Temperatures are constantly

high averaging between 28⁰ - 32⁰C and sometimes rising to 37⁰C especially within Makurdi the state headquarters.

The vegetation of Benue State still possesses relics of the guinea savanna with coarse grasses and numerous species of scattered trees. These trees included *Khaya senegalensis* (Mahogany) which is found in the south-western part, mostly along stream courses while *Daniella oliveri* (chiha) and *Isoberlina doka* (akovol) are found mostly in the north-east and north-western parts of the State respectively. Other tree species such as *Parkia biglobosa* (Locust bean tree), *Prosopis africana* (Iron tree), *Vitellaria paradoxa* (Shea butter tree), *Burkea africana* and oil bean tree are also common (Nyagba 1995; Hula 2009). However persistent clearance of the vegetation for arable agriculture, lumbering and the practice of bush fallowing system create regrowths and characteristic parklands that attract animal grazing and cattle herdsman. Dense forests are very few and far apart in the State and exist either as gallery forest, village forest or forest reserves (Nyagba 1995). The State has a population of four million, two hundred and fifty three thousand, six hundred and forty one (4, 253, 641) people according to the 2006 population census figures (National Population Commission, 2006). Agriculture forms the back bone of the State economy, engaging more than 70% of the population. The State also has an advantage of being located across both the forest zone where tree crops are grown and the savanna where mainly grains are farmed.

The data for this study were sourced and collected in two ways; (i) from direct field and visual observations, and (ii) from secondary source materials which contain information for purpose other than this study, such as Journals, Books, data from National Population Census Commission's State office, Makurdi. The data collected were tabulated, interpreted and analyzed using graph for the overall purpose of achieving the objectives of the study.

RESULTS AND DISCUSSION

Population Distribution Size and Trends in Benue State

The population figures of Benue State can be traced back to 1963 when population census count was first conducted in Nigeria after her independence in 1960. A glance at table 1 reveals a glaring inconsistency

in the population figures of the State. For example, in the 1963 population count some Local Government Areas such as Ankpa, Bassa, Dekina and Idah which are now in Kogi State were parts of Benue while in the 1991 census some Local Government Areas such as Agatu, Logo, Obi, Ohimini and Tarka were not created. Population distribution, however, describes spatial spread of people within an area while population density on the other hand, refers to the ratio of a given number of people to a given land area. Differences in population density often reflect the aerial variation of people and resources over the land. Population density in Benue State increased from a mean figure of 58 persons per square kilometer in 1963 to 88 and 142 persons per square kilometer in 1991 and 2006 respectively (NPC, 1963, 1991 & 2006).

Though Benue State lies in the region that is Middle Belt, which is generally regarded as a low population area in Nigeria (Nyagba, 1995), it has a density of 142 persons per sq. km close to average national density of 152 persons/sq.km (NPC, 2006). There are areas of low population density in the State such as Apa, Tarka, Katsina-Ala, Agatu and Guma with less than 70 persons per sq.km while Okpokwu, Gboko, Ogbadibo, Buruku Ushongo and Konshisha have between 156 and 258 persons per sq. km. Other Local Government Areas such as Ado, Gwer East, Gwer west, Kwande, Logo, Obi, Ohimini, Otukpo and Ukum fall in between.

Makurdi with its restricted demarcation a few kilometers around the metropolis has a density of over 400 persons per sq. km. These density figures give an impression that the State is sparsely populated. However, variations exist between LGAs and even at ward levels (table 1). Demographic trends in the State show a remarkable population growth between 1963 and 2006. It is clear that the population grew steadily between 1963 and 1991 a period of 28 years but almost doubled in 15 years between 1991 and 2006. The data as presented shows that the population increased by 63 percent in the 1963-1991 inter-censal periods and by 65.1 percent in the 1991-2006. The rate of population growth also increased from 2.1 percent to 3.6 percent between 1963- 1991 and 1991-2006 respectively. For example in the 1963-1991 and 1991-2006 inter-censal periods, 1.1 million and 1.4 million people were added in the State respectively.

The consequences of this uneven distribution of population include (a) the plethora of bloody clannish clashes over land related matters as experienced between Gwer East and Konshisha, Gwer East and Gboko and Gwer East and Otukpo Local Government Areas, (b) high incidence of rural-urban migration across Local Government Area boundaries and (c) the attendant pressure on environmental resources most especially vegetation through agricultural practices.

The State population according to sex shows that there is a slight imbalance in favour of males. The number of males population is 2, 144,043 forming 50.4% of the total population against 2, 109,598 females constituting 49.6%. At the time of this research the National Population Commission had not released data on age and occupational structure but one is inclined to believe that like elsewhere in Nigeria the population of Benue State is growing (see fig. 2). Therefore, more people should be between the ages of 1-17 years than in the working population of 18-60 years and far fewer aged people (above 60 years).

Population Growth and Nigerian Economy

Population growth refers to change in the size of population which can be either positive or negative over time, depending on the balance of births and deaths. Population growth increases in both absolute and relative terms. Absolute growth is the difference in numbers between a population over time, while relative growth is usually expressed as a rate or percentage. Benue State which is an agro-based economy state has experienced a very rapid population growth in the past two decades with a high level of poverty. Therefore, the alleviation of poverty especially in developing countries as argued by Madulu (2004) is an important exercise for environmental resource sustainability. In the process of poverty reduction, one needs to understand that population is a basic entity that determines the pace of poverty reduction. An increase in the number of people causes increased demand for food, water, land and other essential materials from the natural resource pool. It also increases pressure on environmental resources, and demand for social services that have to be financed by the national economy.

It is important, however, to note that the provision of social services needs to match the rates of population and economic growth because the higher the population growth the higher the demand for socio-economic

and environmental resources as the economy of the State is largely dependent on agricultural production. Therefore, a man with the largest family is considered to be the wealthiest man; and a large family is equated to an asset of unequalled value as it means more hoes, and hoes spell grain, which is the most important material wealth today. Subsistence peasant agriculture is often linked to environmental degradation most especially vegetation which is highly vulnerable to agricultural activities. In many cases, the need to meet the people's immediate needs is often given the first priority mostly at the expense of environmental conservation. Local communities are compelled to over-exploit the natural resources on which their long-term survival depends. Myers (1989) argued that:

There is hardly any agent more destructive of natural resources - notably soil cover, grasslands, and forests - than the subsistence cultivator who cannot produce enough to eat by cultivating traditional farmlands. ... this marginal person is inclined to seek his livelihood in marginal lands. ... (He) is often impelled by forces of political structures, economic systems, and/or institutional factors, of which he may have little understanding and over which he exercises virtually no influence. But the result is the same: widespread deforestation, soil erosion, and spread of deserts.

In addition to crop farming, rural communities in the State are also engaged in subsistence livestock keeping. Livestock are valued as a source of protein, capital, investment, labour, prestige and respect. In most areas, agricultural lands are widely encroaching upon by the Fulani herdsmen and there exists no formal control of grazing in the parklands that are communally owned. The consequence of such concentration of livestock is excessive overgrazing in the less favourable areas leading to severe vegetation damage. The increase in the human populations and the expansion of cultivation into the traditional grazing areas has in many areas driven the Fulani migrant population into the less fertile and more fragile areas.

Population Growth and Vegetation Degradation

Records about the linkage between vegetation degradation and population trends are a less documented phenomenon in Benue State and Nigeria at large. Whereas the environment and vegetation to some extent is considered to be the primary supply of resources for human use, population size and its composition generates the demand for these resources

and the impact on the environment (UN, 1993). As noted by Madulu (2004), this linkage between population and the environmental resource is clearly demonstrated by Ehrlich and Ehrlich 1990 in their IPAT Model, which they argue that the environmental impact is a joint function of population affluence, and technology. This can be expressed mathematically thus;

$$I = f (P+A+T) \text{ ----- } (1)$$

Where, I = Environmental Impact
P = Population
A = Affluence and
T = Technology

The model sees population size (P) as integrating in a multiplicative fashion with affluence (A) and technology (T) to create impact (I) on the environment (UNFPA, 1991). This implies that population determines how many persons are there to consume available resources and producing more impacts on the environment. In other words, the more people there are, the greater is the impact on environment most especially vegetation even when a population and its growth are relatively small. The high rates of the population growth in Benue State have had significant environmental implications. In many LGAs of Benue State and several other places such as China, Brazil, and Tanzania (UNFPA, 1991 Green, 1992), the vegetation has been degraded to the extent that it can no longer support ecological balance and the provision of necessary resources to present and future populations.

Population increase also causes increased demand for food, water and arable land. Agricultural expansion encourages deforestation, bush clearing and burning, overgrazing among others in turn contributes to vegetation change. Population growth also increases demand for energy, especially fuel wood and charcoal, which provides energy to virtually all rural areas and most urban populations in Benue State. The increase in fuel wood consumption has been observed in many areas resulting into excessive deforestation especially around large settlement centers like Igbor, Konshisha, Vandeikya, Agan Ogbadibo, Okpokwu and Otukpo (Hula, 2005). In relation to that Sadik (1988) argued that:

"In rural areas of developing countries, increasing numbers and concentration of poor, mostly land-less people are being forced to destroy their own resource base. In their search for food, water,

fuel, and fodder, they use up wood faster than it is being grown, farm marginal land at non-sustainable levels, deplete water supplies and overgraze range-lands with increasing numbers of animals".

This argument suggests that rapid population growth stimulate environmental damage, endangers the means of human survival, and worsens the plight of people living in absolute poverty (Green, 1992). In recent years, more and more farms have been opened up in the marginal areas and even in the protected areas in an effort to earn a living. Such expansions have caused serious consequences on the environment and stimulated lands use conflicts. Observing the impact of population pressure on land cover in the Ikwe Forest Reserve at Igbor between 1986 and 2001, Hula (2009) shared similar views with Shishira et al., (1998) who argued that:

"Cultivation and harvesting of forest products are the main factors influencing spatial and temporal changes in the land cover. Similarly, increasing population pressure around the forest reserve is likely to lead to encroachment into the forest reserve hence, threatening its sustainability".

The increasing rate of exploitation of the natural resources is probably a function of an increase in the number of people as it raises the demand for food, water and arable land. The steady increase in population in many LGAs of the State has been accompanied by declining food production because population pressure reduces the per capita arable land while increasing the acreage under cultivation.

CONCLUSION

The above discussion on the linkages between population and the environment seems to suggest that human population increase and non-sustainable production coupled with consumption patterns, is placed at the heart of the State environmental problems which result to among other things, vegetation change. This is confirmed by the demographic trends in Benue State that correlate significantly with the deterioration on resource base, and environmental degradation suggesting remarkable population/resource imbalances. Different groups of people interact differently with the environment.

The impact of these interactions is aggravated by the use of inferior technology and poor economic development as illustrated in the IPAT Model. Benue State is not keeping pace with the demand of the rapid population increases. In many LGAs, the traditional farming and land tenure systems have been unable to adapt to population pressure so as to prevent degradation of the vegetation. Consequently, decline in food production, land degradation, and the resultant vegetation change have accompanied the steady population increase.

The discussion has demonstrated that an increase in the number of people has a negative implication to the State's vegetation and to a large extent the environment generally. Issues like increased demand for food, water, arable land and other essential materials from the natural resource pool are of interest in this respect. Increased exploitation of resources from the natural environment threatens ecological balance and sustainable natural resource conservation.

Many more examples have been cited to illustrate the negative impacts of rapid population growth on the environment and vice versa. Land use conflicts and competitions between cultivators and herders (an example of Fulani herdsmen and the farmers) are becoming common features of the rural communities in many local government areas, and in some cases leading to violent conflicts as experienced between Gwer East, Gwer West, Guma, Ukum, Konshisha and Otukpo LGAs of Benue State. Other examples can be viewed from the inter-state land conflicts between Benue and Cross River and between Benue and Taraba States. The examples given in this discussion have emphasized the existence for strong linkages between population growth and environmental degradation in Benue State. In actual fact, none of these variables can operate on its own without stimulating effects on the other.

MAP OF BENUE STATE

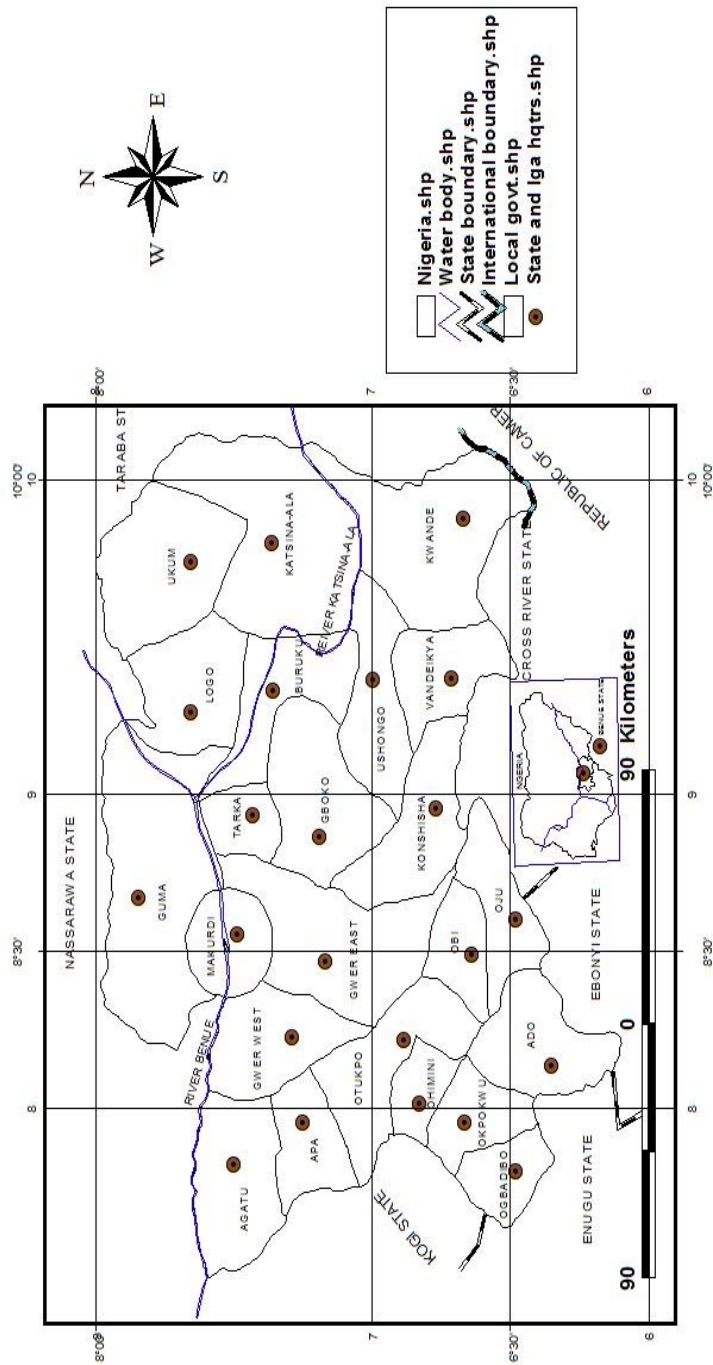


FIG. 1 MAP OF BENUE STATE SHOWING THE LGAs.
SOURCE: BENUE STATE MINISTRY OF LANDS AND SURVEY, MAKURDI.

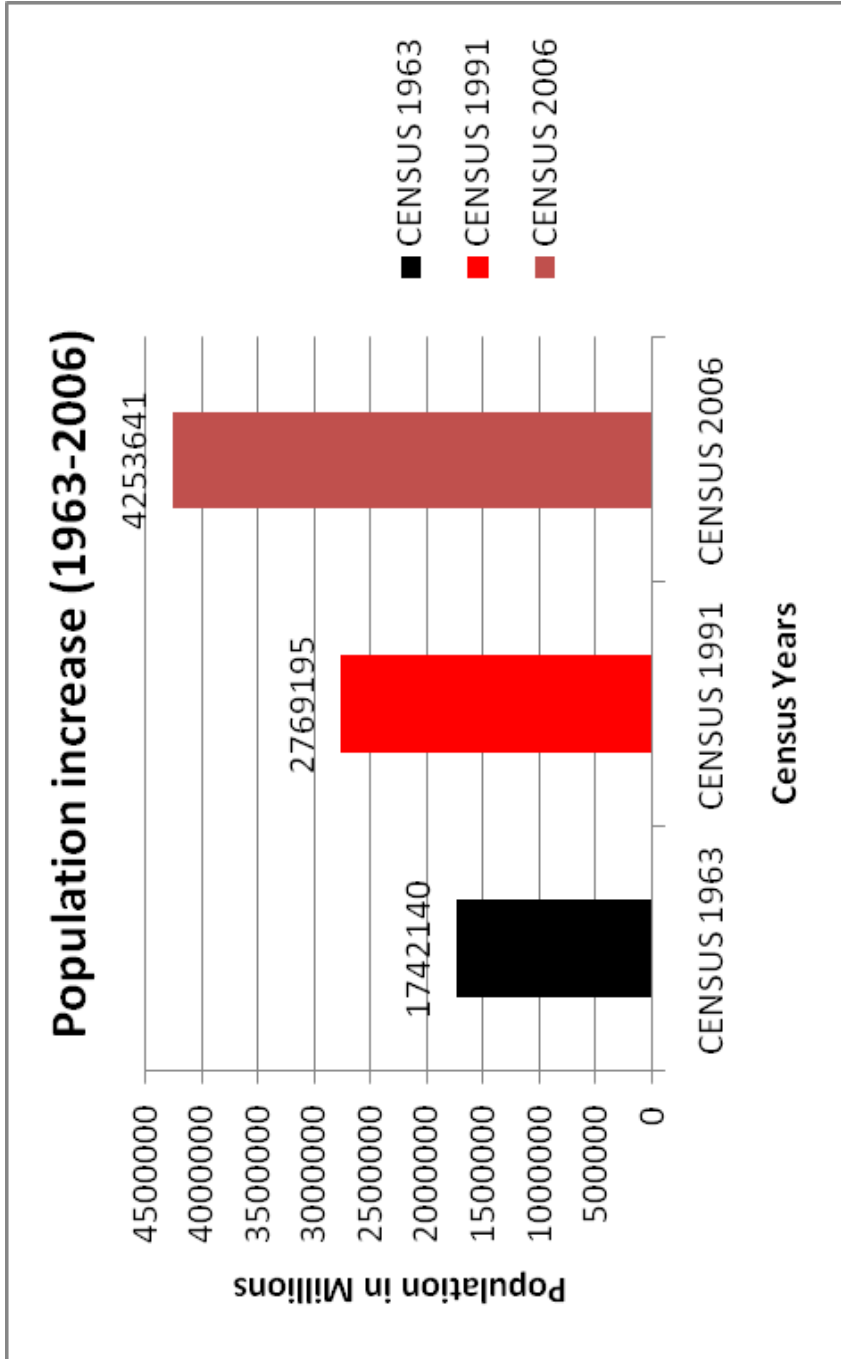


Figure 2. Benue State Population increase Graph between 1963-2006

Table 1: Population Statistics for Benue State (1963-2006)

LGAs	Area (KM ²)	1963			1991			2006		
		Population	% of Total	Density KM ²	Population	% of Total	Density KM ²	Population	% of Total	Density KM ²
Ado	1212	*	-	-	104137	3.8	86	184389	4.3	152
Agatu	1888	*	-	-	**	-	-	115597	2.7	61
Apa	2228	*	-	-	106518	3.8	48	96780	2.3	43
Buruku	1240	*	-	-	130450	4.7	105	206215	4.8	166
Gboko	1940	228455	13.1	118	308421	11.1	159	361325	8.5	186
Guma	2900	*	-	-	116336	3.9	40	194164	4.6	67
Gwer East	2300	197026	11.3	86	117630	4.2	51	168660	4.0	73
Gwer West	980	*	-	-	74548	2.7	76	122313	2.9	125
Katsina-Ala	4284	178648	10.3	42	233353	8.4	54	225471	5.3	53
Konshisha	1448	*	-	-	145614	5.3	101	226492	5.3	156
Kwande	2300	252086	14.5	110	180327	6.5	78	248642	5.8	108
Logo	1758	*	-	-	**	-	-	169570	4.0	96
Makurdi	700	174719	10.0	250	239889	8.7	343	300377	7.1	429
Obi	857	*	-	-	**	-	-	98707	2.3	115
Ogbadibo	536	*	-	-	89497	3.2	167	130988	3.1	244
Ohimini	622	*	-	-	**	-	-	70688	1.7	114
Oju	1540	110956	6.4	72	171525	6.2	111	168491	3.9	109
Okpokwu	680	246959	14.2	363	90241	3.3	133	175596	4.1	258
Otukpo	2012	140038	8.0	70	192258	6.9	96	266411	6.3	132
Tarka	696	*	-	-	**	-	-	79280	1.9	44
Ukum	1800	*	-	-	183422	6.6	102	216983	5.1	121
Ushongo	1156	*	-	-	123166	4.4	107	191935	4.5	166
Vandeikya	946	213253	12.2	225	161863	5.8	171	234567	5.5	248
Total	36023	1742140	100.00	X58	2769195	100.00	X=88	4253641	100.00	X1420

Source: Extracts from the Provisional Results of the 1963, 1991 and 2006 Census counts

*LGAs created after 1963 Census. ** LGAs that were created after 1991 Census. - Not available

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