

# An Assessment of the Socio-economic Effects of Land Use Trends and Population Growth in Eleme, Rivers State, Nigeria

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**Abstract** – Population growth in Eleme has been rapid over the past 82 years with its attendant pressure on the natural resources of the area. Between 1937 and 2006 the population of Eleme grew from 2,528 to 190,194 and is projected to be above 293,741 in 2019 based on an annual growth rate of 3.4 percent. Using the combined technologies of Geographic Information Systems (GIS), remote sensing (RS) and Demography techniques as its methodology, this paper examines the socio-economic effects of land use trends and population growth in Eleme between 1986 and 2019. The result of this study indicates that human population represents a threat to biodiversity in several ways. Thus if our patterns of consumption remain at the present rate, with more people, we will need to harvest more timber, catch more fish, plow more land for agriculture, dig up more fossil fuels and minerals, build more houses, and use more water. All of these demands impact wild species and increase the levels of pollution. Unless we find ways to dramatically increase crop yield per unit area, it will take much more land than is currently domesticated to feed people in the area if our population continue to grow at the prevailing rate of 3.4 percent annually. We therefore recommend more sustainable agricultural practices, investment in family planning and female empowerment, as well as maternal health and education as a veritable way of ensuring food security, and control child birth in the area to guarantee sustainability of the ecosystem

**Key Words:** population growth, effects, assessment, Eleme, Socio-economic, environment, land use, fertility, trends.

## 1.0 Introduction

Nigeria is the 8<sup>th</sup> most populous nation in the world with a population of over 140 million people. Nigeria's population grows at an estimated rate of 3.2 percent per annum. Forty-nine percent of the total population is female. Of this 51 percent are in the reproductive ages (15-49). Twenty-three percent of women age 15-19 are already mothers or are pregnant with their first child. Total fertility rate for Nigeria has remained high (5.7) in the last five years. The current use of modern family planning methods among married women is only 10 percent (2 percentage point increase in the last five years). These phenomena represent a built-in momentum which will continue to stimulate rapid population growth for years to come, according to Makama [2].

The population growth of the last 200 years appears explosive on the historical timeline. The overall effects of this growth on living standards, resource use, and the environment will continue to change the world landscape long after. Hinrichsen and Bryant [1] opine that rising population growth can lessen our quality of life because it destroys resources, such as water and forests, needed to sustain us; slows the dynamics of a healthy economy; decreases the level of biodiversity upon which we depend. As the century begins, natural resources are under increasing pressure, threatening public health and development. Water shortages, soil exhaustion, loss of forests, air and water pollution, and degradation of coastlines afflict many areas including Eleme. As the world's population grows, improving living standards without destroying the environment is a global challenge, thus the necessity of the study, considering the size of Eleme (138 km<sup>2</sup>) and its natural resources, as well as its industrial base and attractiveness to job seekers.

The population growth in Eleme has been on the increase over the past 75 years with its attendant pressure on the natural resources of the area. Dr. Mc Kenzie Talbot in his Thesis of 1937 [4] gave the population of Eleme as 2,528, while the 1991 Population Census of Nigeria gave the population of Eleme as 80,715. By the 2006 Census figure as gazetted by the Federal Government in February, 2009, the population of Eleme Local Government Area is 190,194. It was observed that the population of Eleme grew from 2,528 in 1937 to 80,715 in 1991 representing an increase of 3,093 percent (meaning that it doubled 30 times) in 54 years. Also, it was further observed that the population increased from 80,715 in 1991 to 190,194 in 2006 representing an increase of 137 percent in 15 years, meaning that its doubling time is about 12 years or less.

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Based on the current population density in Eleme towns and communities, it is estimated that the population of the area must have increased significantly between 2006 and 2014 considering the net immigration into the area arising from the tremendous volume of oil and gas exploitation activities.

## 1.1 The Study Area

### Location

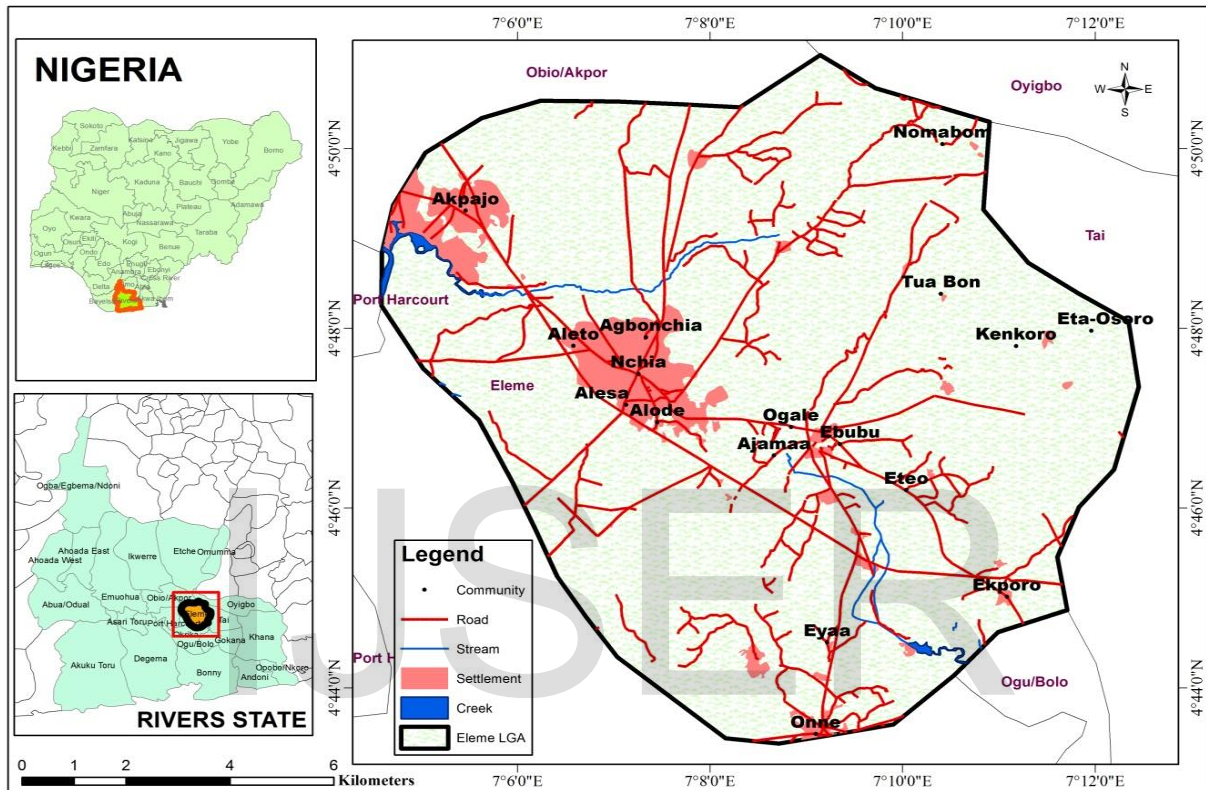


Figure 1: Map of the Study Area (Eleme)

Eleme Local Government Area is one of the 23 Local Government Areas that make up the present Rivers State of Nigeria. Eleme is located between longitude  $7^{\circ}$  and  $7^{\circ} 15'$  (seven degrees and seven degrees fifteen minutes) East of the Meridian and latitudes  $4^{\circ} 60'$  and  $4^{\circ} 35'$  (four degrees sixty minutes and four degrees and thirty-five minutes) North of the Equator. The total area of Eleme is about 138 square kilometers ( $\text{km}^2$ ) as corroborated by Rivers State Government official records and the author's field report. Eleme is bordered on the north by Obio/Akpor and Oyigbo Local Government Areas, on the east by Tai Local Government Area, on the south by Ogu/Bolo and Okrika Local Government Areas as shown in Figure 1 below.

### Origin

Eleme is referred to in all colonial records as **Mbolli** and this nomenclature was given by the Arochukwu slave agents who were virtually administering the territory like an imperial power. They were agents of the then famous Aro Long Juju and backed by the fierce Abam warriors, these Aro slave merchants described Eleme as Mbolli Iche in the Ibo language which by translation means "one country that is different". This name Mbolli was taken by the Aros into the surrounding territories as well as other distant places. When the first British Military force under Captain James Forsbry entered Eleme territory in April 1898, they were escorted by a Bonny indigene known as Mr. Hart and he gave the name of the locality as Mbolli [3].

### Migration

According to Ngofa [3], the people of Ibibio, Eleme (Mbolli), Ogoni and others lived together in the ancient habitat of the Semi-Bantu which is the Cross River Region in Eastern Nigeria. There were also the Efiks, Ekoi, Annang, Ibino and others that co-existed in that region. Overtime, there were migratory movements that brought Eleme out of that ancient habitat. Gradually, new formations were coming into existence. The Ogonis also fanned out, reaching down to where they now occupy by a gradual process. Even the Munshi of the present Middle Belt area of Northern Nigeria

also meandered out of the same habitat. These continuous waves of migration also saw the Abua, Andoni and Abuloma peoples among others budding from this ancient habitat and settling in their present locations after very long.

Ngofa [3], further pointed out that the journey into the present territory of Eleme was not a direct movement. In those distant times when might was right, only the exceptionally brave could lead a family or a group of people through the dangers posed by wild animals and cannibals. It also involved living in a particular location for a period of time and then moving out, if for any reason that location becomes insecure. By and large, many died in this process and some others were born. At last one group settled at a chosen location and enjoyed the protection of the warrior who led them and the conduciveness of the fertile rain forest which supported their life with minimum labour. That settlement now bears the name of the warrior that was their leader and mentor.

The warrior called Eleme is said to have led his people from among the Ekoi and meandered into the present territory in about 1460. He had two sons whose names were Nchia and Odido, and they settled with their followers in the vast area between Ogale and Ebubu, a little North of Mgbala lake in Ogale. Nchia, the first son, later moved away from his father and founded his own settlement which bears the name Agbonchia, meaning Nchia's large settlement. Some monumental structures confirming the reality of the existence of Nchia are Mbie-Nchia, Ejian Nchia, Echieta Nchia and an ancient road passing through Njuru and Okerewa communities to Akpajo, which is known as Ogbere Nchia. The towns that have emerged from the initial settlement of Nchia are Ogale, Aleto, Alesa, Alode and Akpajo. Each of these major towns consists of several villages. Odido himself has the credit for the eventual development of the four major towns of Ebubu, Onne, Eteo and Ekporo. Each of these major towns similarly consists of several villages at different levels of development. Nchia maintains her ancestral reputation of being the capital of Eleme and within Nchia itself; Ogale provides the location of the capital status. In furtherance of this, the Nchia General Hospital, Police Divisional Headquarters, Eleme Local Government Headquarters, the Judiciary consisting of the Customary Court, Magistrate Court, and High Court as well as NITEL, NIPOST, State Electoral Commission and Eleme Civic Centre are all located in Ogale [3].

## **Culture**

History, according to Ngofa [3], has it that the long period of socialization and cultural homogeneity among the various peoples that co-existed in the Cross River Region provides explanation for the definite traces of culture that are common to Eleme, Ibibio and Ogoni peoples of the present day. These are identified in the carving of head masks, mirror handles, ladles, mortars, pestles, doors, ceremonial stools, combs and drums as well as artifacts for shrines. They are also evidenced in the weaving of mats, baskets, bags, cradles, and ceremonial headgears. Of even greater importance are the affinities in ancestral worship and operation of secret cults – Nkonkon and the Leopard cults which have over the years declined to the point of extinction.

The culture of a people tells more of them than may have been written because it stands out as the composite of the persistent tendencies peculiar to and endeared by such people – clan, tribe or country. These can be observed through their language, ancestral origin, occupation, social classes, matrimony, burial music, nutrition, gender bias and other factors.

## **Language**

Eleme language as spoken today contains derivations from Ibibio, Annang, Ogoni and to a minor extent, Igbo. The language is very much modified from what was spoken in the last century. During the unstable years when settlements were being established, various dialects were spoken in this territory, some of them sounding very strange. This made one settlement to regard the other as enemies who must be annihilated and they actually did so as stated by Ngofa [3].

Eleme has two dialects which were spoken in Nchia and Odido Districts. These dialects differed very much in both vocabulary and intonation. Infact the dialect spoken in Ekporo was not easily understood by Nchia people. The

people of Ban Ogoi in the present Tai Local Government Area spoke one of such dialects in Eleme Language. But within the last 50 years, two of the three dialects have coalesced and only very few words are still extant in the Odido dialect.

### **Occupation**

The major occupation of Eleme people from ancient times has remained farming and the primary crops are yams, cocoyams, cassava, sugar cane, pumpkin among others. Farmlands are usually in large blocks that are communally cultivated each year through ownership of properly demarcated sections are vested in each family. The yams are carefully staked, the cassava inter-planted during the months of May and June. There are species of yams that are regarded exclusively for women and these are called Okako, Mkpanyi, Ekororkortor, Eburale, Ngulor and Ochun. They are usually planted separately in the strip of farm called Okaelor. Because the block of farms for each yam is located in one section, it is the tradition that no farm work is carried out on the day locally called Obon, or any day that a child or adult is being buried.

### **Political Administration**

After several petitions, delegations and protestations for the granting of administrative autonomy to Eleme, the Federal Government under General Sani Abacha announced on 4<sup>th</sup> December, 1996, the separation of Eleme and Tai into their respective Local Government Councils. Eleme is an administrative subdivision of Rivers State, Nigeria, located east of the Port Harcourt Local Government Area, it is in the greater Port Harcourt metropolis. The name of its headquarters was changed from Nchia to Ogale by the Legislative Council during the Chairmanship of Honourable Olaka Nwogu in 1992. The administrative offices have always been located in Ogale, believed to be the first town of Eleme. Eleme has 10 political wards with each of the major towns (Akpajo, Aleto, Alesa, Agbonchia, Ogale, Alode, Ebubu, Onne, Eteo, and Ekporo) serving as ward each.

### **Traditional Administration**

Eleme is a Kingdom and the head of the Kingdom is known as The Oneh-Eh-Eleme (The Majesty of Eleme). Beneath him are the paramount rulers of each of the two major groups of towns Oneh Eh Nchia (Chief of Nchia) and Oneh Eh Odido (Chief of Odido). Each Nchia and Odido consists of towns which are further divided into small communities (and then further into areas of the community). The traditional ruler of each town is known as Oneh Eh Eta (Town Chief).

Eleme Local Government Area occupies the western end of Ogoniland. It has 10 clans within two administrative political blocs or units: the Nchia bloc with six clans (Akpajo, Aleto, Alesa, Alode, Ogale and Agbonchia) and the Odido bloc with four clans (Onne, Ebubu, Eteo and Ekporo). Each clan has numerous sub-communities; the Ebubu clan for example includes the Ejamah, Ochani, Obollo, Egbalor and Agbeta communities.

### **Population**

The population growth of Eleme is rapid and characterized by immigration rates by settlers seeking greener pasture because of the level of industrialization in the area. In 1937 the population of Eleme was 2,528 persons; 80,715 persons in 1991 and became 190,194 by the 2006 census.

### **Religion and Education**

Preceding the introduction of Christianity into Eleme in the early twentieth century, the traditional religion of the people was ancestral worship, which was based on their belief in reincarnation. They believed that some of their ancestors have transformed after their death into gods whose abode interpenetrates physical existence and are therefore living in their families and communities. Apart from Onura and Ejilee, deities which were regarded in exceptional terms, there were lesser deities called Ndorwa and Ebajor which had their special functions in relation to life in any given community. There was to be found in every community in Eleme a sacred forest that was dedicated to Ndorwa or Ebajor.

The first Church in Eleme was founded in 1910 as an indirect result of the struggle between Alesa and Alode communities over the ownership of an extensive farmland. Following the a delegation led by Olaka Kate Akaraolu from Alode community to Rev S. MaCarthy and Archdeacon Samuel Crowther and also a petition to the Government

in Degema for the opening of a church, school and court for them, Mr Hezekiah George Pepple, a local preacher from Perekule House in Grand Bonny was appointed to open a church in Alode. Sunday Apifi and Jene Allison were also assigned to open a school for them at Alode. Mr. Hezekiah George Pepple arrived Alode early in 1910 and a small church was built by the eager villagers and christened Saint Stephen's Church. Sunday worship and prayer meetings were held regularly. The entire Alode community gave the new church a great boost as a means through which they would defeat Alesa in their dispute. The degree of acceptance of Christian faith in Alode can be viewed from the fact that most Juju shrines and equipment in the community were brought together at the Alungwa square and burnt in 1912. The second church in Eleme was opened in 1911 by Rev. Ebenezer Tamuno Jumbo from Bonny and Pastor J. M. A. Cole of Okrika and was named Holy Trinity Church Nchia. They subsequently opened in 1915 the second educational institution in Eleme and was called Holy Trinity School Nchia [3].

Today, there are 22 public primary schools and 5 secondary schools spread across the 10 major towns in Eleme with an average annual pupils' enrolment of 12,152 in the primary and 11,584 in the secondary category excluding enrolments in private schools which are higher than that of the public schools [5].

### **Traditional Marriage Practices**

Traditionally, according to Ngofa [3], marriage ceremonies in Eleme could only occur in June, but with the introduction and propagation of Christianity, this practice was first extended to the Christmas period and then beyond. Now weddings occur at any time of year, although more conservative families may still favour the traditional period for wedlock.

Several stages are involved in the marriage proposal process. The first stage, involves the initial inquiry made by the groom to the father of the bride. Drinks, typically palmwine, are given to the father at this point. The process of drink-giving may occur several times before moving on to the next stage. Drinks are usually accompanied by money.

The most serious negotiation involved in the marriage process is that of the bride-price. The bride-price is a large sum of money paid to the family of the bride, accompanied by yams, rice, palmwine, a large goat and other gifts. The negotiation may involve a number of important figures from the community. The negotiated amount is highly variable and generally reflects the estimated wealth of the proposed in-laws.

The wedding ceremony itself a procession from the house of the bride to the town square, accompanied by the sound of drummers and singing. The bride is dressed in ceremonial beads and traditional headgear. Heavy metal bracelets spiral from her ankles to her knees. Around her waist, wrappers are tightly tied in concentric circles by her female relatives. The bride's body may be extensively decorated in elaborate designs with natural dyes. Important guests are thanked and presented with drinks. The ceremony concludes with various dances and gifts are given to the new couple, including money and clothes.

### **Oil and Gas**

According to UNEP [6], the oilfields in Eleme Local Government Area, which encompass locations in Ebuma (Ejamah, Agbeta, Obollo, Egbalor), Ogale (Ajioepuori, Nsisioken, Obajeaken) and Onne (Ekara), were discovered in October 1956. Oil from operations in Eleme was included in the first shipment of 22,000 barrels of crude oil exported from Nigeria to Europe in 1958. The communities of Eleme host several major national and international establishments, for example, Eleme's main river is the Imu Ngololo, along which the Nigerian Naval College is based.

### **Geology and Vegetation**

Eleme's aquifers are a crucial resource upon which the region's entire population depends for drinking water. The protection of these aquifers is therefore vital. These aquifers are very shallow, with the top-most groundwater levels occurring anywhere between close to the surface and a depth of 10 meters. To tap the aquifers, Eleme communities typically construct open, hand-dug wells about 60 cm in diameter and water is abstracted either manually or with pumps. In some areas affected by localized pollution of water closer to the surface, wells can be up to 50 meters deep. In such cases, immersible pumps are used to draw water. Water levels in these aquifers are highly seasonal [6].

The coastal area of Eleme comprises three vegetation zones: (i) beach ridge zone, (ii) saltwater zone and (iii) freshwater zone. The beach ridge zone is vegetated by mangroves on the tidal flats and by swamp trees, palms and shrubs on the sandy ridges. The saltwater zone is mainly vegetated by red mangrove (*Rhizophora mangle*). The coastal plain and freshwater zone is vegetated by forest tree species and oil palm.

### Industrial Development

With the discovery of oil in the Niger Delta in the 1958, the Eleme territory has become home to both oil refineries and fertilizer industries, increasing the role of a more industrial economy. About 100 wells are thought to be in use throughout the Eleme territory. The mining of oil has had notable political and environmental effects on the status of the Niger Delta, with pollution from national industries located in Eleme increasing acid rain and reducing soil, water and air qualities. Obviously, Eleme has become an area of much political interest over the last 40 years since oil exploration is estimated to account for around 65 per cent of Nigerian Government budgetary revenue and 95 percent of all foreign exchange earnings (www.odci.gov). Consequent high levels of migration into Eleme territory by other ethnic groups in Nigeria have made a sizable impact on Eleme society. The presence of non-Elemes hoping to find work within the chemical industries has affected the social importance of Eleme cultural identity, raising concerns over the retention of Eleme cultural practices and language use.

The discovery in 1956 of abundant reserves of oil and gas in the area has attracted over one hundred companies that are engaged in the up-stream and down-stream sectors of exploration and exploitation, with the Onne Port Complex serving as the pivot in sub-Saharan Africa.

Eleme has two of Nigeria's four, as of 2005, petroleum refineries and one of Nigeria's busiest sea ports and the largest sea port in West Africa located at Onne, a famous town with numerous industries [5].

## 2.0 Materials and Methods

### Research Design

The study used remote sensing and GIS techniques to develop land cover maps of Eleme in different epochs as well as land use map of the study area. A supervised classification method was adopted using Landsat TM for the study. This procedure is detailed with a methodology flowchart as shown in figure 5.

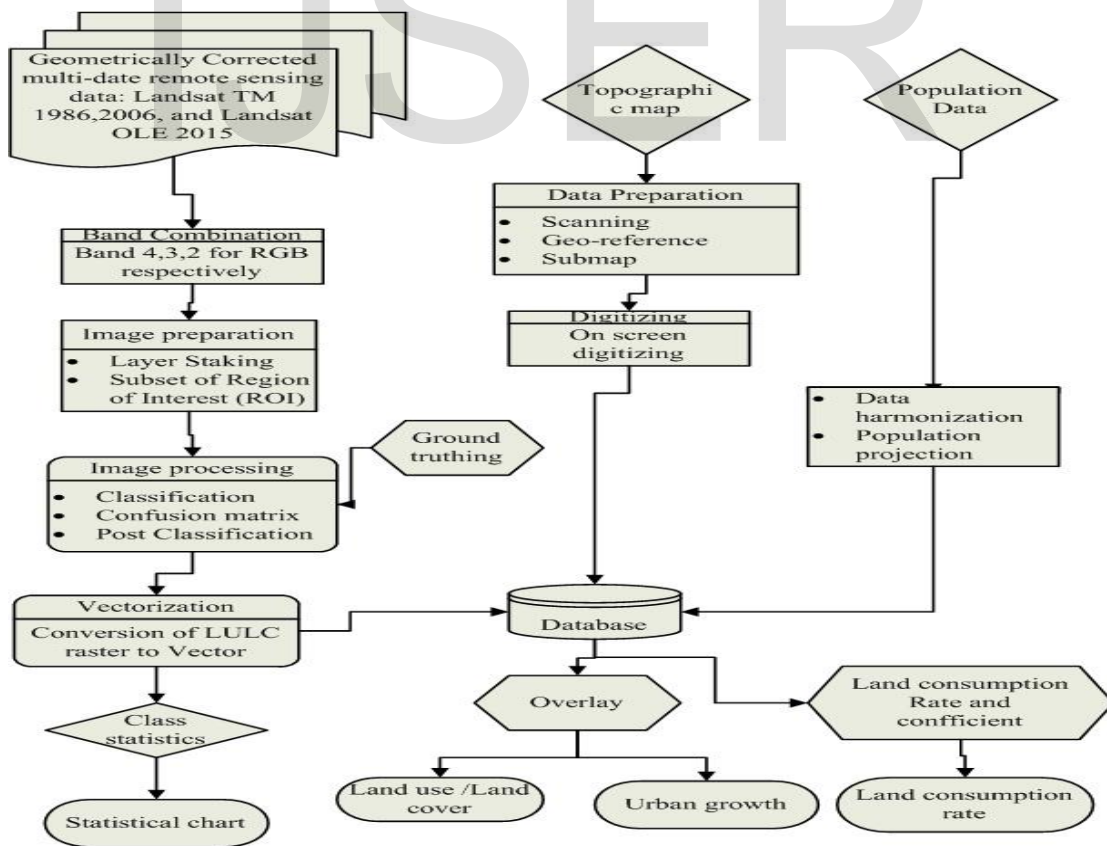


Figure 2: Methodology Flowchart

**2.1 The Land Consumption Rate and Absorption Coefficient Formula;**

$$L.C.R = \frac{A}{P} \dots\dots\dots eqn2$$

Where:

A = areal extent of the city in hectares

P = population

$$L.A.C = \frac{A_2 - A_1}{P_2 - P_1} \dots\dots\dots eqn3$$

Where

A<sub>1</sub> and A<sub>2</sub> are the areal extents (in hectares) for the early and later years, and P<sub>1</sub> and P<sub>2</sub> are population figure for the early and later years respectively [7].

**L.C.R = A measure of compactness which indicates a progressive spatial expansion of a city.**

**L.A.C = A measure of change in consumption of new urban land by each unit increase in urban population**

Both the 2007 and 2015 population figures were estimated from the 2006 population figure of Eleme using the recommended National Population Commission (NPC) 3.4% growth rate as obtained from the 2006 census.

The first task to estimating the population figures was to multiply the growth rate by the census figure of Eleme in year (2006) while subsequently dividing same by 100. The result was then multiplied by the number of years being projected for, the result of which was then added to the base year population (2006). This is represented in the formula below;

$$n = \frac{r}{100} * P_0 \dots\dots\dots eqn4$$

$$P_n = \sum P_0 + (n * t) \dots\dots\dots eqn5$$

Where

P<sub>n</sub> = estimated population (2007, 2019)

P<sub>0</sub> = base year population (2006 population figure)

r = growth rate (3.4%)

n = annual population growth

t = number of years projecting

In evaluating the socio-economic implications of change, the effect of observed changes in the land use and land cover between 1986 and 2015 were used as major criteria.

**3.0 Results**

**Table 2: Population of Eleme in 1937**

S/N	LOCALITY	POPULATION
1	Onne	458
2	Agbonchia	398
3	Alesa	336
4	Ebubu	308
5	Ogale	299

6	Aleto	212
7	Alode	200
8	Akpajo	177
9	Eteo	110
10	Ekporo	30
<b>Total</b>		<b>2,528</b>

*Source: Osaronu, (2013)*

**Table 3: Population of Eleme in 1991**

S/N	LOCALITY	POPULATION		
		MALES	FEMALES	BOTH SEXES
1	Onne	7,022	5,526	12,548
2	Agbonchia	5,129	4,699	9,828
3	Alesa	4,202	3,306	7,508
4	Ebubu	6,442	6,064	12,506
5	Ogale	5,306	4,814	10,120
6	Aleto	3,211	3,165	6,376
7	Alode	3,132	2,888	6,020
8	Akpajo	2,936	2,260	5,196
9	Eteo	1,975	1,853	3,828
10	Ekporo	301	400	701
<b>Total</b>		<b>80,715</b>		

*Source: National Population Commission (NPC), 2009*

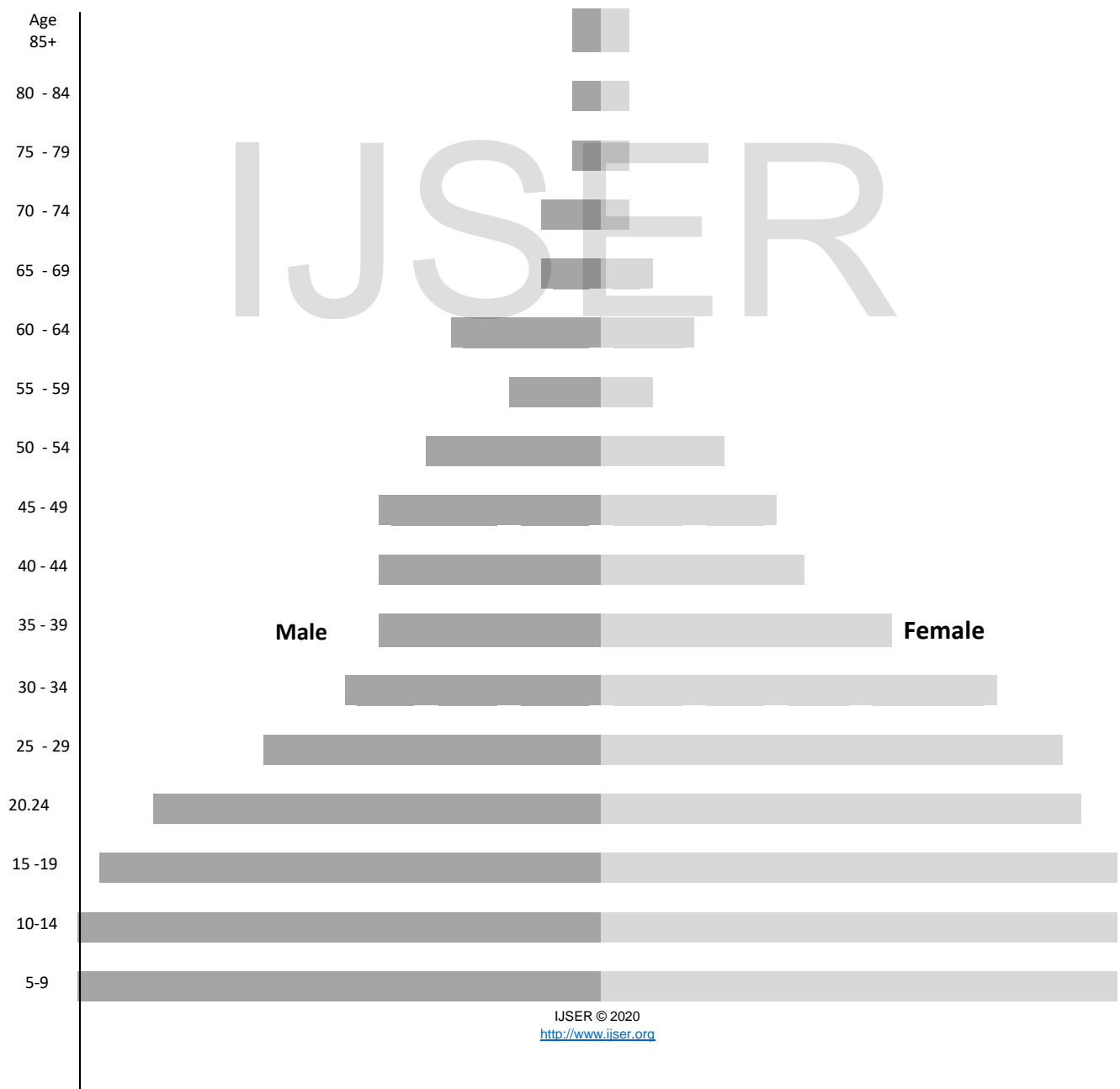
**Table 4: Distribution of Population (2006) by Five Year Age Groups and Sex**

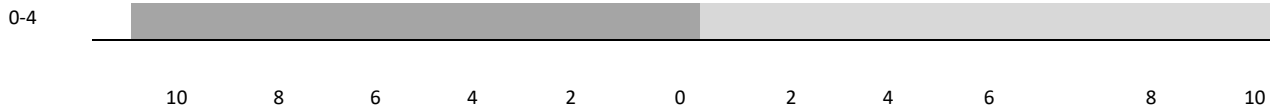
Age Groups	Sex		
	Total	Males	Female
<b>ELEME</b>			
<b>Total</b>	<b>190,194</b>	<b>98,345</b>	<b>91,849</b>
0 - 4	21,651	11,217	10,434
5 - 9	24,307	12,628	11,679
10 - 14	23,476	12,432	11,044
15 - 19	23,013	12,004	11,009
20 - 24	19,803	10,098	9,705
25 - 29	16,731	7,742	8,989
30 - 34	12,564	5,651	6,913



35 – 39	10,977	4,932	6,045
40 – 44	9,965	5,167	4,798
45 – 49	8,149	4,453	3,696
50 – 54	6,853	3,981	2,872
55 – 59	3,281	1,956	1,325
60 – 64	3,987	2,592	1,395
65 – 69	1,640	962	678
70 – 74	1,507	1,076	431
75 – 79	600	355	245
80 – 84	840	549	291
85+	850	550	300

Source: NPC Priority Table Volume IV, 2010 (2006 Population and Housing Census)





**Figure 3: Structure and Distribution (Pyramid) of Eleme Population by Five Year Age Group and Sex**

Both the 2007 and 2015 population figures were estimated from the 2006 population figure of Eleme using the recommended National Population Commission (NPC) 3.4 percent growth rate as obtained from the 2006 census. The first task to estimating the population figures was to multiply the growth rate by the census figure of Eleme in year (2006) while subsequently dividing same by 100. The result was then multiplied by the number of years being projected for, the result of which was then added to the base year population (2006). This is represented in the formula below;

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$$P_n = \sum P_o + (n * t) \dots\dots\dots eqn5$$

Where

**P<sub>n</sub>** = estimated population (2007, 2019)

**P<sub>o</sub>** = base year population (2006 population figure)

**r** = growth rate (3.4%)

**n** = annual population growth

**t** = number of years projecting

In evaluating the socio-economic implications of change, the effect of observed changes in the land use and land cover between 1986 and 2015 were used as major criteria.

**Table 5: Projected Population Increase in Eleme Using 3.4 Per cent Growth Rate**

Year	Population	Projected Population Increase in Eleme Using 3.4 % Growth Rate
2006	190194	6467
2007	196661	6686
2008	203347	6914
2009	210261	7145
2010	217410	7392

2011	224802	7643
2012	232445	7903
2013	240348	8172
2014	248520	8450
2015	256970	8737
2016	265707	9034
2017	274741	9341
2018	284082	9659
2019	293741	9987

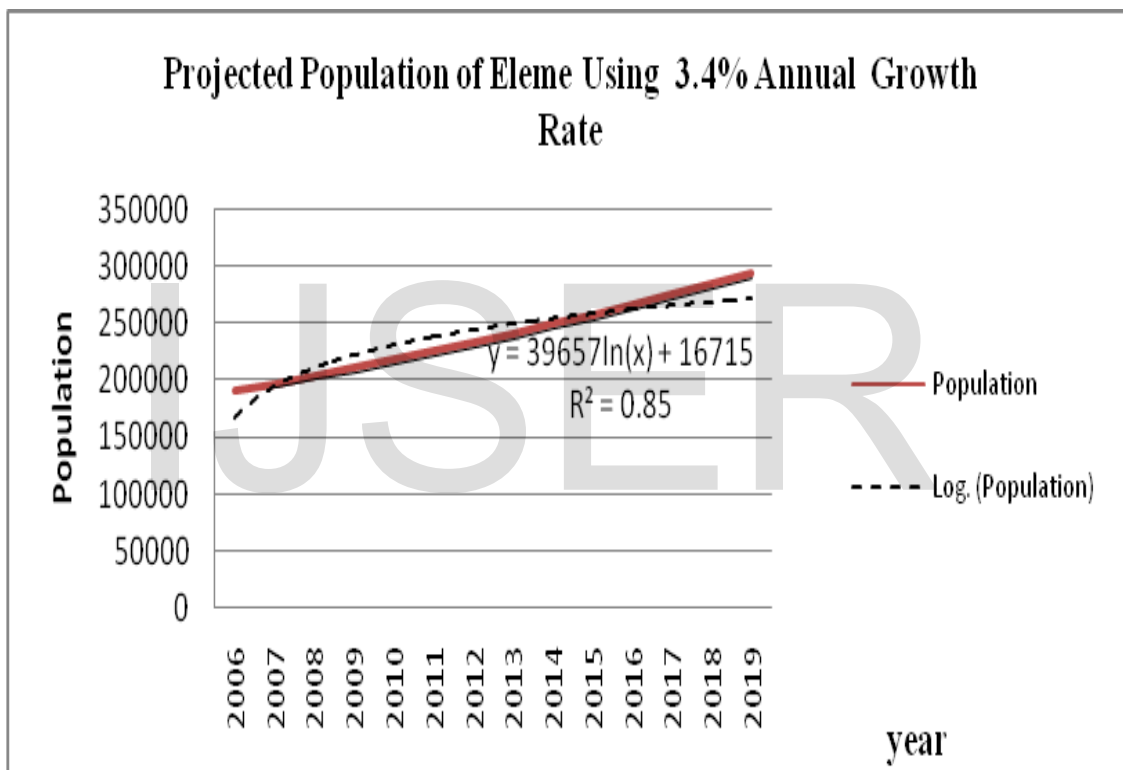


Figure 4: Projected Population of Eleme Using 3.4 Per cent Annual Growth Rate

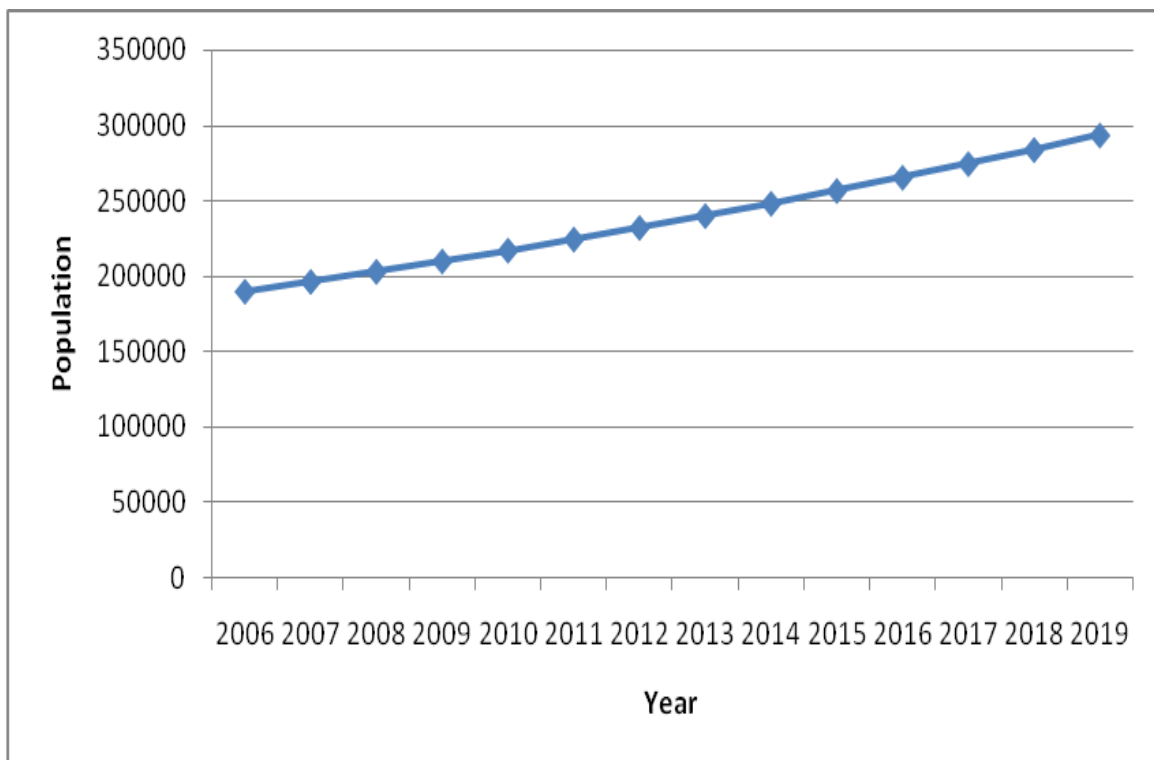


Figure 5: Population growth and projected trend of Eleme from 2006-2019

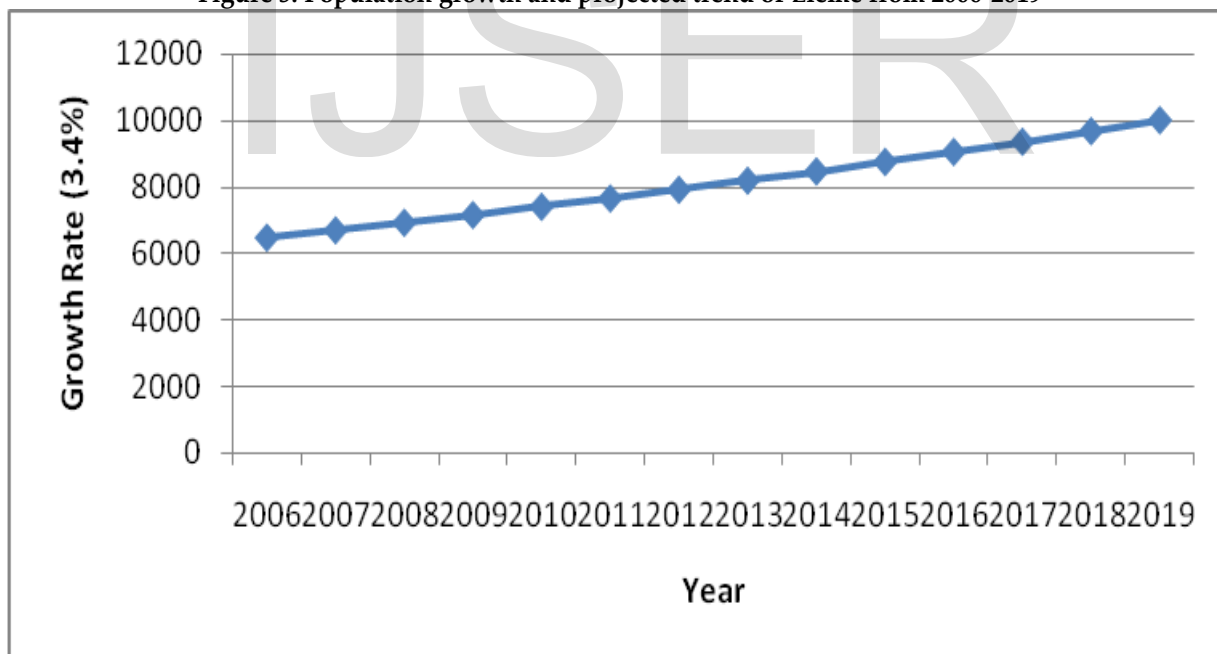


Figure 6: Growth rate and projected rate of Eleme from 2006-2019

Table 6: Land Consumption Rate/Land Absorption Coefficient in Eleme between 2006 and 2019

Year	Population	Change in Population	Built-up Area Projected by	Change in projected Built-up	Land Consumption Rate (LCR)	Land Absorption Coefficient
2006	190000					
2007	195000	5000				
2008	200000	10000				
2009	205000	15000				
2010	210000	20000				
2011	215000	25000				
2012	220000	30000				
2013	225000	35000				
2014	230000	40000				
2015	235000	45000				
2016	240000	50000				
2017	245000	55000				
2018	250000	60000				
2019	255000	65000				

			<b>2.32 (m<sup>2</sup>)</b>	<b>Area</b>		<b>(LAC)</b>
2006/2007	190194	6467	18670000	2320000	98.16293	358.7444
2007/2008	196661	6686	20990000	2320000	106.7319	346.9937
2008/2009	203347	6914	23310000	2320000	114.6316	335.5511
2009/2010	210261	7149	25630000	2320000	121.8961	324.5209
2010/2011	217410	7392	27950000	2320000	128.5589	313.8528
2011/2012	224802	7643	30270000	2320000	134.6518	303.5457
2012/2013	232445	7903	32590000	2320000	140.2052	293.5594
2013/2014	240348	8172	34910000	2320000	145.2477	283.8962
2014/2015	248520	8450	37230000	2320000	149.8069	274.5562
2015/2016	256970	8737	39550000	2320000	153.909	265.5374
2016/2017	265707	9034	41870000	2320000	157.5796	256.8076
2017/2018	274741	9341	44190000	2320000	160.8424	248.3674
2018/2019	284082	9659	46510000	2320000	163.7203	240.1905
2019	293741		48830000		166.2349	

**Table 7: Population Growth and Land Use Change Trend in Eleme (2006 – 2019)**

<b>Year</b>	<b>Population Growth</b>	<b>Built-up Area</b>	<b>Farmland</b>	<b>Light Vegetation</b>	<b>Thick Vegetation</b>	<b>Water Body</b>
2006	6273	18.67	24.3	76.79	16.09	2.25
2007	6467	20.805	24.653	75.213	15.146	2.105
2008	6686	23.12	25.006	73.636	14.202	1.96
2009	6914	25.435	25.359	72.059	13.258	1.815
2010	7149	27.75	25.712	70.482	12.314	1.67
2011	7392	30.065	26.065	68.905	11.37	1.525
2012	7643	32.38	26.418	67.328	10.426	1.38
2013	7903	34.695	26.771	65.751	9.482	1.235
2014	8172	37.01	27.124	64.174	8.538	1.09
2015	8450	39.325	27.48	62.59	7.594	0.945
2016	8737	41.64	27.83	61.013	6.65	0.8
2017	9034	43.955	28.183	59.436	5.706	0.655
2018	9341	46.27	28.536	57.859	4.762	0.51

2019	9659	48.585	28.889	56.282	3.818	0.365
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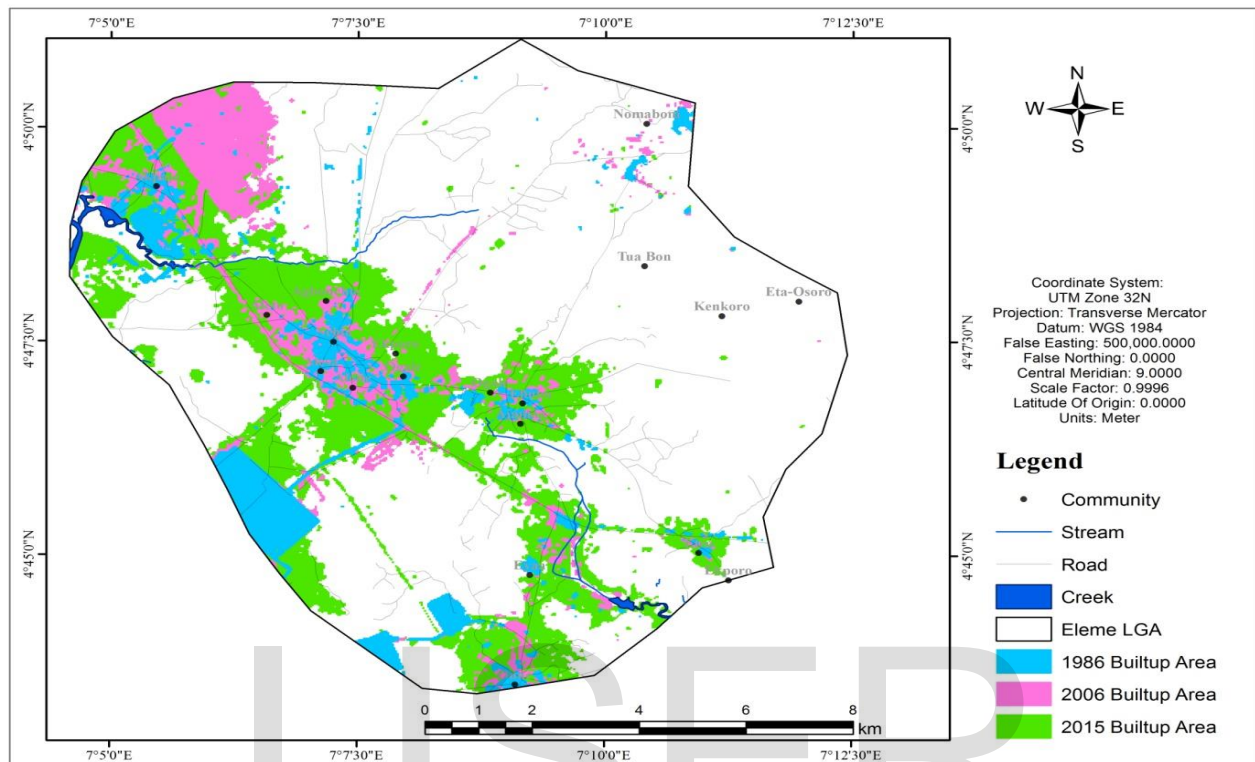


Figure 7: Image of Built-up Area Distribution in Eleme between 1986 and 2015

#### 4.0 Discussion

Table 2 shows the population of Eleme as at 1937 which was 2,528 while Table 3 shows the population of Eleme in 1991 which was 80,715. Table 4 gives the population of Eleme, resulting from the 2006 Census which was 190,194. It further gave the characteristics of the population including the sex component. Figure 3 shows the structure and distribution otherwise known as the pyramid of the population. Figure 3 gives a clear illustration that Eleme population is young or youthful and has a high momentum.

Table 5 shows the population projections of Eleme from 2006 to 2019 using an annual growth rate of 3.4 percent. Figure 4, 5, and 6 give a graphical illustration of the population growth rate and trends between 2006 and 2019 in Eleme. Table 6 shows the projected population and land consumption rate in Eleme between 2006 and 2019 using an annual rate of 2.32km<sup>2</sup> for built-up area. Table 7 shows the projected population growth and the expected changes in the natural environment which include built-up area, farmland, light vegetation, thick vegetation, and water body, while figure 7 shows the combined effects of changes that will occur or have occurred in Eleme environment from 1986, 2006, and 2015.

#### 5.0 Conclusion and Recommendations

The outcome of this study shows that human population represents a threat to biodiversity in several ways. Thus if the patterns of consumption remain at the present rate, with more people, we will need to harvest more timber, catch more fish, plow more land for agriculture, dig up more fossil fuels and minerals, build more houses, and use more water [9]. All of these demands impact wild species and increase the levels of pollution. Unless we find ways to dramatically increase crop yield per unit area, it will take much more land than is currently domesticated to feed people in the area if our population continue to grow at the prevailing rate of 3.4 percent annually. We therefore recommend more sustainable agricultural practices, investment in family planning and female empowerment, as well as maternal health

and education as a veritable way of ensuring food security, and control child birth in the area to guarantee sustainability of the ecosystem.

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