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A STUDY OF POPULATION GROWTH AND ITS SOCIETAL EFFECTS IN BALI LOCAL GOVERNMENT AREA OF TARABA STATE, NIGERIA

***[1]USMAN, Danfulani Bitrus, [2]HASSAN, Musa, [2]WANIYOS, Hamidu Umaru**

[1]Department of Statistics and Operations Research Modibbo Adama University, Yola Adamawa State Nigeria
[2]Adamawa State Polytechnic, Yola Nigeria

*Corresponding authors' email: usmandanfulani4@gmail.com Phone: +2347039798031

ABSTRACT

Human beings evolved under conditions of high mortality due to famine, diseases and relatively low fertility rate. In the recent years, human population has drawn attention to the global issues because of the alarming growth rate. The study focused on growth rate of human population and its societal effects. A questionnaire was developed and administered among 389 respondents selected for the study. Also population figures of the area of study was obtained from 2006 National Population Bulletin and information from settlement, farm land, vegetation, build-up, water and others were obtained through Global Positioning System (GPS). The statistical analysis used for the study includes correlation, analysis of variance, and exponential modelling and simulation study. The results of the analysis showed that the settlement, water usage and farm land increases while vegetation reduces in years 1986, 2005 and 2012.The simulation studies carried out because of availability of relevant data showed an exponential trend of population growth. A population projected indicated a carrying capacity of 322,160 people in the next 30 years and a growth rate of 1.81%. We recommended that the local government should consider population growth at all level of education in its budget. There should be a study of population growth at every level of education; social amenities should be increased as the population increases. The study also recommends for the evaluation of technological, pollution and the social trends on a vital coefficient and the fertility rates for at most 3 years to determine the variation in the population growth.

Keywords: Population, Growth and Effects

INTRODUCTION

The rapid growth on human a population over the past hundreds of years is astonishing. This growth results from the difference between the rate of birth and the rate of death and partly by immigration (Kinder, 2008). Population projection has become one of the most important problems in any society. The sizes of population growth in a country directly influenced the situation of economy, policy, culture, education and environment of any, especially the developing country and determine exploring and cost of natural resources. Every government and collective sectors always require accurate idea about the future size of various entities like population, resources, demands and consumptions for their planning activities (Agustus, Epiphanie & Pacifique, 2012).

The problems of population growth are serious issues that drew global attention to its existence. For instance,Kinder (2008) asserts that human beings evolved under conditions of high mortality due to famines, accidents, illnesses, infections and war and therefore the relatively high fertility rates were essential for species survival. In spite of the relatively high fertility rates it took all the time from evolution of mankind to the middle of the 19th century for the global population to reach one billion (Carson, 1990). The twentieth century witnessed an unprecedented rapid improvement in health care technologies and access to health care all over the world; as a result, there was a steep fall in the mortality and steep increase in longevity. The population realized these changes and took steps to reduce their fertility but the decline in fertility was not so steep. As a result, the global population has undergone a fourfold increase in a hundred years and has reached 6 billion (David, 1997; Richard & Robert, 1997). In the past, infant and childhood deaths and short life spans used to limit population growths. In today's situation due to improved nutrition, sanitation and medical care, more babies survive their first few years of life. Kinder (2008) reported that the combination of continuing high birth and low death rate is creating population increase in many countries, especially Asia, Latin America and Africa and people generally live longer (Harte, 2007).

If America and other Nations will ignore the problems of population growth and their own massive contribution to it; they will be trapped in a downward spiral that may well lead to the end of civilization in a few decades. This, we will have more frequent droughts, more damage crops, and famines, more dying forests, more smog, more international conflicts, more epidemics, more gridlock, more drugs, more crime, more sewage swimming, and other extreme unpleasantness will mark our course. It is a route already travelled by too many of our less fortunate fellow human being and we too can be affected (Digby, 2010; Paul & Erhlich, 2008).

Alex (2011), asserts that the rapid rise in the rate of population growth has prompted concern that the world is poised on the brink of disaster that not only are we running out of enough food to sustain the growing population, but that the growth in population is also responsible for poverty, environmental destruction and social unrest. This is true; as long as population continue to rise, economic development in poor countries is impossible, any increase in economic output must go to sustain the increase population instead of being invested to create new jobs and wealth creation(Kennedy & Cheng, 1998; Paul & Erhlich, 2012). These concerns have led to the international agencies and government to control population growth, especially in Third World countries where it is highest. Except for the religious objections in promoting decreased fertility, there are few people who questions that there is a population problem, that it is a problem primarily of the poor nations, and that the solutions require women to limit their fertility.

David (1997) noted that population growth is one of the biggest problems faced on this planet. Not only does it cause overcrowding in general, it is accompanied with problems. Many of the resources we take for granted are being diminished and even contaminated. For instance, we are running out of land on which to grow our food, and the land itself is becoming less productive. Mayo (2011) supported the above conscious problem that the erosion that causes this as well as population causes the supply of clean and fresh water to decrease.

Energy sources are also used up quickly and there are few alternatives. He further asserts that as we push more and more life on to this planet we are leaving less room for other plants and animal species that are useful for nutritional and medicinal purposes as well as being part of a diverse community. The most critical part of all these damages is that most of it is interconnected. Also, damage to soil leads to less food and polluted waters. Over consumption of energy lead to dryer soil, and global warming. It is obvious that without finding a solution to the cause of all of these, a rapid population increase, we will not be able to save the earth from the continuation of this type of devastation (Ofosuhene, 2009).

Population growth has become one of the most important problems in the world. Alex (2011) averred that every government and collective sectors always require accurate idea about the future size of the various entries like population, resources, demand and consumption for their planning activities. To obtain this information the behaviour of the connected variables is analysed based on the previous data by the statisticians, Operations Researchers and mathematicians at first, and using the conclusion drawn from the analysis they make future projections of the aimed at variables. There are enormous concerns about the consequences of the human population growth for social, environment and economic development. The projection of future population is normally based on present population. Ideally, if the population continues to grow without bounds, nature will take and death rate will rise to solve the problem. Unfortunately, this is not the most attractive scenario: instead, the birth rate will rather be control in order to reduce population growth.

Malthus Theory on Population Growth

British economist Thomas Robert Malthus raised an alarm about population growth in the late 18th century. Malthus in (Kinder 2008)argued that population growth would eventually outstrip food supplies. Steve,(1995) also noted that Malthus based his theory on the assumption that populations grew faster than food supplies. Under Malthus's theory, a country with no constraints on population would grow according to the rules of geometric progression—a population of one million would double to two million in 25 years, to four million over the next 25 years, and so on. But according to Malthus, food supplies could be expected to grow by the rules of arithmetic progression. He believed that human population increases geometrically whereas food supplies can only grow arithmetically as it is limited by available land and technology from one million tons to two million tons in 25 years, and from two million to three million over the next 25 years. Over time the ratio of people to food would drop below subsistence level, Malthus reasoned, triggering checks on population growth (Digby, 2010).

According to Malthus, population growth does not only depend on the population size but also on how far this size is from its upper limits. The model of Malthus is unconstrained growth that is a model in which the population increases in size without bound. It is an exponential growth model governed by a differential equation.

Other critics of Malthus argued (and continue to argue) that his pessimistic scenario never unfolded. The world population reached 1 billion in Malthus's lifetime, crossed the 2 billion mark in the early 20th. century, and stood at more than 6 billion in 2000. Under Malthus's theory, the world should have faced massive starvation long ago. Supporters of Malthus, however, note that scores of major famines emerged to check population growth. The Irish potato famine of 1845 to 1847 occurred within half a century of his writing. Since then, there have been many famines in Africa, in India, and in China, including one in China that claimed more than 20 million lives during the late 1950s and early 1960s. Today, 1.2 billion people are chronically hungry and undernourished—more than the entire world population at the time Malthus was alive.

Theory of Demographic Transition

Great as the population growth of the last 50 years has been, the population boom is far from over. Depending on what is done to address population growth, UN demographers project that the world's population will grow by anywhere from 1.6 billion to 5.1 billion people over the next 50 years. The UN expects almost all of this growth will take place in the developing world, much of which is already densely populated.

Lawal (2003 in 1945 and in Encarta 2009) developed the demographic transition model by dividing the countries of the world into three categories: stage one countries, stage two countries, and stage three countries. In first stage countries, generally preindustrial societies, birth rates and death rates are both high, essentially offsetting each other and leading to little or no population growth. Life expectancy (the average expected length of life) is low, and the infant mortality rate (the probability of death in the first year of life) is high. This is what the study area has been witnessing in the past 50 years.

Countries enter stage two when they begin to modernize. Modernization is typically accompanied by improvements in health care and standards of living. As a result of these improvements, death rates decline. Birth rates, however, remain high. Lowering birth rates requires changes in human reproductive behaviour, a change that does not come nearly as rapidly as the introduction of vaccines, antibiotics, improved public health measures, and expanded food supply. Thus, population growth typically reaches 3 percent a year, or 20 fold per century. In stage two; countries cannot remain in this stage long simply because continual population growth will eventually overwhelm their available resources.

When birth rates begin to fall, countries enter the third stage. In the third stage, birth and death rates again balance, but at low levels, and the country's population size stabilizes. Under Notestein's model, economic and social gains—such as rising income and educational levels—encourage the birth rate to fall, which in turn leads to further economic and social gains because families with fewer children devote fewer resources to raising their children, freeing those resources for other purposes, such as savings and investment.

As of 2000, only 32 countries, many of them in Europe, had made it to stage three, according to the Population Reference Bureau, a population research organization based in Washington, D.C. The rest of the world's countries remained in stage two. About 39 of these stage two countries, including China and the United States, are approaching stage three, but the others continue to grow at a fast clip. As of 2000, there were no countries in stage one. Can the 160 or so countries still in stage two make it to stage three? Most of them probably will, but some may not. This transition will be achieved most easily if we take quick steps toward reducing birth rates. But even if such measures are in place, many countries will likely face population-related crises before they can reach stage three (Digby, 2010).

Causes of Population Explosion

At the beginning of the population increase, there were many factors that caused it to grow. For example, with the industrial revolution came advances in agriculture and industry that gave way to individual families being able to afford more children. Increases in our knowledge about nutrition and medicine help us to have more healthy babies (Erhlich & Erhlich 1990). When women take care of their bodies better, they are more fertile and therefore can have more children. With cure for fertile diseases including antibiotics and vaccines, these children are also able to live longer. Kennedy and Cheng (2008), reported that because of this development, there has been a number of increase in fertility due to a number of factors including the reduction in the average age at which menarche occurs and an increase in the number of menstrual cycles a woman have in her life time. Menarche refers to the age at which a girl has her first period. According to them this has been falling for the past hundred years (Agresiti, 1990).

That at present a girl can experience a menarche at the age of 13 or less. An indication that; a woman time of fertility is increasing to include most of her teen age. They also observed that hitherto women in the Western world average only 30 menstrual cycles in a life time but today for women with two children it is nearer to 450 (Dudley & Leon, 2010; Juha & Bruce, 2005). These figures all give a woman more opportunity to conceive children in their lifetime. Yes! These types of changes seem good for society, and they are in sense that more people mean more development for the world societies. But now that the population has skyrocket the world, attention has been turned to it and how to curb it if possible.

METHODOLOGY

Stratified random sampling was used to divide the local government into four stratas. The layers are Mai-hula, Garba-chede, Mayo-kam and Bali, the headquarters of the local government. The layers were further grouped into government approved polling units and later used simple random sampling to select from each of the polling units that we administered questionnaires. The reason for chosen the stratified random sampling was to divide the local government population into homogeneous groups that will make the sampling easy for the survey and to increase the efficiency of our estimates. The sampled for the study was 389 respondents.

Data Collection

Two types of data were collected; primary data and the secondary data. In collecting primary data, questionnaire was designed and administered among the respondents. There were two parts in the questionnaire. The first part consists of personal data, which comprises of gender, age group, marital status, highest school attended, highest qualification and occupation, while the second part includes 29 items that were based on everyday life and the respondents demographics characteristics and how they obtained the mean of their livelihood. A total of 389 of the designed questionnaires were reproduced and administered in four of the towns that were experiencing population growth. The proportional allocation was used to allocate the questionnaires for each unit using the formula $n_i = \frac{n}{N_i}$ .X N_i. Where $n_i$is the number of questionnaires allocated to each unit, $N_i$is the population of the unit while n and N are the respondents sample size and population size respectively. Five enumerators were recruited and trained to assist in the administering of questionnaires. After the training, they were given questionnaire to answer and were allowed to ask questions on any item they do not understand.

Pilot study was first conducted in order to identify the question's item that is ambiguous for the respondents. All items that were ambiguous were reframed. Enumerators were instructed not to allow respondents to have access into another respondent to avoid influence.

Secondary data of the study area was obtained from Taraba State National Population Commission (2006 census figure) and the population of all the 11 wards of the local government were obtained from the Local Government Primary Health Care Department. These data were used to determine the number of the questionnaires to be administered to each of the four towns. Other data used were the coordinates of the four towns using Global Positioning Systems (GPS).

Research Design for Remote Sensing for Data Collection

The coordinates of the four towns were taken to the National Centre for Remotes Sensing Jos, Nigeria. They were used to download the satellite images of 1986, 2005 and 2012; from the Global Land Cover Facility (GLCF).

The three images were classified as band 3, 4, and 5. These bands were merged together and classified using ERDAS software to gives clear view and identification of earth features. We used image interpretation and supervise classification to classify the features. These includes: Water, Build-up, Farmland, vegetations and others. The others comprise of bare land, wet land, rock and alluvial deposit. The LandsatTM with resolution of 28.5m was used to classify 1986 imagery; while NigeriaSat1 with resolution of 32m and NigeriaSatX with resolution of 22m were used for the classification of 2005 and 2012 imageries.

Method of Data Analysis

The census data of Bali LGA was obtained for the year 2006 from the TarabaSate National Population Commission, hence exponential distribution was used. The Model
is given below:

$$f(x) = \lambda e^{-\lambda x} \tag{1}$$

where x is the population and λ is the estimated mean used to simulate the population on study. The MATLAB software was used for the simulation.

Logistic Model

In order to include variables such as fertility, Verhulstmodel was modify to suit the population of the study area. This is because the existing models, Verhulst and Malthusian Model do not include this type of variable. The modification of the model is as follows:

Let $P(t)$ denote the population of the study area at time say t and γ denote the difference between the birth rate and the death rate refers to as vital fertility and coefficient rate of the study area. Putting this in equation form, we have:

$\frac{d}{dt}P(t),$ now the rate of population equals $\gamma P(t)$, where γ a constant that does not change with either time or populations (Meng and Wai, 2011). This scenario is giving by the differential equation below:

$$\frac{d}{dt}P(t) = \gamma P(t) \qquad (2)$$

above non homogenous linear first order differential equation has the solution;

This $P(t) = P_0 e^{\gamma t}$ is based on Malthusian population growth which follows exponential distribution. The above (2) has no bound. However, in real life, population cannot grow infinitely without bound. As the size of the population increases, the environment ability to satisfy the population also decreases leading to inverse relationship. Also waste product accumulate, birth rate tends to decline while death rate tends to increase migration also crop in. Hence we modify the Verhulst model by introducing fertility rate to his earlier carrying capacity (limiting values). This is in line with (Augustus, Epiphanie & Pacifique, 2012).

$$\frac{d}{dt}P(t) = \frac{\gamma - \rho P(t)}{\gamma} \qquad (3)$$

where, γ and ρ is our vital fertility and coefficient rate respectively. The 'γ', reflect how far the population is from its limiting value and ρ the possibility of a couple having high rate of fertility for procreation. In a case where these terms become very small and approaches zero, this shows the possible feedback that will limit the population growth. Using our terms:

$$\frac{d}{dt}P(t) = \frac{\gamma P(t)(\gamma - \rho P(t)}{\gamma} \qquad (4)$$

This is a non-linear differential equation; hence we multiply equation (3) by itself. At the time when t=0, and $P(t) = P_0$ representing the initial population and time respectively, equation 4 becomes:

$$\frac{d}{dt}P = \gamma P - \rho P^2 \qquad (5)$$

Using variable separation;

$$\int \frac{1}{\gamma}\left(\frac{1}{P} + \frac{\rho}{\gamma - \rho P}\right)dP = t + c \qquad (6)$$

this yield:

$$\frac{1}{\gamma}[\log P - \log(\gamma - \rho P)] = t + c \qquad (7)$$

As t = 0, and $P(t) = P_0$;

$$c = \frac{1}{\gamma}[\log P_0 - \log(\gamma - \rho P)] \qquad (8)$$

$$\frac{1}{\gamma}[\log - \log P_0(\gamma - \rho P_0)] = t + \frac{1}{\gamma}[\log P_0 - \log(\gamma - \rho P_0)] \qquad (9)$$

Finding P yields:

$$N = \frac{\frac{\gamma}{\rho}}{1 + \left(\frac{\frac{\gamma}{\rho}}{P_0} - 1\right)e^{-\gamma t}} \qquad (10)$$

Taking the limit of equation (10) as $t \to \infty$

Differentiating equation (10) twice yields:

$$\frac{d^2P}{dt^2} = \frac{C\gamma^3 e^{\gamma t}(C - e^{\gamma t})}{\rho(C + e^{\gamma t})^3} \qquad (12)$$

$where, C = \frac{\frac{\gamma}{\rho}}{P_0} - 1$, we know that at the point of inflexion the second derivative of P must equal to zero; hence:

$$C = e^{\gamma t} \qquad (13)$$

$$\text{and } t = \frac{\ln C}{\gamma} \qquad (14)$$

This explains the time when the population is half of its carrying capacity. If this time is represented by $t = t_\alpha$ then $C = e^{\gamma t}$ will be $C = e^{\gamma t_\alpha}$. We now use this value of C and replacing $\frac{\gamma}{\rho}$ with say K, equation (10)

This explains the time when the population is half of its carrying capacity. If this time is represented by $t = t_\alpha$ then $C = e^{\gamma t}$ will be $C = e^{\gamma t_\alpha}$. We now use this value of C and replacing $\frac{\gamma}{\rho}$ with say K, equation (10) becomes

$$P = \frac{K}{1 + e^{-\rho(t - t_\alpha)}} \qquad (15)$$

Augustus, Epiphanie and Pacifique (2012) as while as Meng and Wai (2011) used similar approach but they could not include variables γ and ρ which in our case serve as coefficient rate and the fertility rate of procreation.

Analysis of Variance

The analysis of variance (ANOVA) and Spearman Correlation Coefficient waere used to determine the variability among the five classes of the change detection. The SPSS version 15.0 was also used to implement it.

Study Area

Bali Local government is located between latitude $010^0 58.191$'E and longitude $07^0 51{,}313$'N with an elevation of 295m above sea level. It has a total population of 211,024 people base on the 2006 census figure with a total land mass of 10,000 km^2. It is located in the central zone of Taraba State, Nigeria. It bordered Zing local government in the North, Ganye (Adamawa State) in the North-East, Gashaka local government in the East Wukari in the South-West, Wussa in the South-East, Donga in the South and Gassol in the West. The settlement of the Headquarters is situated on the upper course of river Taraba; a major tributary of river Benue, at an altitude of about 450 meters above sea level. Most of her inhabitants are predominantly agrarian with enormous potentials for tourism and few are either traders or public servant.

It has an annual mean temperature between 27^{o}C -28^{o}C while annual maximum and the minimum temperatures are 32^{o}C-34^{o}C and 22^{o}C-24^{o}C respectively. Highest mean monthly temperatures of about 34^{o}C are recorded in April while the lowest mean monthly temperatures of about 23^{o}C are recorded in the months of January and December. Annual rainfall figures are between 1000-1200 millimetres. Rainfall is experienced for about seven months of the year starting from April to October, with mean monthly rainfall recordings of about 220 millimetres in the months of august and September see map of the study area.

RESULTS AND DISCUSSION

The analysis was done in batches and arranged in sections according to the data obtained. For example, the pixel data obtained from the satellite imagery was displayed in Table 2 showing the changes of the five classes considered from 1986 to 2012 (i.e. settlement, vegetation, farm, water and others). The Table shows an increase in settlement from 4.86386266 KM^{2}in 1986 to 57.601469KM^{2}and 83.25040225 KM^{2}in 2005 and 2012 respectively while vegetation decreases from 5975.61281KM^2 in 1986 to 5383.37525KM^2 and 3815.87815KM^{2}2005 and 2012 respectively. This can be seen in farm, water and others leading to an inverse relationship among them. The same data was analysed using Pearson correlation coefficient to see whether they are correlated. The result revealed negative correlation in some variables (Table 3). For example, settlement and vegetation has correlation of -0.900 as well as vegetation and farm water and vegetation having negative correlation of -0.998 and -0.537; implying an increase in one variable lead to a decrease of the other.

The imagery data obtained for 1986, 2005 and 2012 were unzipped and classified with the help of ERDAS software to see how accurate the above results were. The imagery shows the same result as seen in Plates 1 to 3 the blue colour indicates water, the green vegetation, red settlement and the yellow indicates farmland. The vegetation decreases as the population increases from 1986 to 2012 as can be seen in the three plates. The data were also depicted in a multiple bar charts in Figure 1 showing an increase in the four of the classes while vegetation decreases.

In order to compare the changes with the population data, we simulated and projected 2006 census data of the Bali local government as seen in Table 4 and plotted in Figure 2. The figure shows that the graphs are closer to each other this shows that the data fit well in the model. To know the past data of 1986 to 2005 as the data are not available, we used exponential model to project the data backward and the data is presented in Table 5 and plotted in Figure 4. These data were analysed using ANOVA and the result was significant with F = 56.112 and p = .000 see Table 6.

Table 2: Change Detection for all the Five Classes from 1986 to 2012.

Classes (KM^2)	1986	2005	2012
Settlement	4.865386266	57.6014691	83.25040225
Vegetation	5975.61281	5383.37525	3815.87815
Farm	2879.711613	3246.13061	3966.510608
Water	36.76209618	61.7292365	55.88870779
Others	125.7349612	303.095183	1302.333162

Table 3: Correlation Coeficient of the Five Classes from 1986 to 2012.

		Settlement	Vegeation	Farm	Water	Others
Settlement	Pearson Correlation	1	-0.900	.928	.851	.836
			.288	. 244	.351	.370
	N	3	3	3	3	3
Vegeation	Pearson Correlation	-0.900	1	-0.998	-0.537	-0.992
		.288		.044	.639	.082
	N	3	3	3	3	3
Farm	Pearson Correlation	.928	-0.998*	1	.594	.981
		. 244	.044		.595	.126
	N	3	3	3	3	3
Water	Pearson Correlation	.851	-0.537	594	1	.424
		.351	.639	.595		.721
		3	3	3	3	3
Others	Pearson Correlation	.836	-0.992	.981	.424	1
		.370	.082	.126	.721	
		3	3	3	3	3

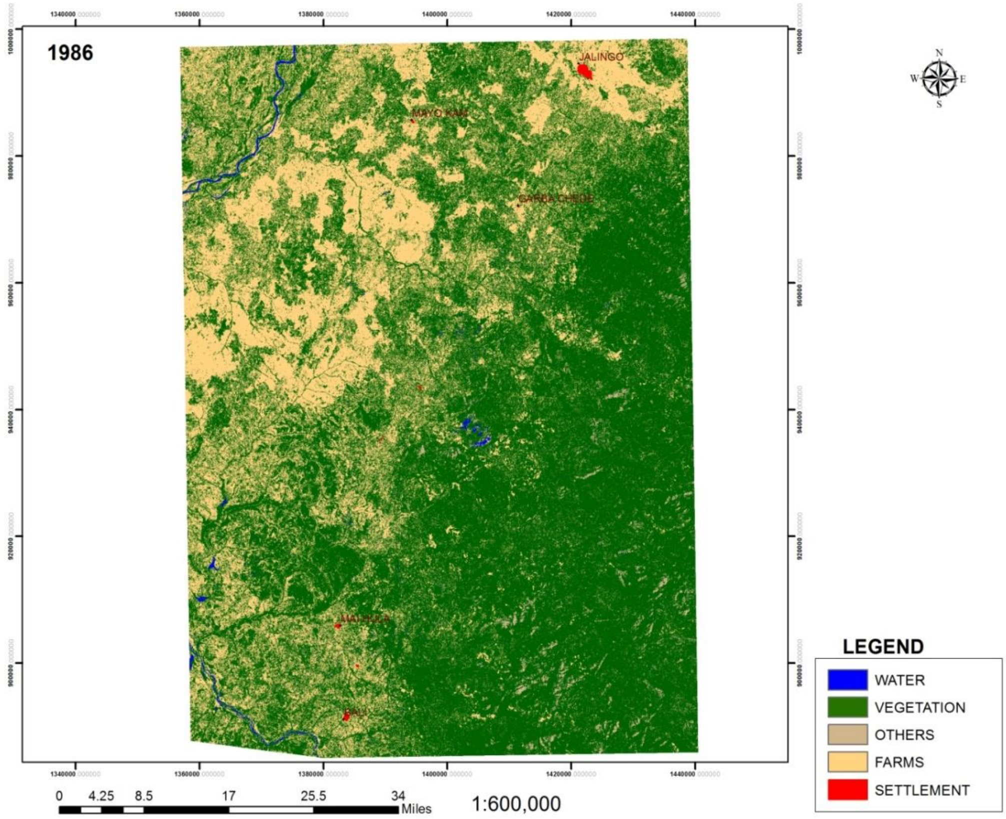

Plate 1: Satellite Imagery of Bali Local Government in 1986 showing the five classes covered in that year.

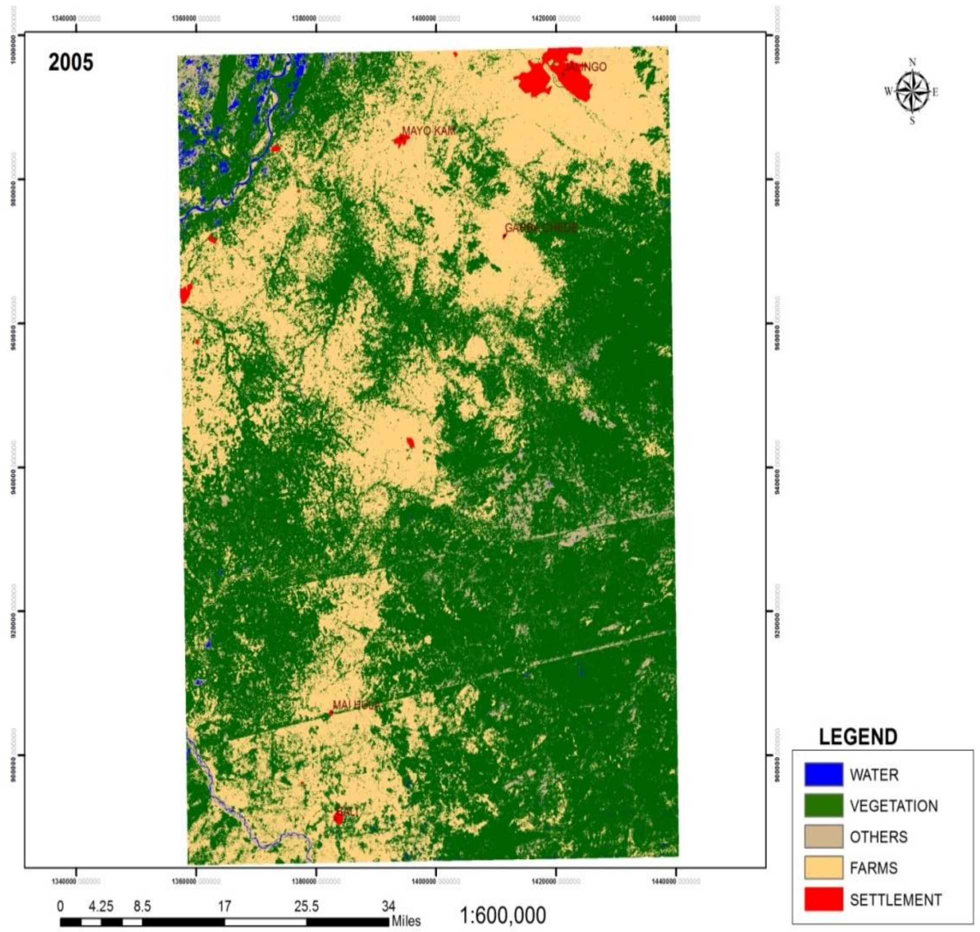

Plate 2: Satellite Imagery of Bali Local Government in 2005.

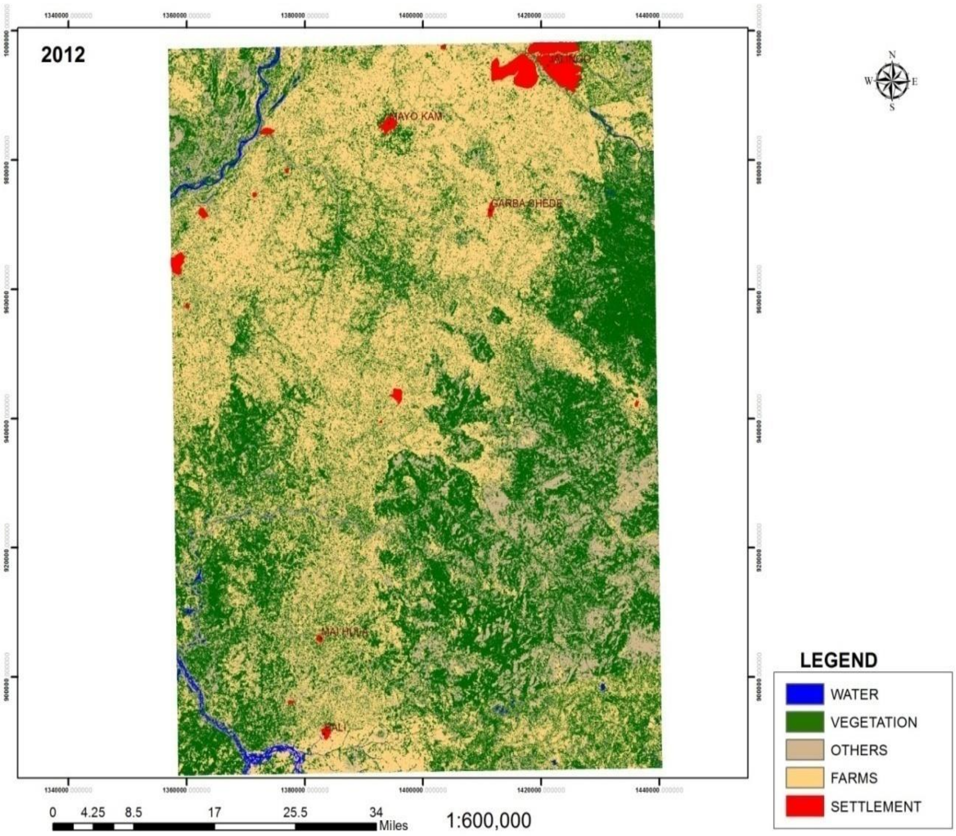

Plate 3: Satellite Imagery of Bali Local Government in 2012.

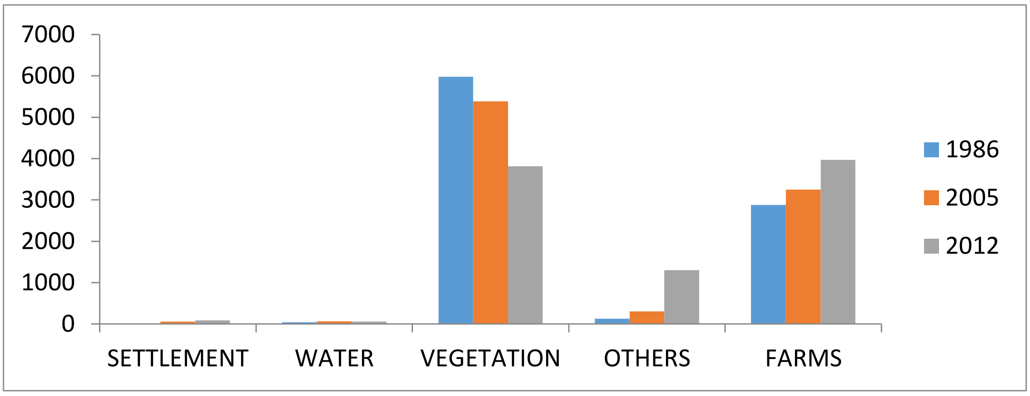

Figure 1: Multiple bar-charts of the five classes considered from 1986 to 2012.

Table 4:Simulated and the Projected Population for a Period of 24 Years.

Year	Simulated Population	Projected Population	Year	Simulated Population	Projected Population
2006	211024	211618	2019	255183	257244
2007	211789	212471	2020	261732	263846
2008	212942	213714	2021	268935	271325
2009	214489	215354	2022	276837	279410
2010	216439	217399	2023	285488	288257
2011	220384	221450	2024	294942	297923
2012	223194	224364	2025	305262	308471
2013	226449	227728	2026	316515	319971
2014	230168	231560	2027	328777	332501
2015	234372	235855	2028	342133	346147
2016	239085	240725	2029	342677	346837
2017	243893	245665	2030	358550	363049
2018	249248	251160	-	-	-

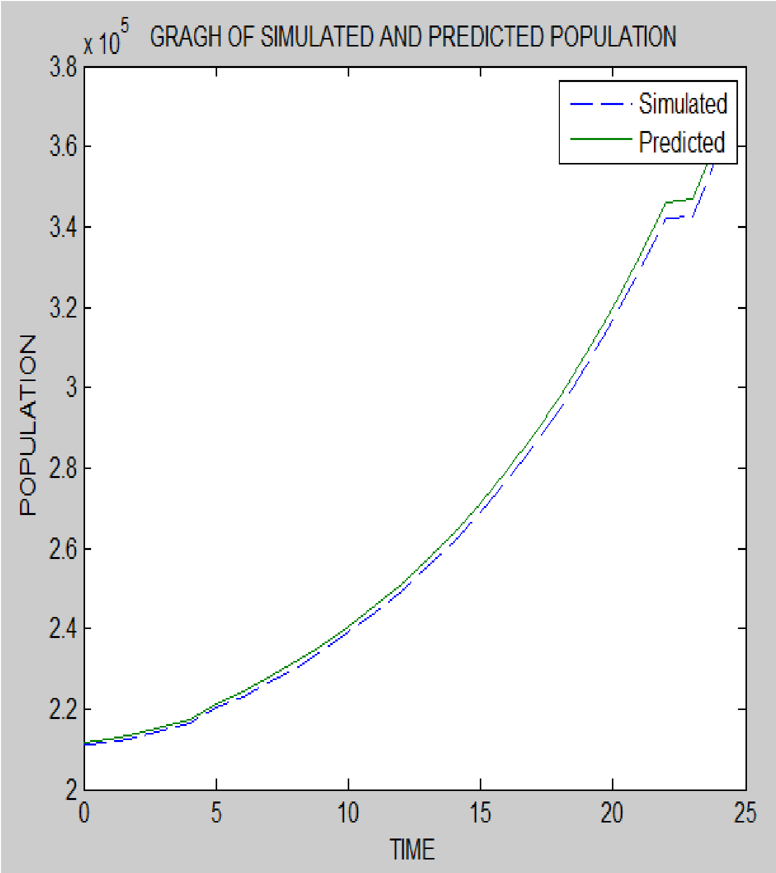

Figure 2: Graph of the Simulated and the Projected Population.

Table 5: Retrospective Projected Population of the Study Area from 1986 to 2006.

Year	Population
1986	146932
1987	149615
1988	152348
1989	155131
1990	157964
1991	160849
1992	163787
1993	166779
1994	169825
1995	172927
1996	176085
1997	179302
1998	182576
1999	185911
2000	189307
2001	192765
2002	196285
2003	199870
2004	203521
2005	207238
2006	211024

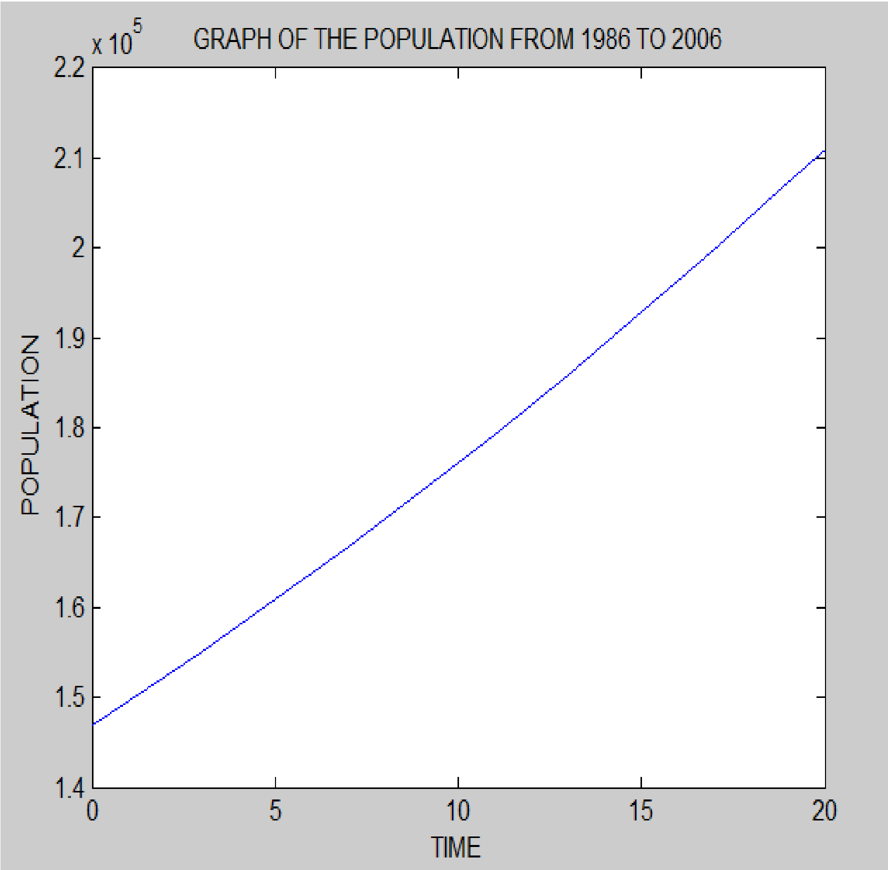

Figure 4 :Graph of the Retrospective Projected Population from 1986 to 2011.

Table 6: ANOVA table for the Simulated and the Projected Population.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1086.924	2	543.462	56.112	0.000[a]
Residual	213.076	22	9.685		
Toal	1300.000	24			

The consequences of increasing human population size are dynamic and nonlinear, not passive and linear. The model in equation 15 was used to determinethe carrying capacity of the study area and was found to be 322,160 people in the next 30 years. In the analysis, there is a spontaneous increase in the five classes considered. For example, as settlement, water, others and farm land increases vegetation decreases. Also the test of the analysis of variance (ANOVA) revealed significant results at 5% level of significance ($F = 39.665$, $p = 0.000$) which also agreed with result of the change detection obtained by the used of ERDAS software (see plates I to III).

The major challenges posed by the trends of a population growth are that not only the human species that is affected but other species also become extinct. We know that demographic pressure forces farmers to travel farther from their homes in search of additional land. While they sometimes manage to purchase these distant parcels, increasingly they must rent them. In other cases, farmers acquire holdings from the breakup of commonly-held lands. While close to some households, these formerly communal lands are often many kilometres away. Farmers in land scarce settings will operate whatever holdings they can to ensure their families' needs.

We can also see that in figure 2 the actual data points and predicted value are very close to one another. This indicates that the errors between them are very small. Also the graphs are in the shape of exponential pattern. This shows that the value fitted well in the logistics equation. At first, the population start to grow going through an exponential growth rate reaching 249248, (half of its limiting value i.e. its carrying capacity) in the year 2018 after which the rate of the growth is expected to slow down but this was not so. In a normal circumstance at the growth rate gets closer to its carrying capacity, 322160, it will drastically slow down because of lack of so many resources to support the population. The growth rate of Bali Local government was calculated to be 1.81%; however this rate will be changing either upward or downward depending on the growth of the population.

On the other hand, the graph of the backward predicted figure 3, shows different pattern slightly deviate from the logistic and the exponential growth but not completely linear. The reason was because the growth rate was maintained throughout the prediction and the second reason was due to the nature of our census data in the country.

Generally, in plates I to III above, as at 1986 the satellite image showed that vegetation is dense at almost all the areas covered but in plate II that is in the year 2005 (19 years) later; farm land and settlement has encroached the vegetation. The yellow areas seen in plate II are farmland and the red shows the settlement. With just 7 years that is from 2005 to 2012 the rate of the population increase was much thereby pushing vegetation far away from the people and hence life becomes difficult (see plate III); since the study area depend largely on farming.

CONCLUSION

Population of any species is very important especially that of a human being as its growth in a country directly influenced the situation of economy, policy, culture, education and environment of that country, especially the developing country and determine exploring and cost of natural resources. Every government and collective sectors always require accurate idea about the future size of various entities like population, resources, demands and consumptions for their planning activities. However, the converse is always the case, as the growth of any species causes hardship to that species. There will be less space to live in, more environmental degradation, uncommon social vices crop in and the criminal activities always surfaces.

Based on this studies and the findings we conclude that population growth is very important as its directly influenced the situation of: economy, policy, culture, education and environment of any country and determine exploring and cost of natural resources in every human endeavour as mentioned above; but the growth most go along way planning for it. The negative impact of a population is more than the positive impact in case of over population. Finally, we conclude that the carrying capacity of the study area will be 322, 160 in the next 30 years and her growth rate is 1.81% while her population is growing inversely proportional to its natural resources. Government most not failed to wage campaign on family planning, child spacing above all, planning for future as the population keep growing. Though control of population is a controversial issue but planning for it must not be over look.

We recommend that government should plan for the growing population as this will manage the growing population. Child spacing say, four to five years after and before birth will also help. We also recommend for the studies of a human population growth at all levels of education so that more people can be captured into the awareness of the danger of overpopulation. As the population keeps increasing government should also increase social amenities to meets the demand of the growing population. These should be the expansion of schools and hostels, erection or constructions of maternities and provision of a portable drinking water. We provide some of the societal effects of population growth in Appendixes I to V.

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APPENDIXES

APPENDIX I

Erosion sides captured in Mayo-kam near Primary School

APPENDIX II

Improper Solids Wastes Disposal in Bali Local Government Headquarters at the Bank of River Taraba

APPENDIX III

Erosion Side captured in UngwanYandangNearGarba-chede III Primary School.

Appendix IV

Improper Solid Waste Disposal in Mai-hula beside Market.

APPENDIX V

Improper Solid Waste Dumping Yard in Bali Local Government Headquarters, School Road.