



An Analytical View of Temperature in Lokoja, Kogi State, Nigeria

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ABSTRACT

Temperature is one of the climatic variables mostly affected by global warming, climate variability and climate change. This study examines the attributes of temperature in Lokoja. The data used are monthly and annual temperatures of 1971 – 2010 (40 years) obtained from the Nigerian Meteorological Society, Oshodi, Lagos, Nigeria. Results are presented in tables and analyzed using simple statistical measures such as minimum, maximum, range, mean, median, variance, standard deviation and coefficient of variance. The results show that the minimum annual temperature was recorded in 1975 (27.2°C), maximum was recorded in 2001 (29°C), range is 1.8°C, mean is 28.03°C, median is 28°C, variance is 0.15, standard deviation is 0.39; while the coefficient of variance is 1.39%. It is further stated that with these values, monthly and annual temperatures are still tolerable in the study area despite the observed temperature increase of 0.34°C between 1971 – 2010 (40 years) which is an indication of global warming. Measures to combat global warming, climate variation and climate change are suggested such as tree planting and proper town planning among others.

Keywords: *Temperature, temperature range, global warming, carbon and climate change.*

I. INTRODUCTION

Weather and climate have elements or variables which act differently, but are interrelated. One of such variables is temperature. Temperature could be that of the sea (water), soil, body, ambient or air. The temperature described here is the air temperature which is described as how hot, warm or cold a place is at a particular time. Temperature is controlled by the amount, duration and intensity of solar output which in turn is controlled mostly by the seasons and the position of the overhead sun in Nigeria. Temperature is so important because it influences health, agriculture, evaporation, transport, rainfall and human comfort among others. These were observed by various authors such as ^{[1][2]}. For instance, physiological temperature is put at 36.7°C or 37°C ^{[3] [4]} when this amount is exceeded, heat stress begins. Reports of heat waves are becoming common especially in temperate regions like the USA, Britain and Canada among others.

Over the years, temperature in Nigeria is not static. Many studies have shown that, there has been a steady rise in temperature across the country. ^[5] There is a general increase in mean minimum temperature of 3°C per decade based on data for 40 years from Nigeria. ^[6] Observed temperature increases of about 0.2°C – 0.3°C per decade at various locations in the rainforest of Nigeria. ^[7] There is a general increase in annual minimum temperature in Katsina, 1971 – 2006. ^[8] It is certain that the earth's temperature is rising. The steady rise in temperature across Nigeria is the cause of global warming. Global warming is the gradual, but continuous increase in temperature of an area over time. It is caused by both natural and man – made factors. Although, the current trend of global warming has indicated that man – made factors are the most critical factors which result from various activities aimed at making life more comfortable such as industrialization, intensive and extensive farming, use of generating sets and urbanization among others. These activities tend to build up Green House Gases (GHGs) in the troposphere thereby leading to green house effect. Examples of GHGs are carbon dioxide

(CO₂), methane (CH₄), Chlorofluorocarbons (CFCs) and water vapour among others. In recent time, the concept of global warming has gained a universal discourse not only because of its contribution to the general increase in temperatures, but also due to the torrential rainfall concentrated within few days, weeks or months leading to high incidences of hydro – meteorological hazards such as erosion, landslide and flooding ^{[9][10][11b]}. Nigeria is already facing the realities of these hazards especially flooding which is now an annual event especially in Jos Plateau, Ibadan, Sokoto, Abuja, Ilorin, Lokoja and Lagos among others.

II. OBJECTIVES OF THE STUDY

This paper has the following objectives:

- i. to analyze the attributes of temperature in the area,
- ii. to determine the rate of temperature increase in the area,
- iii. to examine the tolerability of temperature in the area; and to proffer solutions to global warming.

III. STUDY AREA

The study area, Lokoja; which is expanding and increasing in size and population at alarming rate, is located between latitudes 7°46'N - 7°52' and longitudes 6°38'E – 6°46' (see figure 1). Lokoja derived its name from two (2) Hausa words, a tree and a colour. “Loko”, which means “Iroko” and “ja”, which means red. So, the name Lokoja means, Red Iroko (tree) ^[11]. Lokoja is the Headquarters of Lokoja Local Government, capital of Kogi State and the major confluence town in Nigeria. Kogi is also a Hausa word which means river. The area enjoys both wet and dry seasons with the total annual rainfall ranges between 804.5mm – 1767.1mm ^[11]. Mean annual temperature is about 27.7°C and a relative humidity of 30% in dry season and 70% in wet season ^[12]. Average daily wind speed is 89.9 km/hr. Average daily vapour pressure is 26 Hpa ^[12]. The most



important hydro – geological feature is the River Niger and the confluence of Rivers Niger and Benue [12]. Lokoja LGA falls within the Precambrian age as well as the various sedimentary rocks [12] [13]. It is also found in Guinea Savanna with the presence of gallery forest along water courses [12]. The land rises from about 300m along the Niger valley to between 300 – 900m above sea level in the uplands [12]. In terms of population, Lokoja LGA had a total population of 82, 483 in 1991 [13]. In 2006, the population of the LGA stood at 196,643 [14].

depart from the lowest and highest temperatures. The minimum, maximum and mean temperatures are also below the physiological temperature of 36.7°C or 37°C [3] [4] which indicates that human comfort in the study area is still favourable.

Table 1: Statistical Analysis of Temperature in Lokoja, Kogi State, Nigeria; 1971 – 2010

Statistics	Values
N	40 years
Minimum	27.2°C
Maximum	29°C
Range	1.8°C
Mean	28.03°C
Median	28°C
Variance	0.15
Standard deviation	0.39
Coefficient of variance	1.39%

Source: Author’s computation (2012).

Further, the median is 28°C which agrees with the mean. The variance is 0.15; standard deviation is 0.39; while the coefficient of variance is 1.39%. These figures are all low which indicate that temperature is still tolerable in the study area in spite of the topical issues of global warming, climate variability and climate change. This result is contrary to that of minimum temperature of Katsina [7]. The hottest year in Lokoja was 2001 (29°C), while the lowest annual temperature was recorded in 1975 (27.2°C) (see table 1). December has the lowest monthly temperature of 19.37°C due to harmattan and the fact that the over head sun is in the Southern hemisphere and far from the study area, while March (25.56°C) and April (25.31°C) are the hottest months.



Fig. 1: Map of Kogi State showing the Study Area.

IV. METHODOLOGY

Data for this study were obtained from the Nigerian Meteorological Agency, Oshodi, Lagos. The data covered from 1971 – 2010 (40 years). The data were made up of the monthly and annual temperatures. The results are presented in tables and subjected to simple statistical analysis to enable us view the characteristics of temperature in the study area. The results are further discussed with useful suggestions offered.

V. RESULTS AND DISCUSSION

According to the results and based on the number of years under consideration (40 years) which is sufficient enough to determine the climate of any station, Lokoja has minimum annual temperature of 27.2°C, maximum of 29°C and range of 1.8°C. The mean temperature is about 28.03°C which does not

Table 2: Decadal Temperature of Lokoja, 1971 – 2010

Decades	Values
1971 – 1980	27.82°C
1981 – 1990	28.03°C
1991 – 2000	28.19°C
2001 – 2010	28.08°C

Source: Author’s computation (2012).

Table 3: Difference in Decadal Temperature of Lokoja, 1971 – 2010 (40 years)

Decade	Difference
2 nd decade – 1 st decade	0.83°C
2 nd decade – 3 rd decade	0.16°C
3 rd decade – 4 th decade	0.11°C
4 th decade – 1 st decade	0.26°C
Mean	0.34°C

Source: Author’s computation (2012)



The decadal temperature indicates a general rise in temperature from 1971 – 2010. This is attributable to the creation of Kogi State in August, 1991 with Lokoja as the capital. Following the creation of Kogi State with Lokoja as the capital, there has been an exodus movement of people into the colonial city, Lokoja which has led to rapid urbanization, high population, massive construction of houses and roads, deforestation of gallery forest, numerous vehicular movement, use of generating sets and reduction in vegetal cover. Constructions lead to more bare spaces and increase the albedo leading to positive temperature changes since modern building materials like the aluminum roofing sheets are poor absorbers of heat, but rather heat reflectors. Also, farmlands were taken over by rapid urbanization hence reduction in vegetation cover (both natural and artificial) leading to increasing temperature. Again, vehicles and generating sets which are on the increase burn carbon which have two (2) main effects – smokes from them cause pollution and increases the ambient temperature and the carbon emitted increases the carbon layer in the lower atmosphere thereby leading to global warming. Table 3 shows a rise in temperature of about 0.83°C between the 1st and 2nd decades which is the highest difference within the decades. The factor responsible for this cannot be unconnected with the droughts of 1982 and 1983 since temperature is said to increase during dry spells and droughts ^[15]. The decadal mean temperature of 0.34°C agrees with the findings of ^[15] for the study area. This decadal mean is less than that of Sokoto, 1°C; Owerri, 0.9°C and Ibadan, 0.6°C from 1981 – 2010 (30 years) ^[16]. The mean decadal temperature for Sokoto is on the rise due to severe desertification experienced in the area, while that of Owerri and Ibadan are attributable to massive deforestation, heavy vehicular movement and industrialization. Several authors have pointed out that anthropogenic activities are the main causes of global warming, climate variability and climate change ^{[16] [17] [9] [6] [18]}. Therefore, areas with low population, less affected by desertification, low or total absence of industrialization and other human activities have low vulnerability rate to global warming, climate variability and climate change.

In conclusion therefore, this study has shown that there is a little increase in long term annual temperature in the study area which confirms global warming in the study area. It is therefore suggested that further studies should look at the minimum and maximum temperatures of Lokoja separately to enable us see if there is any difference in the study area. Tree planting campaign should be given an aggressive attention in order to curb excess carbon dioxide emission which can lead to an abnormal rise in temperature of the study area. Again, there should be proper urban planning with the creation of green areas in and around the town to serve as carbon sink. Illegal structures, encroachments and alteration of the colonial town planning / master plan in the old Lokoja city in places like Ungwar Kura, Madabo, Ungwar Rimi, Mahuta, Ungwar Masara, Ungwar Yashi, Makera, Kabawa, Lokogoma, Adankolo and Ungwar Hamza among others should be

discouraged. Alternative power sources such as wind, solar and waste energies should be explored to replace the use of generating sets.

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