An Analysis Of Climatic Elements And Its Impacts On Human Settlement In Nasarawa State, Nigeria

Usman I.I.[1*], Adamu Y.D..[1], Umar S.Z.[2],Babansoro S.[3] and Awaisu A.H.[4]
[1]Department of Urban and Regional Planning, School of Environmental Studies, Nasarawa State, Polytechnic, P.M.B 109 Lafia, Nasarawa State, Nigeria
[2]Deparment of Local Government Studies, Nasarawa State Polytechnic, Lafia
[3]Department of Office Technology Management, Nasarawa State Polytechnic, Lafia
[4]School of General Studies, Federal Polytechnic, Nasarawa, Nasarawa State.
[1]*corresponding author Gmail: usmanibrahim375@gmail.com

Abstract
A study was conducted to analyses climatic elements and its impacts on human settlement in Lafia city, Nasarawa state. The specific objectives includes identifying climatic elements, analysis and records. The populations of this study were climatic elements and due to the nature of this population, four climatic elements were selected, includes temperature, evaporation, relative humidity and rainfall. The data for the study were collected from secondary source, which was from documentary survey. The data were analyzed using descriptive statistics; frequency distribution, percentage and were presented in the tables, charts and graphs. The findings reveals, hot temperature in dry season from November to April and high rainfall during rainy season from March to October but experienced scanty rainfall in dry season. The paper recommends that government should employ more professionals and provide up-to-date equipments to metrological stations; proper building orientation should be given to the general public and awareness about climate and weather in the study area.

Keywords: *An Analysis, Climatic Elements, Impacts, Human Settlement, Lafia City.*

1. Introduction

Weather and climate is exchangeable and interchangeable words, yet there were differences between them. According to Waugh (1995), the distinction between climate and weather is one of the scales. Weather refers to the state of the atmosphere at a local level, usually on short term scale of minutes to months, it emphasis aspects of the atmosphere that affect human activities such as sunshine, cloud, wind, rainfall and temperature. Climate is concerned with the long term behaviour of atmosphere in a specific area. Climatic characteristics are represented by data on temperature, pressure, wind, precipitation, humidity, etc. which are used to calculate daily, monthly, and yearly averages and to build up global patterns. The elements of weather and climate are interrelated and interdependent on each other for proper function and their importance to life and ecosystems at large,

According to Areola, Ahmed, Irueghe, Adeleke and Leong (1992), comment in the importance of temperature as:

1. Temperature influences the actual amount of water vapor present in the air and thus decides the moisture-carrying capacity of the air.

2. It decides the rate of evaporation and condensation, and therefore governed the degree of stability of the atmosphere.
3. As relative humidity is directly related to temperature of the air, it affects the nature and types of cloud formation and precipitation.

The impacts of weather or climate can be feel, seen and observed by local or professionals through their senses and or sophisticated instruments such as thermometer for temperature, barometer for relative humidity, rain gauge for rainfall and the evaporation in a country, state, continent, and regionally or globally.

The synoptic study is important yet; microclimate analysis is the most important for human activity. The analysis of micro-climate will help tremendously in the planning of human settlement in the areas where such studies were conducted. The Climate or weather have dominates, controls and dictates all human activities such as agricultural, dressing, trading, housing and so on either positively or negatively. According to Ayoade (1983), weather and climate must have dominated the life of pre-historic human for thousands of years. As extracted from Encyclopedia (2008), the influence of weather and climate on physiological processes in normal health, humans and their diseases, the influence of microclimate in dwellings and urban centre on human health, and the influence of past climatic conditions on the development and distribution of plants and animals.

Climate and weather were dynamic in nature and its dynamism affects human settlement and activity. On this, Waugh (1995) have this to say, climate have change and still are continuously changing at all scales from local to global and are varying time-spans. There have been however, surge of change our time which meteorologists and earth sciencetists are continually trying to clarity and explain. The evidence of climate change have observed and recorded such as hotness or coldness, wetness or dryness and emerging of strange diseases, melting of ice, sea-level rise and so on. The causes of changes is not far-fetched from what was recorded in Encyclopedia (2008), that two major factors in the studying of both ancient and present dry climatic conditions of the earth are the changed in the relationship between the earth and the sun (e g, the slight alteration in the configuration of the earth's habit) and the changes in the surface of the plant itself (such phenomena as volcanic eruption, mountain building, and the dispersal of the continent after the breakup of the supper continent Pangaea).

2. AIMS AND OBJECTIVES OF THE STUDY

The aim of this study is to analysis climatic elements and their impacts or human settlement. The specific objectives of the study are as follows:

1. To identify climatic elements.
2. To collect the observations of the climate.
3. To analysis the data collected.
4. To ascertain the impacts of the climate on human settlement.
5. To proffer recommendations.

3. METHODOLOGY OF THE STUDY

The study was conducted at Lafia city, the largest city in Nasarawa state, the headquarters of Lafia local government area and the state capital of Nasarawa state, since 1st October 1996 when

the state was created out of old Plateau state under late General Sani Abacha's regime. Lafia city lies between latitudes 8^{o} 30' N and longitude 7^{o} 31' E of the south senatorial district of Nasarawa state in the north central geopolitical zone of Nigeria. It covers the total land mass of 2,797.5sq.km with population of 330712 inhabitants according to the 2006 national population census. It is bounded with Shabu satellite town up North, East by Assokio, down South Doma local government area and West by Agyragu Jankwe Development area, Obi local government area. The city is linked with major roads Jos and Akwanga-Keffi- Abuja, Lafia-Makurdi, Lafia – Shendam and Lafia-Doma as well as miner roads that links it to other settlements within and outside the state.

Landform, Lafia city is located on the North Bank of River Amba that drained Mada river basin of Benue valley platform. While the topography is featured with undulating landform with clay, loamy and sandy and sandstone with guinea savannah vegetation. The tropical climate with clear dry and wet seasons. The land uses pattern includes, the plain area for residential, commercial and industrial as well as fertile arable land for all agricultural purpose. The land support the cultivation of foods and cash crops- maize, beniseed, millet, melon, yam, cassava, cashew, mangoes, oranges etc, and production of animals- cattle, goats, sheep, chickens etc. The study area has potentials for supporting all kinds of business and investments processing industries; solid minerals, beverages and other tertiary services as well as tourist centres- Farin Ruwa Water Fall, Doma Dam, Maloni hill, Mada hills, Keffi and Eggon Salt pond, Keana and Awe to mention but a few.

The population of the study was climatic elements and due to the nature of the population and instruments of observations. All elements cannot be selected therefore only four elements were selected- temperature, evaporation, relative humidity, and rainfall using purposeful and systematic sampling techniques. The data for the study were collected from secondary source using documentary survey designed and content analysis. The collected data were analysed using descriptive statistic such as frequency distribution and percentage as well as using graphs and charts.

4. RESULTS AND DISCUSSION

Table 1 shows the monthly and annual mean maximum temperature in degree celcious (^{o}c) from 2010-2015. The result reveals that January (8.89%), February (9.23%), march (9.37%), April (8.82%), May (8.27%), June (7.75%), July (7.51%), August (7.29%), September (7.53%), October (7.92%), November (8.69%) and December (8.73%).

Table 1. A Monthly and Annual mean maximum Temperature (^{o}c)

Month	2010	2011	2012	2013	2014	2015	Total	Percentage
January	39.5	35.5	35.2	36.6	36.6	35.2	218.6	8.89
February	39.1	37.4	37.3	38.1	37.8	37.4	227.1	9.23
March	39.0	39.1	38.3	38.4	38.0	37.7	230.5	9.37
April	37.5	36.1	32.9	35.4	36.3	38.7	216.9	8.82
May	34.1	34.3	33.1	33.0	33.8	35.0	203.3	8.27
June	32.5	30.3	31.9	31.6	32.3	31.9	190.5	7.76
July	30.5	31.6	30.2	30.5	30.7	31.2	184.7	7.51
August	30.2	29.8	29.9	29.8	29.6	30.2	179.5	7.29
September	30.5	31.0	30.9	31.4	30.4	30.9	185.1	7.53

October	31.8	31.9	32.3	33.2	32.7	32.9	194.8	7.92
November	35.0	35.6	35.1	36.5	35.6	36.0	213.8	8.69
December	36.3	35.7	36.4	35.7	36.1	34.4	214.6	8.73
Total	416.0	408.3	403.5	410.2	409.9	411.5	2459.4	100
Percentage	16.9	16.6	16.4	16.7	16.7	16.7	100	

Source: NIMET (2016)

The study indicated that, there are insignificant variations in the monthly and annual mean maximum temperature in the study area. The Implication of findings of the study is that, the study area was experienced hot temperature relatively throughout the year.

Table 2 also shows the observations of monthly and annual mean of minimum temperature in degree Celsius (^{o}c) from the month of January 2010 to December 2015. The analysis reveals that, January (7.29%), February (8.82%), March (9.35%), April (9.29%), May (8.37%), June (8.56%), July (8.71%), August (8.34%), September (8.28%), October (8.47%), November (7.95%) and December (6.56%).

Table 2. Monthly and Annual Mean Minimum Temperature (^{o}c)

Month	2010	2011	2012	2013	2014	2015	Total	Percentage
January	26.8	17.1	19.0	20.5	19.6	18.0	121.0	7.29
February	25.0	23.8	27.6	23.5	22.5	24.0	146.4	8.82
March	25.6	26.2	25.6	26.8	25.6	25.4	155.2	9.35
April	27.1	25.3	26.1	24.7	25.2	25.7	154.1	9.29
May	25.6	25.4	14.4	24.0	24.2	25.2	138.8	8.37
June	24.7	23.3	23.6	23.4	23.0	24.0	142.0	8.56
July	23.5	28.8	23.4	22.7	22.8	23.3	144.5	8.71
August	23.5	23.4	23.4	22.9	22.0	23.2	138.4	8.34
September	23.4	23.1	23.0	23.1	22.0	22.8	137.4	8.28
October	23.8	23.1	23.4	23.4	23.3	23.6	140.6	8.47
November	22.8	19.5	22.9	23.3	22.4	21.0	131.9	7.95
December	17.3	16.9	18.5	19.8	19.3	17.1	108.9	6.56
Total	289.1	275.9	270.9	278.1	217.9	273.3	1659.2	100
Percentage	17.4	16.6	16.3	16.8	16.4	16.5	100	

Source: Nimet (2016)

The study also shows insignificant variations in minimum temperature in the study area.

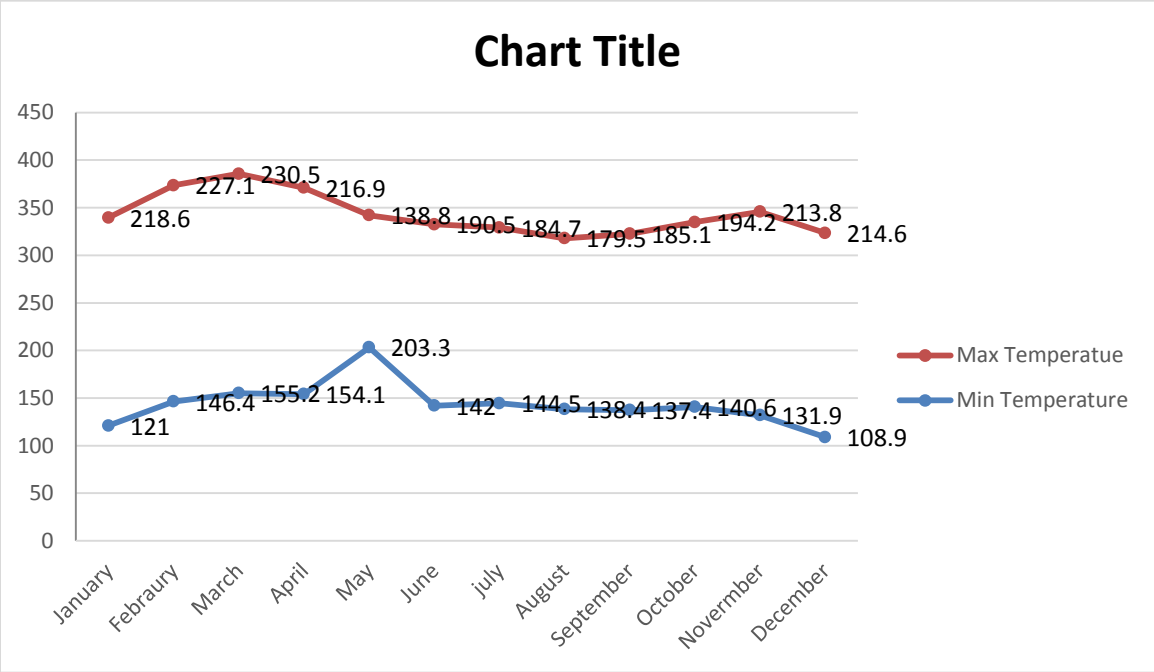


Table 3 shows the monthly and annual evaporation in millibar (mb) from the January 2010 to December 2015. The analysis reveals that, January (13.5%), February (13.4%), march (13.9%), April (11.4%), May (6.83%), June (4.37%), July (3.36%), August (3.26 %), September (2.85%), November (3.58%), November (9.11%) and December (14.4%).

Table 3. Monthly and Annual Evaporation (mb)

Month	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**	**Percentage**
January	7.8	2.4	7.5	8.2	7.7	9.0	42.6	13.5
February	8.2	2.1	7.9	8.9	9.1	6.2	42.4	13.4
March	9.5	2.4	8.8	7.4	7.1	8.9	44.1	13.9
April	7.0	2.1	8.1	4.8	5.4	8.7	36.1	11.4
May	3.5	1.9	5.8	3.0	3.1	4.3	21.6	6.83
June	2.7	1.3	2.5	2.5	2.4	2.4	13.8	4.37
July	1.8	1.5	1.8	1.9	1.7	1.9	10.6	3.36
August	1.5	2.1	1.6	1.9	1.8	1.4	10.3	3.26
September	1.6	1.9	1.8	2.2	-	1.5	9.0	2.85
October	1.9	2.2	2.2	2.8	-	2.2	11.3	3.58
November	3.9	6.2	3.9	4.8	4.7	5.3	28.8	9.11
December	7.3	8.2	7.5	6.7	6.8	8.9	45.4	14.4
Total	56.7	34.3	59.4	55.9	49.8	60.7	316.0	100
Percentage	17.9	10.9	18.8	17.4	15.8	19.2	100	

Source: Nimet (2016)

The analysis also shows that there are little variations in annual evaporation from earth's surface to the atmosphere. The rate and amount of evaporation during the dry season is equal to the rate and amount of precipitation during the rainy season.

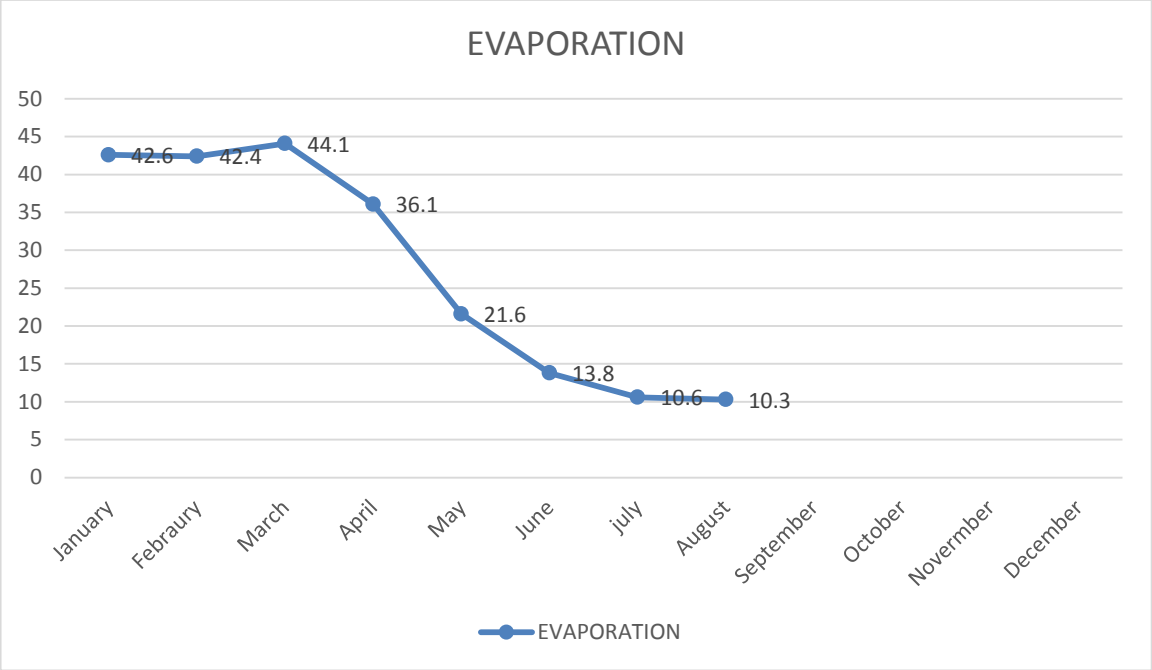


Table 4 shows that the monthly and annual observations of the relative humidity from January 2010 to December 2015. The study reveals that, January (5.82%), February (6.46%), March (7.06%), April (7.78%), May (9.26%), June (10.2%), July (10.6%), August (10.5%), September (10.1%), October (9.73%), November (7.59%) and December (4.89%).

Table 4. Monthly and Annual Relative humidity

Month	2010	2011	2012	2013	2014	2015	Total	Percentage
January	54	46	49	47	53	34	283	5.82
February	56	49	52	51	48	58	314	6.46
March	53	53	54	63	64	56	343	7.06
April	63	58	65	71	68	53	378	7.78
May	76	69	78	78	77	72	450	9.26
June	80	89	85	82	80	81	497	10.2
July	84	91	85	85	86	85	516	10.6
August	86	87	76	85	87	88	509	10.5
September	85	83	82	74	83	85	492	10.1
October	81	79	79	76	79	79	473	9.73
November	68	56	68	64	61	52	369	7.59
December	36	35	44	50	42	31	238	4.89
Total	822	795	817	826	828	774	4862	100
Percentage	16.9	16.4	16.8	16.9	17.0	15.9	100	

Source: Nimet (2016)

The findings also show that, there are insignificant variations in monthly and annual observations of relative humidity in the study area. The finding further depicted in the line graph below.

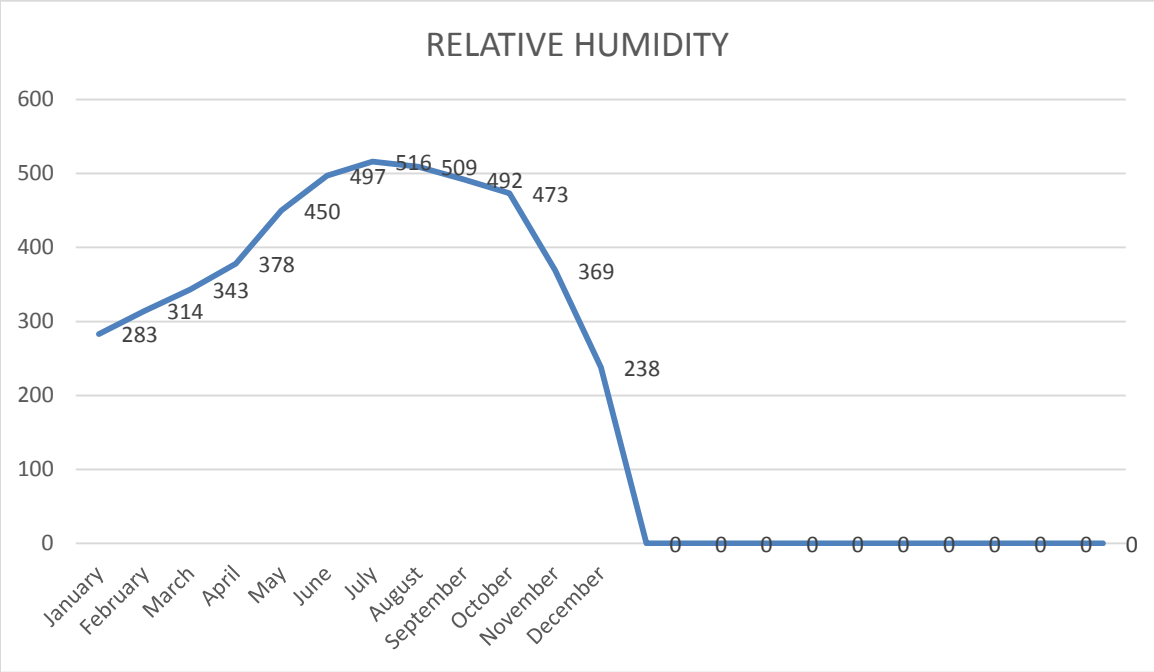


Table 5 shows the observations and records of monthly and annual mean of rainfall, the study area from January 2010 to December 2015. The analysis of the observations reveals that January (0.19%), February (0.13%), March (0.73%), April (4.89%), May (12.2%), June (11.0%), July (19.1%), august (17.8%), September (16.1%), October (10.9%), November (6.66%) and December (0.02%).

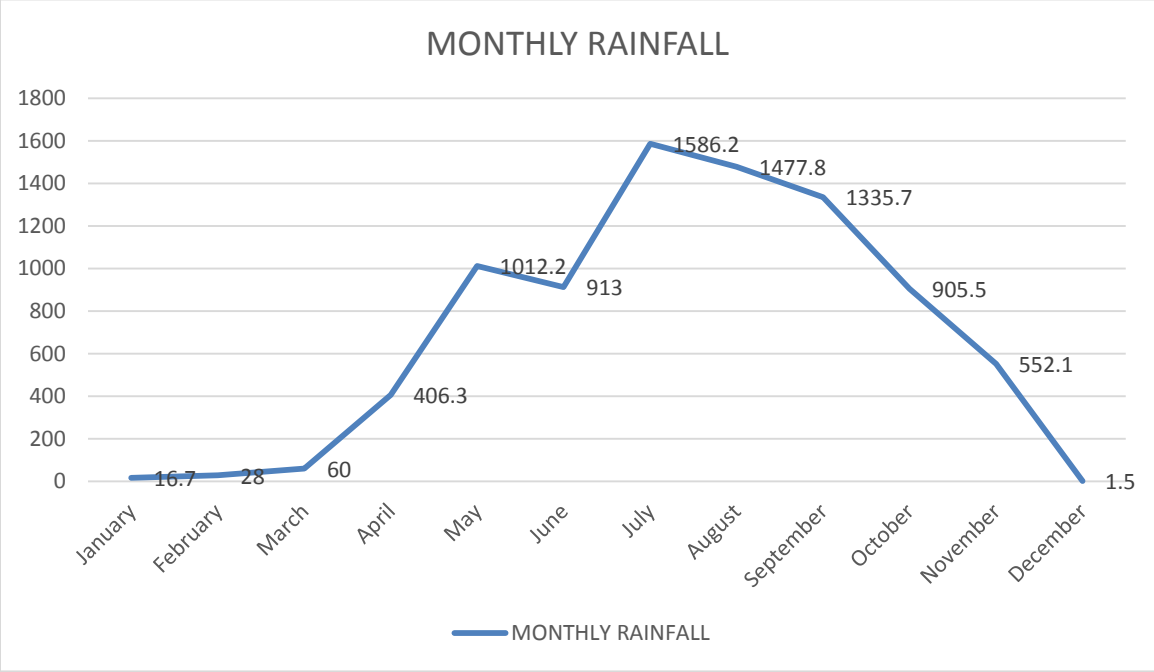
Table 5. Monthly and Annual Means Rainfall in (mm)

Month	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**	**Percentage**
January	-	-	-	-	16.0	-	16.0	0.19
February	-	9.3	-	-	-	16.7	26.0	0.31
March	-	-	-	35.1	24.7	1.0	60.0	0.73
April	75.0	28.1	93.5	109.0	73.5	27.2	406.3	4.89
May	116.3	197.7	175.9	164.6	199.2	158.5	1012.2	12.2
June	125.0	222.0	200.0	141.2	122.7	102.1	913.0	11.0
July	382.0	74.4	218.4	341.9	231.8	337.7	1586.2	19.1
August	230.3	274.6	230.3	138.1	344.8	259.7	1477.8	17.8
September	312.3	228.1	194.0	102.3	159.4	339.5	1335.7	16.1
October	177.4	227.1	174.2	78.6	123.5	124.7	905.5	10.9
November	200.0	-	349.9	-	2.2	-	552.1	6.66
December	-	-	-	1.5	-	-	1.5	0.02
Total	1618.3	1261.4	1636.2	1112.3	1297.8	1367.1	8293.1	100
Percentage	19.5	15.2	19.7	13.4	15.7	16.5	100	

Source: Nimet (2016)

The finding of this study reveals that, there is significant variations in monthly rainfall with insignificant variations in annual rainfall in the study area. The findings indicated that the study area experienced rainfall in 7-9 months and dry season 3-5 months in a year. The study also shows that, there are some months in dry season that, there are some months in dry season but,

rainfall was experienced- November, December, January and February.



The implications of finding of this study is that, the inhabitant of the study area should prepare for rainfall throughout the year. While commenting on climate and settlement, Waugh (1995), have this to say, usually there are several reasons why an area is sparsely or densely populated; areas receiving very low annual rainfall (the shara desert); areas having a long seasonal drought or unreliable, irregular rainfall (the shale countries); area suffering high humidity (the amazon basin); very cold areas, with short growing season (Northern Canada). While the densely populated areas, areas where the rainfall is reliable and evenly distributed throughout the year; with no temperature extremes and a lengthy growing season (North-west Europe); where sunshine (the constant del sol) or snow (the alphs) is sufficient to attract tourists; and areas with a monsoon climate (South East Africa).

5. **CONCLUSIONS**

The conclusions gleaned from this analysis were as follows: four climatic elements were identified-temperature, evaporation, relative humidity and rainfall and were interrelated and interdependent. Again, the temperature was high and hot during the dry season around November, December, January, February and early March. More so, the evaporation was high during the dry and low during the rainy seasons. In addition, the relative humidity was low in dry and high in rainy seasons. Furthermore, rainfall occurred during the rainy season around late march to October but the study area experienced scanty rainfall in dry season. Finally, there were insignificant variations in both monthly and annual observations of climate in the study area.

6. **RECOMENDATIONS**

Based on the conclusions of the analysis reached, the following recommendations were made.

1. That more meteorological stations and up to date equipment should be provided to cover other climatic elements and more professionals should be employ by government.
2. We recommend that government through it various means should create awareness and inform the society about importance and impacts of climate to human settlement and

development.

3. That government through urban development board should plan, design and monitor human settlement development towards climate of the area and to prevent negative impacts of climate on human settlement.
4. That the meteorological and weather forecast stations should informed the general public with accurate weather information beforehand.
5. Finally, this paper recommends that, the general public should be prepared about climate and climate changes against their activities.

References

Adewuya, S.B, Fabusuyi, E.B (1986). Social Studies, Ibadan, Onibonaje Press & Book Industries (Nig) Ltd.

Areola, O. & Ahmed, K, Irueghe, O.I, Adeleke, B.O, Leon, G.C (1992), (2nd ed), *Certificate Physical and Human Geography II.* Ibadan; University Press Plc.

BBC (1992). *English Dictionary for the Word*. Harper Collins Publishers.

Microclimate. (2008).. *Encyclopedia Britannica 2008 Ultimate Reference Suite*. Chicago: Encyclopedia Britannica

Waugh, D. (1995), *Geography, An Integrated Approach.* (2nd ed.) Walton-on- Thomas Surrogely: Thomas Nelson and Sons Ltd.