



The Environmental Physiology of Kainji Lake

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Abstract: The current changes in environmental conditions have necessitated changes in adaptive mode of mankind. These changes in temperature, precipitation, wind pressure and so on, over some physical features like mountains, hills, river, streams, lake etc., has been observed to influence the way of life of the communities around these physical features, as the people of these communities look for a way to survive or adjust to these environmental changes. This study observed the variation in temperature, wind pressure as well as precipitation over communities around Kainji lake for a period between 2016 and 2017, its influence of the some communities surrounding Kainji lake, and the adaptive mode of the people.

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INTRODUCTION

Environmental physiology is known as the study of adaptation to the environmental conditions, which are usually adverse. These include altitude, hyperbaria, immersion, extremes of temperature, dehydration etc. There is a compelling need to study environmental physiology, and some of these reasons are; due to the fact that both human and animals are expose to different conditions of the environment, therefore it is important to understand the effect of their exposure to the environmental forces, more so, environmental physiology is a field of study in which human and animals readily expose themselves to environmental forces and are observed as specimen for experiment to take place, this will further enhance human physiology (E.R Moon; 2009).

Like most areas of science, environmental physiology became more recognized in the 19th century, whereby series of experiments were carried out to understand the tolerance rate or how a specie can acclimatize to prevailing environmental conditions or forces.

Kainji Lake is known to be majorly responsible for the prevailing environmental and socio-economic conditions of the communities surrounding

it, as the two seasons of the year (i.e. wet and dry seasons) in these areas are well pronounce compared to towns and communities that are further away from the lake. During these periods, the prevailing temperature, precipitation and wind flow varies, the average annual rainfall in the basin amounts to about 860 mm which is usually distributed between the months of June and October, thereby dictating the socio-economic life style of the people within the communities close to the lake due to it late start and quick end of the raining season. Kainji Lake lies between 9°30'N and 10°35'N latitudes and 4°25'E and 4°45'E longitudes (Fig. 1). This region is an area of Guinea savannah maintained by annual burning. The topography is of low relief lying at an altitude of 500 ft (150 m) to 1 000 ft (300 m) above sea level, with a highly dendritic pattern of drainage. The human population density is low in the areas adjacent to the lake and generally low throughout the drainage basin (F. Henderson, 2009).

Furthermore, the multi-purpose nature of the Kainji Lake, with its projected benefits of hydro-power, flood control, regulated water for navigation and the growth of the fisheries industry(A.A Abiodun;2009), has also helped form the socio-economic life of the communities. The lake drains an

area of 0.735 x 106 km² which includes the catchment area outside Nigeria: the River Niger which feeds the

lake travels over 2740 km before reaching Nigeria.

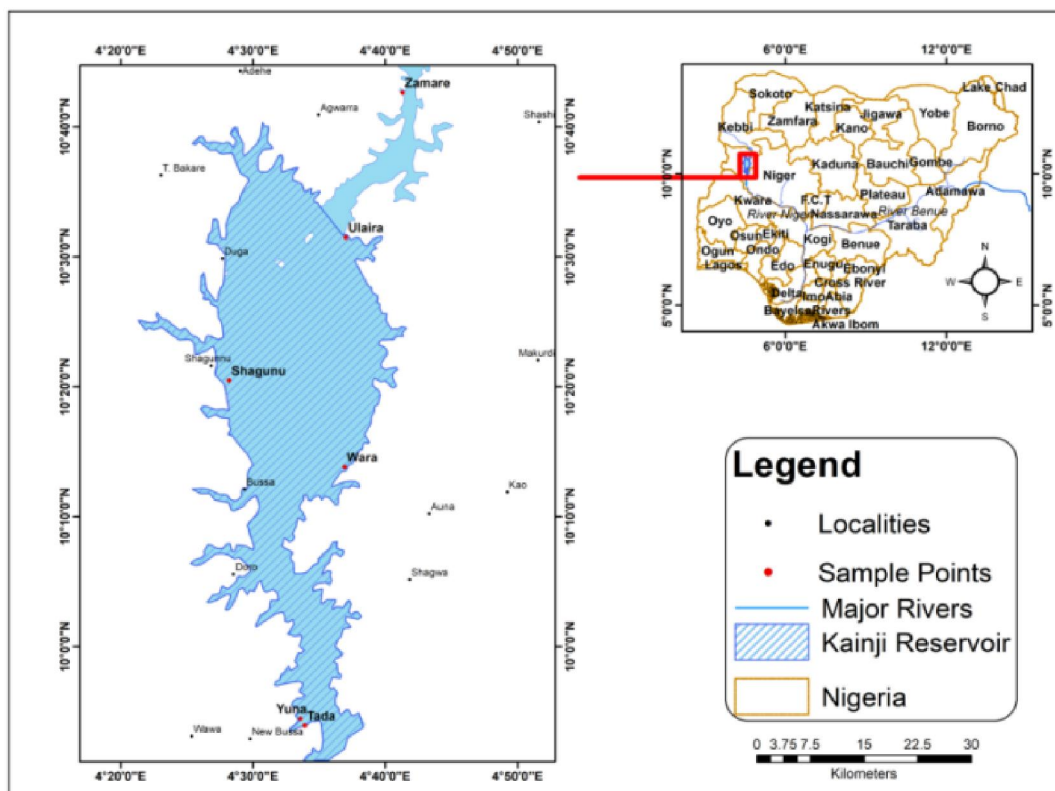


Fig 1: Map of Kainji Lake showing Surrounding Communities

METHOD

The objectives of this study emphasized the need to know some prevailing environmental conditions of communities around Kainji Lake and how they adapt to the adverse conditions at this period of changing climate. Towns and communities sampled were randomly selected, and a descriptive method was used to interpret and compare data gotten.

CLIMATE OF KAINJI LAKE

(i) TEMPERATURE

Kainji Lake lies in a transition region, and experiences mostly dry continental trade winds during the winter months and moist maritime equatorial air during the summer. These seasonal changes are due to the changes in the Intertropical Discontinuity (ITD), which happens from north and south seasonally on latitude 12°. This is responsible for the adverse changes in seasons of the region and adaptive mode of the population in clothing and housing construction, whereby there is a compelling need for them to wear very thick cloths from December to January the harmattan (Winter) period and raining season starting late in April through to September with temperature

ranging between 18°C and 27°C. More so, lite cloths are required by the people of these communities during the hot or dry season (Summer) with temperature also ranging between 30°C and 42°C.

Housing roofs are built high, so also trees are planted to reduce heat from high solar radiation resulting to hot inland and sea breezes.



Fig 2: showing building with high roof and surrounding trees in New Bussa.

The results of the heat budget analysis recently carried out is roughly indicative of the distribution of the components of heat flow, consequently, contributions to the heat budget are

divided into incoming short-wave radiation less reflection, net longwave (thermal) radiation, evaporation loss, convective exchange between the water surface and the air above, advective gain or loss through inflow and outflow, and heat storage (change in lake temperature).

Below is the monthly mean temperature of communities around Kainji Lake.

Table 1

MONTHS	TEMPERATURE	
	MAX	MINI
JANUARY	24	18
FEBUARY	27	23
MARCH	42	30
APRIL	29	17
MAY	29	17
JUNE	28	17
JULY	25	18
AUGUST	25	14
SEPTEMBER	25	14
OCTOBER	27	16
NOVEMBER	29	21
DECEMBER	26	18

Source: NIFFRMet Station 2016.

(ii) WIND

The prevailing winds at this region where Kainji Lake lay are the northerly trade winds which blow in the area from mid-November to mid-March, and the southerly maritime regarded as "westerlies", which dominate the flow for the remaining part of the year. Both winds are lite averaging about 2.5 to 3 mph (i.e. Meter Per Hour) (NIFFR MetStation data). The squall wind blowing from the east usually occur at the beginning of rainfall especially in April through June, so also in September and October, and has an average velocity ranging from 3-7 mph, which can also reach a peak of about 45 mph (NIFFR MetStation data), and as a way of adapting to this wind condition, populations around the lake plant big trees to break the impact of the wind on infrastructures. More so, margins around the lake experience Land and sea breezes, particularly in the late afternoon (sea breeze) and early morning (land breeze), which is mainly responsible for the weather in the communities surrounding the lake, and as earlier mentioned, trees are planted to either help provide shade and cool the environment or break the impact winds or breeze on the infrastructure within the communities.

(iii) PRECIPITATION

The kind of rainfall experience around the lake is usually convectional, this is due to the prevailing weather type, raining season in the lake area begins from mid-April to mid-October, and measures between

850mm and 1000mm (40 inches) averagely per annum (NIFFR MetStation data). Rainfall in communities around the lake is usually with high intensity and accompanied wind, thereby resulting in floods and runoff, these runoff picks up clay into colloidal suspension imparting a blue-white colour to local runoff. This material is retained in the rivers and the lake and gives the name "white flood" to the water (A.A Abiodun; 2009). The white flood usually occur during the raining season as a result of runoff from other nearby basins depositing into Kainji lake, this usually occur between mid-July to December , while the black flood begins from October through May.

Due to the topography of the areas around Kainji Lake, water is usually scare during the dry season and abundant during the wet season, which makes rainfall the major water source in the area. The change in seasons also affects the water volume and depth of the lake whereby it high water volume reaches 15 km and low reaches 5 km, more so its maximum and minimum depth range between 50 meters and 9 meters respectively, which in turn affect the efficiency of the lake in water supply for domestic and agriculture, hydro power generation and navigation purposes (E.S Owolabi; 2019).

Table 2 below shows the mean annual variation in rainfall of New Bussa for 2017;

Month (s)	Mean monthly rainfall (mm)
January	0
February	0
March	0
April	58.2
May	215.8
June	296.2
July	375.74
August	273.8
September	238
October	79.85
November	0
December	0
Overall mean	monthly rainfall 128.13mm

Source: NIFFR MetStation data 2017.

Table above shows vividly the distinct seasons of the year in the study area, where the dry season of the year is partially or totally dry with little or no precipitation, thereby reducing the amount of available water for either domestic or agricultural purpose, more so, the situation is usually different with the raining season beginning in April, there is abundance of water with July usually having the height amount of rainfall,

and October marking the end of the raining season. The knowledge of this seasonal variation has helped the population living in communities around the lake to properly plan their farming year on the types of crops to plant, when to start fish culturing, how to manage adequately available water and so on.

CONCLUSION

The geographic location of Kainji Lake amongst communities surrounding it, makes the influence of the water body very significant and felt all year around. The resultant effect of different seasons has also help form the decision and way of life of the population of the communities around the lake in construction of houses and infrastructures, clothing and other socio-economic activities (e.g. kind of job they do, where and how to have fun, mode of transportation, etc.), it is therefore necessary to encourage periodic assessment of the environmental impact of the lake on the people and communities surrounding the lake.

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