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Geographical Distribution of Average Monthly Rainfall in the Western Section of Benin- Owena River Basin, Nigeria

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Abstract

A geographical analysis of rainfall distribution of the northern section of the Benin- Owena River Basin was investigated. Information on the rainfall of Ondo /Benin City was gathered for forty years (1961-2000). Results show that there have been fluctuations in the distribution in the basin over the years. In Benin City, rainfall in the decade 1961-2000 exhibited distinct variations. The first three decades showed double maxima of rainfall with an August break. In the fourth decade (1991–2000), the August break was absent with the August months recording generally higher rainfall values than all the other decades. The rainfall distribution of Ondo during the period of study (1961-2000) also showed wide variability. The highest rainfall figure in the decade was recorded in 1963 (2,440.94mm) and the lowest was recorded in 1997 (1,217.10mm). The rains decreased generally in the last decade (1991-2000).

Key Words: Climate Change, Floods, Rainfall, Water Resources.

Introduction

Rainfall distribution pattern has been of major concern to climatologists, pedologists, agriculturists, hydrologists, and even to the ordinary man in the street.. Rainfall is a critical index of climatological investigation and has major impacts on flora and fauna, as well as the ecological setting and water resources management of any area. Thus Adefolalu (1981) investigated precipitation trends in relation to water resources management in Nigeria. Olaniran (1990) investigated climate change in Nigeria, variation in rainfall receipt per rain-day, Babatolu (2002) studied spatial distribution of rainfall in Ondo area of Ondo State. Similarly, Morunkeji (2002) investigated rainfall variability within a study period of ten years in Enugu Urban. Other workers such as Olufayo et al (1998) and Goma (1998) are of the view that the distribution of rainfall in any geographical area is significant for hydrology and water balance as well as rain fed agriculture. Rainfall amounts, onset and cessation of rainfall determine the type of crops which can be cultivated in a place. Ikhile et al (2003) are of the view that rainfall variability has great impact on irrigation activities in the Benin-Owena River Basin of Nigeria.

The study stems from the need to investigate the geographical distribution of average monthly rainfall in the northern parts of Benin-Owena River Basin. This study is objective in that it uses the average monthly rainfall to extrapolate the rainfall over this portion of the basin for the period of time.

The Study Area

The study area has been detailed in the works of Ikhile (2007a and 2007b). It lies between latitude 6° 30' to 7° 35' N and longitude 4° 50' and 6° 00' E (Figure 1). This includes parts of Ondo and Edo States of Nigeria. The climate is the tropical continental type with alternating wet and dry seasons of varying duration. The seasons correspond to the periods of dominance of the wet tropical continental air masses. The seasonal distribution of rainfall follows the direction of the Inter-Tropical Divergence (ITD) and varies almost proportionally with distance from the coast. The wet season occurs within seven months from April to October while the dry season lasts from November to March. There is usually a break in rainfall in August. Specifically, this area has the annual mean rainfall ranging from 500 to 2, 780 mm. About 90% of the rain falls in six to seven months of April to October. The mean annual temperature ranges between 24°C-33°C. The mean number of hours of sunshine is 5-7 depending on the season. The rate of

Results/Discussion

Rainfall Distribution for Benin City

Rainfall for the basin as a whole exhibited distinct patterns in the decades 1961–2000 as shown in Figure 2. The annual total for Benin during the decade 1961–1970 ranged from 1985 mm to 3049 mm for the years 1964 and 1965, respectively. The decadal total was 247691mm (Table 2). January was particularly dry in 1964, 1967 and 1969, with zero values of mean monthly rainfall, while it was only 1970 that had no rainfall in the month of December (Figure 2). The decade 1971–1980 showed a different pattern. The total annual rainfall ranged from 1702 mm (1972) to 2585 mm (1980). In this decade, most January and December months were very dry (Figure 3) with zero rainfall values for up to five years (1973–1976, 1979). This decade was drier than the previous one. The decadal total was 20050.51mm. The total annual rainfall for the third decade, (1981–1990), ranged from 1227 mm to 2461 mm, in 1986 and 1990, respectively. Between 1985 and 1989, Decembers were completely dry with zero rainfall values and January was also dry for many years. This decade was apparently the driest of the record. A similar observation was made by Olaniran *et al.* (1991). December 1990 recorded an unusually high mean monthly total of 168 mm, and this was the highest ever-recorded rainfall in December between 1961–2000. The decadal total was 235493mm.

The total annual rainfall for 1991–2000 ranged from 1860 mm to 2776 mm in 1993 and 1992, respectively. December and January were not as dry as previously experienced (Ojo, 1987). The rains tended to fall in all months of the year, with the exception of 1992 and 1994 when the Decembers were dry. The decadal total was 24932.23mm.

Generally, the first three decades showed double maxima of rainfall with an August break. In the fourth decade (1991–2000), the August break was absent with the August months recording generally higher rainfall values than all the other decades. This means that the normal pattern was reversed in this decade. Even the December months were very wet. January was generally the driest month with a total of 682 mm of rain from 1960–2000. July was the wettest month with a total of 14 975 mm of rainfall from 1961–2000.

Rainfall Distribution of Ondo

The result of this analysis is as presented in Table 2. The rainfall distribution of Ondo during the period of study (1961-2000) showed a wide variability as

shown in Figures 2 and 3. This finding is in line with the work of Babatolu (2002). The highest rainfall figure in the decade was recorded in 1963 (2,440mm) and the lowest was recorded in 1997 (1,217mm). The rains decreased generally in the last decade (1991-2000). In the decade 1961-1970, the decadal total rainfall was 16,639mm with a decadal total mean of 1,663mm. This decade was the wettest, although the pattern of distribution was more even. Figure 4 presents the mean annual rainfall and the decadal average rainfall, respectively, for Benin and Ondo. The highest rainfall was 528mm recorded in August 1968. The distribution of rainfall in the decade (1971-1980) was also even although the amounts were generally lower than the first decade. The decadal total was 16,023mm with a decadal total mean of 1,602mm. The decade (1981-1990) showed a general reduction in rainfall distribution pattern compared with the latter decade. The total rainfall for the decade was 15,409mm with a decadal total mean of 1,540mm. The decade (1991-2000) showed a downward fluctuating pattern. Apart from 1991, all other years recorded generally low rainfall totals. The decadal total was 16,263mm and the decadal total mean was 1,626mm.

Conclusion

In Benin City, rainfall in the decade 1961-2000 exhibited distinct variations. Generally, the first decades showed double maxima of rainfall with an August break. In the fourth decade (1991-2000), the August break was absent with the August months recording generally higher rainfall values than all the other decades. This means that the normal trend was reversed in this decade. Even the December months were very wet. January was generally the driest month with a total of 682 mm of rain between 1960 and 2000. July was the wettest month with a total of 14 975 mm of rainfall between 1961 and 2000.

The rainfall distribution of Ondo during the period of study (1961-2000) showed wide variability (Babatolu, 2002). The highest rainfall figure in the decade was recorded in 1963 (2,440.94mm) and the lowest was recorded in 1997 (1,217.10mm). The rains decreased generally in the last decade (1991-2000).

It is concluded that the rainfall distribution of this part of the basin is quite varied. Ondo area recorded lower rainfall generally compared with Benin City which is more humid than Ondo.

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Table 1: Rainfall Distribution of Benin City (1961-2000)

Decade	Decadal Total (mm)	Decadal Mean (mm)
1961-1970	24796.1	2479.61
1971-1980	20050.5	2005.05
1981-1990	23549.3	2354.93
1991-2000	24932.23	2493.23

Source: FMAMS (2002)

Table 2 Rainfall (mm) Distribution of Ondo (1961-2000)

Decade	Decadal Total	Decadal Mean
1961-1970	16639.0	1663
1971-1980	16023	1602
1981-1990	15409	1540
1991-2000	16263	1626

Source: FMAMS (2002)

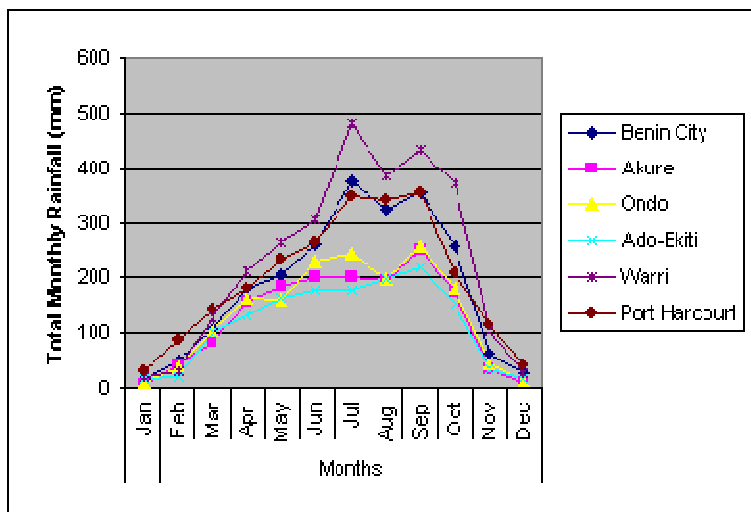
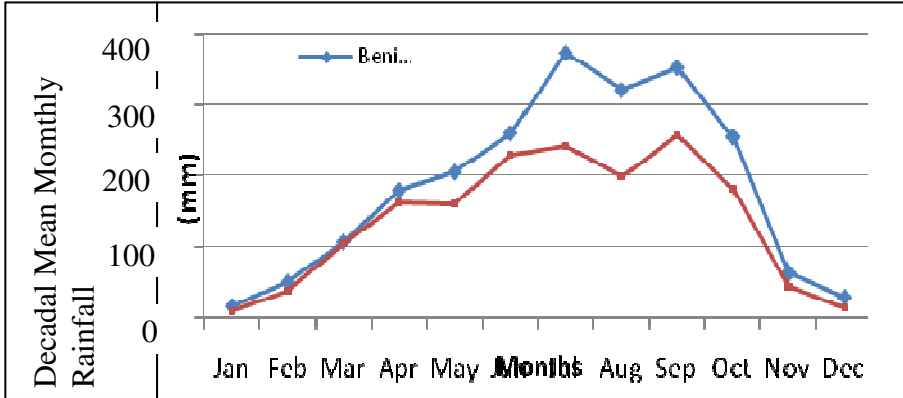


Figure 2: Decadal Mean Monthly Rainfall (mm) for Benin-Owena River Basin Area (1961-2000)

Figure 3: Decadal Mean Monthly Rainfall (mm) for Benin-Owena River Basin Area (1961-2000)



Monthly Rainfall (mm) Distribution of the Study Area (1961-2000)

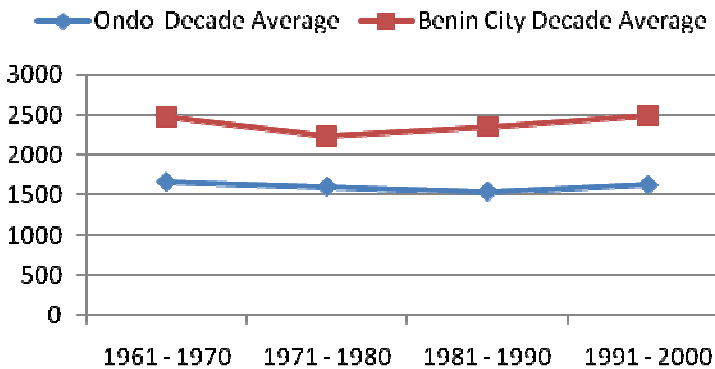


Figure 4: Decadal Average Rainfall (mm) for Benin and Ondo (1961-2000)