Precipitation Anomalies and The Effects in Port Harcourt Metropolis of Rivers State Nigeria

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Introduction

According to [9], one of the major climate factors of importance is precipitation and its mode of occurrence. In West Africa, rainfall is used as a measure for climate variability and change [6],[1].

The [10] Nigerian Climate Review bulletin has added new climate indicators such as rainfall months' anomaly, extreme meteorological parameters, etc. The rainfall anomaly showed that wetter than normal rainfall conditions were experienced over most parts of the country; especially over the southern part [2],[7]. This study aimed to analyze the anomalies in the variability of rainfall and the consequences in Port Harcourt metropolis of Rivers State, Nigeria. Rainfall intensity is high in Port Harcourt due to climatic changes such as high rainfall volume and duration.

Study Area

The study area is Port Harcourt metropolis, the capital of Rivers state, Nigeria. The city is bounded in the north by Etche and Ikwere local government areas, in the east by Oyibo, southeast by Eleme, south by Okrika and Degema and in the west by Emuohua (sees fig.1). It is located at latitude 4^0 45^1 and 4^0 47^1 North and longitude 7^0 00^1 and 7^0 40^1 East and features a tropical monsoon climate with lengthy and heavy rainy season from April to October, ranging from 2000mm to 2500mm and very short dry seasons. Heaviest precipitation in the city occurs during September with average of 367mm of rain. Temperatures are relatively constant, showing little variation throughout the year, with average between 25^0C and 28^0C.

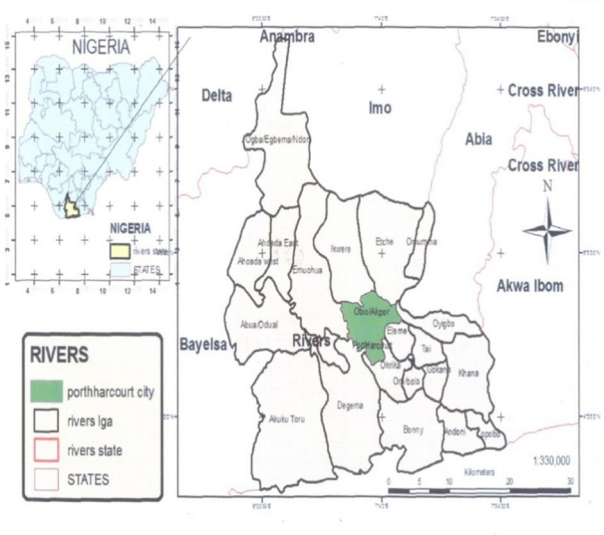

Fig. 1: Map of Rivers State showing Study Area

Methodology

For this study, the Nigerian Meteorological Agency data collection centre, Oshodi Lagos was visited for the weather data. Therefore precipitation data of the study area (Port Harcourt) for 20 years (1991-2010) was acquired. The meteorological data was based on average monthly precipitation for each year for the two decades of the study period (see table 1). Other data used include map (e.g. map of the study area, rainfall anomaly maps of Nigeria from Nigeria climate review archives) as well as direct photograph of flood disasters in the study area.

Table 1: Port Harcourt monthly average Precipitation (mm) for 20 years (1991-2010)

Month / Year	J	F	M	A	M	J	J	A	S	O	N	D	Σ	χ
1991	Tr	80.9	105	107.5	432.1	256.5	360.2	310.1	139.1	171.6	111.1	20.3	2094.4	174.5
1992	0	Tr	111.3	76.4	408.6	348.5	388.5	234	349.4	227.9	56.8	26	2227.4	185.6
1993	6.9	17.1	183.9	84.5	172.5	255.4	776.7	339.8	393.2	306.6	60.6	42.2	2639.4	219.95
1994	16.1	18.4	120.7	66.5	310.1	230.4	375.3	281.7	359.3	431.7	212.1	0.5	2422.8	201.9
1995	79.6	15.6	118.3	120.1	362.5	246.6	398.7	333.6	319.6	413.1	29.6	53.6	2490.9	207.6
1996	Tr	130.4	113.9	320.9	373.6	160.5	241.3	299.4	478	272.8	22.8	5.9	2419.5	201.6
1997	Tr	120.6	93.2	112.9	195.6	392.5	182.7	129.5	221.3	294	148	33.9	1924.2	160.4
1998	22.6	36.9	87.6	188	279.1	414.6	369.8	247.3	489.1	265.4	136.7	32	2569.1	214.1
1999	40.9	52.1	106.6	186.4	291.6	232.9	294.1	257.4	453.5	510.6	73.5	Tr	2499.6	208.3
2000	11.6	7.2	59.2	190.2	202.3	181.5	420.4	245.4	454.9	153.1	51.6	16.9	1994.3	166.2
2001	31.3	2.4	152.7	118.2	314.7	245.2	336.9	309.9	365.3	137.2	108.1	28.1	2150	179.2
2002	79	75.5	77.8	118	324	195.6	556.7	265.4	288.5	67	28.1	26.4	2097	174.8
2003	86.2	93	98.3	175.2	254.7	480.9	485.5	152.1	334.2	131.2	177.1	33.2	2501.6	208.5
2004	46.5	50.7	120.7	132.8	251.8	335.7	222.9	493.1	344.6	171.5	88.2	4.8	2263.3	188.6
2005	17.1	85.9	170.8	121.4	247.3	383.4	252.9	228.6	284.2	194.3	28.7	38.4	2053	171.1
2006	39.6	103.7	95.6	59.8	399.4	360.3	392.6	267.8	557.3	291.4	4.5	0.0	2572	214.3
2007	0	78	93.2	168.8	290.1	415.9	500.9	455.1	366.7	299.2	145.1	10.5	2823.5	235.3
2008	2.4	0	142.4	228.4	196.6	195.1	285.1	387.2	275.8	142.2	63.5	87.5	2000.2	167.2
2009	61.3	67.6	120.1	156.9	312.9	351.1	439	391.9	213.5	372.1	77.6	0	2504	213.7
2010	29.5	62.6	136.1	188	338.2	288	345	342	367	258	76.2	20	2450.6	204.2

Results and Discussion

The climatic changes such as high rainfall volume and duration are always causing high rainfall intensity in Port Harcourt Metropolis. From the results of the study, many years with high rainfall events, above normal (otherwise regarded as years of rainfall anomaly) were indicated and those years correspond to years of high flood risk in the study area. For example, 1992 was a year of rainfall anomaly with April average rainfall, 84.5mm; May = 172.5mm; June = 255.4mm; July = 776.7mm; August = 339; September and October = 319.6mm and 413.1mm respectively. 1998 was a year of rainfall anomaly up to November month, as April rainfall was 188mm; May = 279.1mm; June = 414.6mm, July = 369.8, August = 247.3mm, September = 489.1, October = 265.4mm and November = 136.7mm. 2003 was another year of higher rainfall with April having 175.2mm, May = 254.7mm, June = 480.9mm, July = 485.5mm, August = 152.1mm, September = 334.2mm and October = 131.2mm even November rain was high with 177.1mm. For 2007 rainfall anomaly, April rainfall was 168.8mm, May = 290.1mm, June = 415.9mm, July = 500.9mm, August month was 455.1mm and September had 366.7mm and October and November rains were 299.2mm and 145.1mm respectively. Also in 2009, April had 156.9mm rainfall, May = 312.9mm, June = 351.1mm (very high). July = 439mm (above normal), August = 391.9mm (above normal), September = 213.5mm (below normal) and October was 372.1mm (above normal), (see figures 2-7).

The results of this study however, show very high rainfall variability in Port Harcourt within the twenty years covered in the study. It further shows that the risk of occurrence of potentially damaging flood and associated disasters increases with increasing rainfall intensity in the Metropolis.

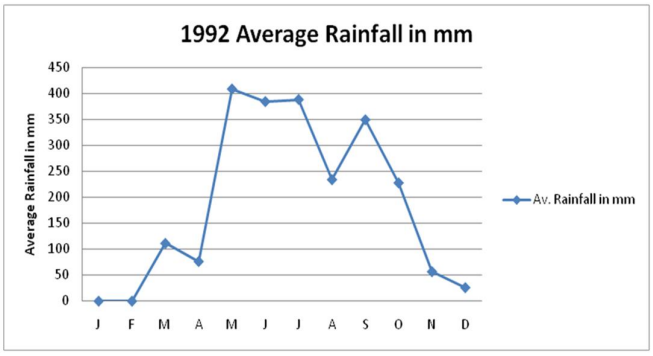

Fig. 2: Rainfall variability curve in Port Harcourt Showing Rainfall anomalies (1992)

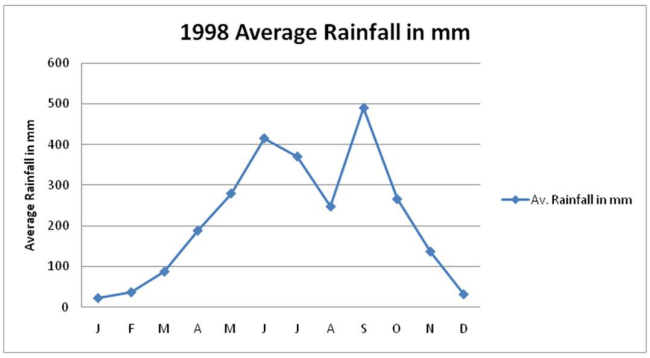

Fig. 3: Rainfall Variability curve in Port Harcourt (1998)

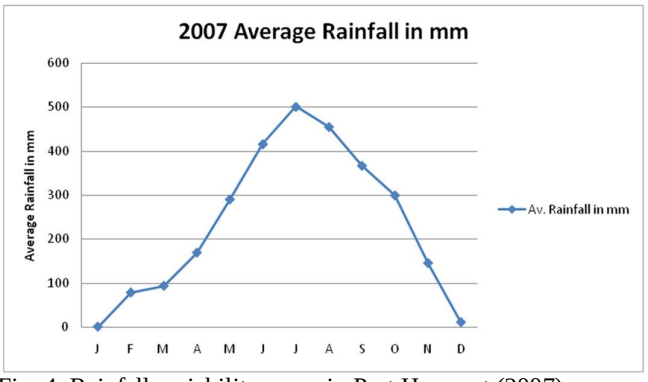

Fig. 4: Rainfall variability curve in Port Harcourt (2007)

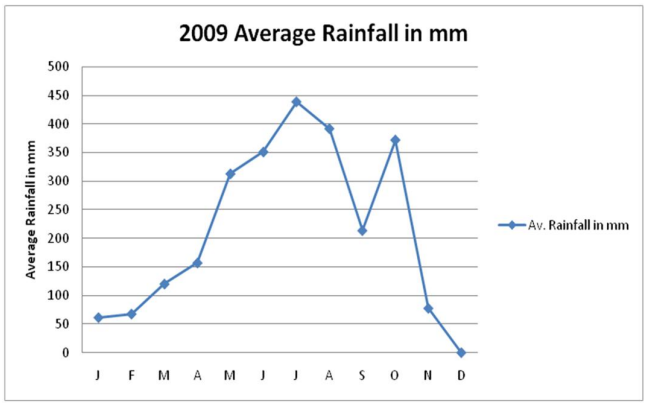

Fig. 5: Rainfall Variability curve in Port Harcourt (2009)

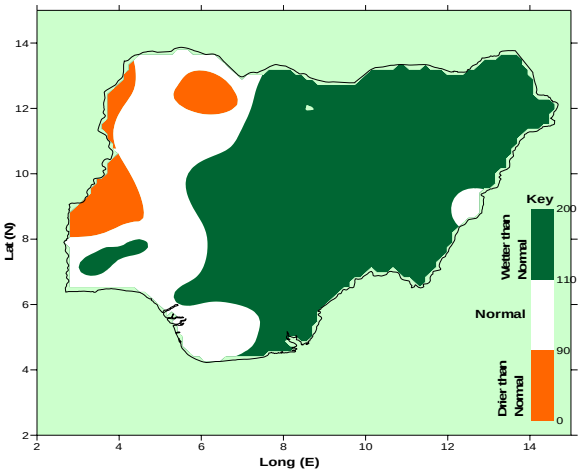

Fig 6: September rainfall anomaly in Nigeria showing Port Harcourt wetter than normal

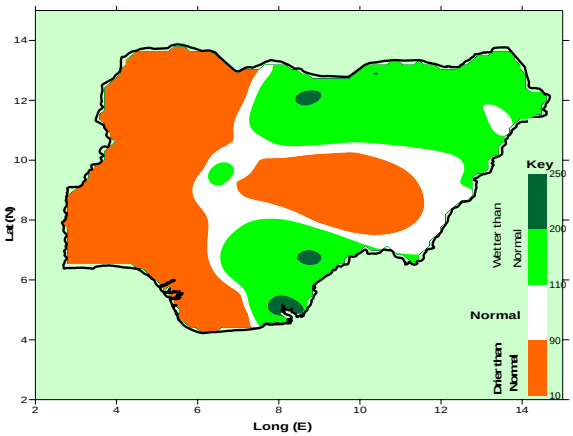

Fig. 7: 2010 Rainfall Anomaly in Nigeria showing Port Harcourt Wetter than Normal

Effects of precipitation anomalies in Port Harcourt

Rainfall anomalies are observed in excessive annual rainfall which leads to flooding and other related issues that cause socio-economic problems in the metropolis [4]. Flood is one of the major environmental problems affecting the livelihood of Port Harcourt urban city [3]. Perennial flood destroy lives and properties, crops and livestock as well as roads and other infrastructural facilities in Port Harcourt. For example, a teenager was killed by electricity leaking into flooded streets of Mbano junction, Oyigbo in the morning of June 19, 2008 during torrential rain while he was walking through the flood [8]. In August, September and October months of the year 2009, Port Harcourt experienced extremely heavy downpours of rain which made the entire city to be flooded throughout causing severe problems to the residents (see fig. 8).

Furthermore, crops such as yam, maize and cassava were always affected due to excessive flooding following August to September rainfall anomalies.

Finally, flights disruptions were reported always in Port Harcourt Airport for local and International flights during the wet season mainly due to heavy downpour [5].


Fig. 8: Flood in Port Harcourt after heavy down pour in September 2009

Conclusion

The climate of Nigeria has shown considerable signals of changing climate through the careful study of meteorological data [10]. Analysis of long term trends of meteorological parameters such as rainfall in terms of its variability and the onset and cessation of the rainy season lend support to this deduction. This study however, established that high rainfall intensity (rainfall anomaly) is characteristics of rainy seasons in Port Harcourt metropolis which causes perennial flood and related problems in the area.

The study also went further to recommend possible ways to avoid the negative impacts of the climatic anomaly.

Recommendation

Having established that Port Harcourt Metropolis is a flood prone area, it is better for the people to have reliable ways of diverting storm-water away from streets and building while putting down pavements.

People should first of all find out if the area they plan to buy and build their houses is susceptible to flooding.

Residents of Port Harcourt Metropolis are advised to keep off the streets and avoid driving and moving out whenever there is a heavy downpour.

People should as well adhere to the predictions and warning of bad weather (heavy storm) by the weather prediction Agency (Nigerian Meteorological Agency).

References

[1] Adedokun, J.A. 1978: "West African Precipitation and Dominant Atmospheric Mechanism"; Arch Met Geoph. Biokl.SerA, 22,289-310

[2] Adefolalu, D.O. 1983: "Rainfall Patterns in the Coastal Areas of Nigeria" Nigerian Geographical Journal, vol. 26, pp 153-170

[3] Akpokodje, E.G. 2010: Flood and Hydrometeorological Hazards in the Niger Delta, A holistic Risk Management and Emergency Response, Being a paper presented at Two-Day south-south Emergency Management Summit

[4] Chiadikaobi, K.C.,Omoboriowo, A.O. Chiaghanamn, O.I., Opatola, A.O. Oyebanji, O. 2011: Flood Risk Assessment of Port Harcourt, Rivers State, Advances in Applied Science Research. Dec. 2011, vol. 2 Issue 6, 287

[5] Hudgens, J. and Trillo, r. 2003: The rough guide to West Africa (4ed) Rough Guides, p. 1075, ISBN1-843-53118-6. The Experts Guide to Port Harcourt

[6] Nicholson, S. Selato, J. 2000. The Influence of La Ninja on African rainfall. International Journal of Climatology 20:1761-1776.

[7] Okorie, F.C., Okeke, I.C., Nnaji, A.O., Chibo, C.N. Duru, P.N. 2011: Rainfall variability as evidence of climate variation in Imo State of south-eastern Nigeria. International journal of Sustainable Development vol. 4 no. 9 (2011)

[8] Olugunorisa, T.E. 2009: Strategies for Mitigation of Flood Risk in the Niger Delta, Nigeria. J. Appl. Sci. Environ Manage. Vol. 13(2) 17-22.

[9] Wilson, F.O. 1990: Engineering hydrology. London: Macmillan Press Ltd.

[10] Nigeria Climate Review Bulletin 2010 and 2012mhttp://www.nimetng.org