

Assessment of Selected Physical Planning Strategies and the Challenges in Combating Flooding in Maiduguri, Borno, Nigeria

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Abstract: *Urban flooding is a catastrophe that continued threatened settlements, inflicting serious damages to man. This has brought about different strategies and techniques in combating the menace. This study aimed at assessment of the physical planning strategies and its challenges of combating the flooding in Maiduguri metropolis. The study involved collection of data, both primary and secondary. The primary data are information obtained on the causes, peak month of the flood occurrences, extent of flood plain encroachment and strategies in place. This was done through questionnaires administration, oral interview, and physical observation and snapping of photographs while the secondary data were obtained through review of related literatures. A simple random technique was adopted in the administration of the questionnaires without replacement, due to homogeneity of physical characteristics of the areas. The data was analyzed using descriptive statistics in form of tables, percentages and charts. The study revealed flood is largely due to lack of drainages, blockages of water channels, depression and subsidence of the terrain, and high encroachment of the floodplain. There are measures taken but due to poor design and maintenance culture the infrastructures identified are silted with sediments. It is recommended government to use special techniques, integrated and progress renewal strategy to avert the situation before it becomes difficult to handle due to continues urban sprawl.*

Keywords: *Assessment, Physical Planning, Strategy and Flood*

I. Introduction

Man has always tried to avoid flood damages by one method or another. But rapid increases in population growth, poverty and environmental degradation have continued to threaten cities settlement, particularly in the developing countries (Ray et al, 1979). Each year, the threat of flood takes an increasing number of lives and properties. A single event, result in heavy death tolls and property damage. These are due to non-availability of data in developing countries, where the catastrophe frequently, inflicted serious damages to man. As more and more land is urbanized, trees and grasses are replaced by asphalt and concrete, rainwater has less chance of being absorbed. Thus, storm water rushes down streets, and areas that were never flooded are now routinely under water.

Furthermore, municipalities are continuing with the sprawling squatter settlements that push city boundaries ever out-ward, filling the only land available. As a result, essential services such as garbage collection and sewerages are erratic all over. During heavy rains, piles of garbage flow into the few existing drains; because these cannot handle the overflow waste backup, it spreading over whole section of cities. Freeman (1999) pointed out that in developed countries where technology has advanced, data availability has always been used to monitor and cushion the effect of flooding. These are real time flood forecasts and warnings via weather radiation and satellite. The shift from structural to non-structural flood control due to increased awareness is very important (Eric, 1992). Khalequzzaman (1994) made great effort in finding both physical and institutional strategies to mitigate the hazard in the present and future.

The physical strategies; are dykes systems, canals, drainages reforestation, medium and large scale reservoirs in upstream areas, strengthening of dykes system, flood diversion whenever necessary, river dredging and clearance for flood discharge channels and dyke monitoring. Institutional strategies; flood disaster management board and communities organization have been set up, involving professionals for warning and enhancing power responsibilities of the government for the hazard reduction. Just to bring a sustainable human settlement development in an urbanizing world, thereby contributing towards the reduction of loss of lives and damage to properties in flood prone areas; United Nation Conference on Human Settlement (UNCHS) Habitat 2 in Istanbul, Turkey (June 1996). This mechanism of integrated combat scheme for flood mitigation must become part and parcel of the human settlement planning and management process at the national, regional and local government levels

II. Materials And Methods

This research is an empirical study carried out. It involved collection of both primary and secondary data. The primary data are information obtained on the field through observation, structured

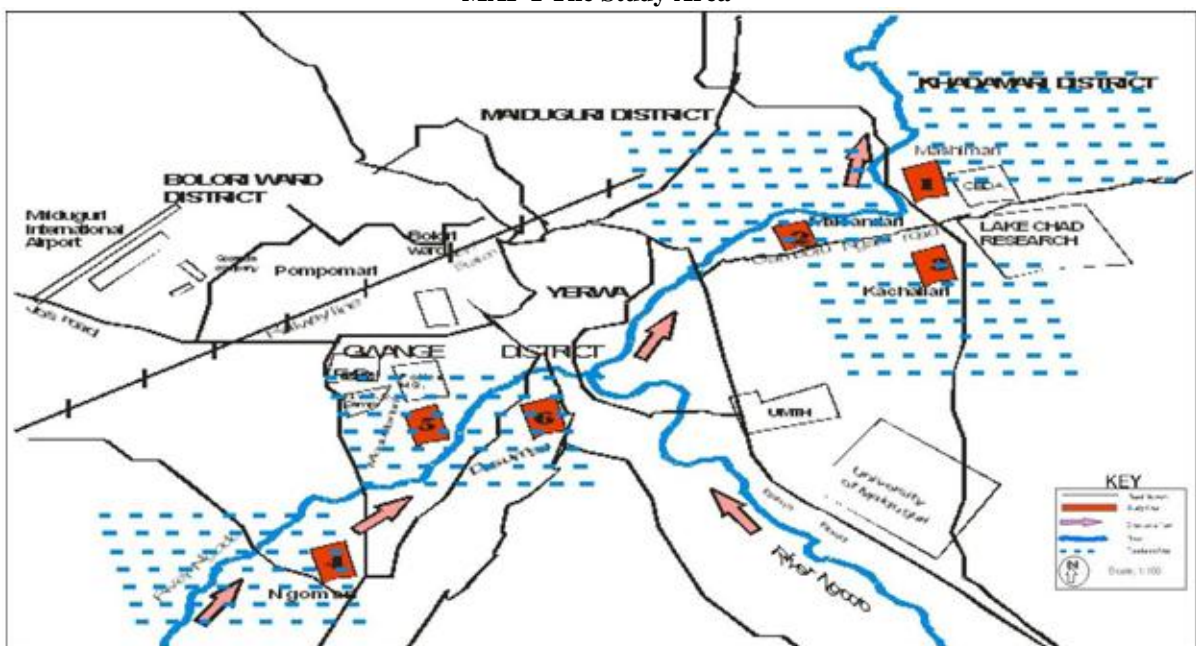
questionnaire, oral interview and photographs while the secondary data are information obtained through review of related literatures from textbooks and published journals. The study population break down is shown in Table 1 below. 30% is taken as a sample frame summed 250 questionnaires. And a simple random sampling technique was used for the administration of the questionnaires without replacement because of homogeneity of the study area. The data was analyzed using descriptive statistics that is, use of percentage and frequency tables.

Table 3.1 Population and Sample Frame

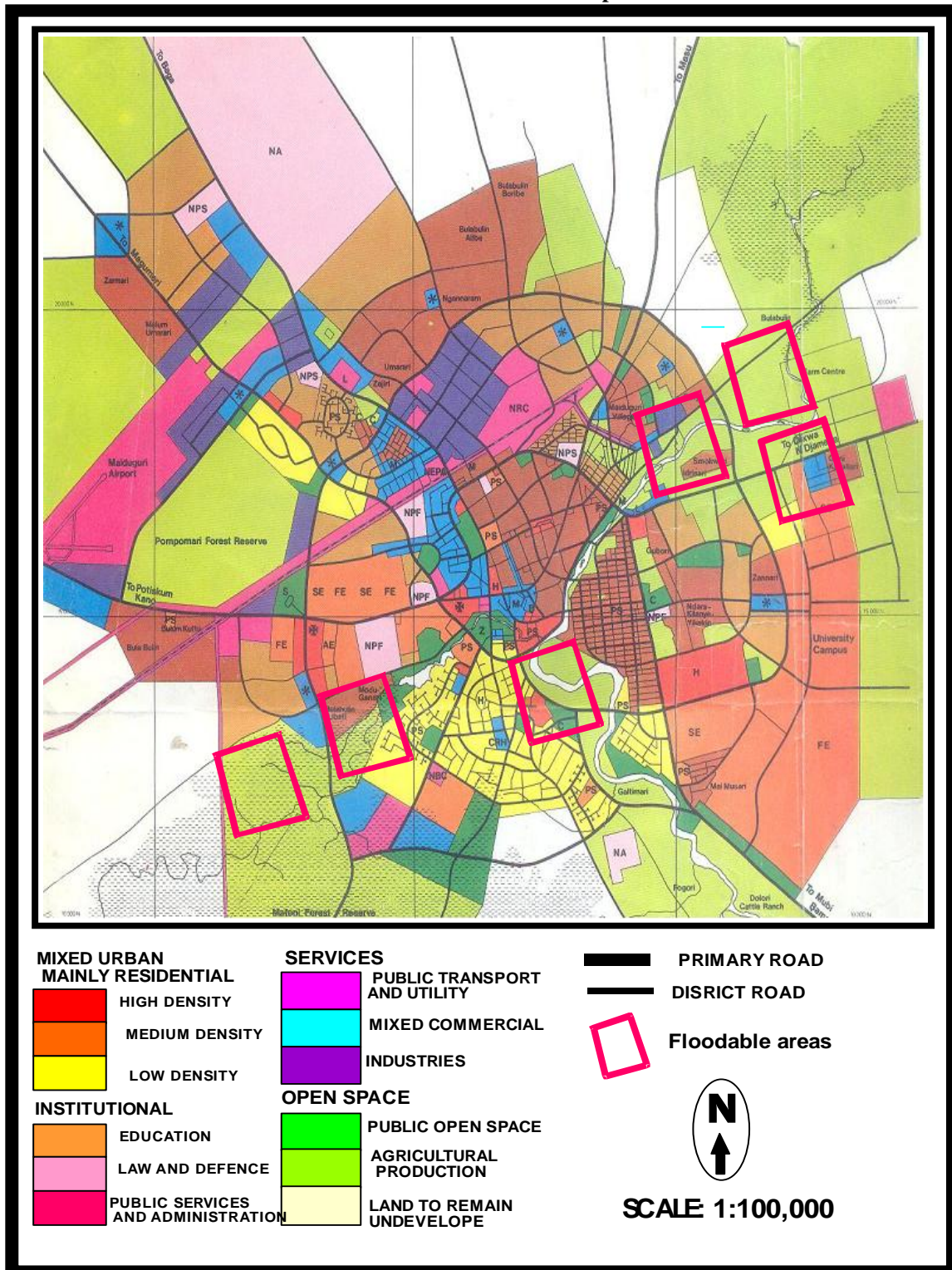
Wards	Population	Pop. Of household	30%	Sample size
Moduganari	5,824	319	95.7	96
Dusuman	4,748	255	76.5	77
Kachallari	1043	51	16.2	16
Ngomari	1369	72	21.6	22
Maisandari	1161	59	17.7	18
Mashimari	1417	74	22.2	21
Total	15,562	830	249.9	250

Sources: M.M.C Primary Health Care.

MAP 1 The Study Area



MAP 2: Land Use Map.



Source: Ministry of Land and Survey, 2010

III. Results And Discussion

The study revealed that, 36.0% of the respondents attributed the major causes of the flooding to absences of drainages while 24.4% to blockage of the water channels and 24.8% to the general topography of the areas this is shown in the Table 1 below.

Table 1: Causes of the Floods in Maiduguri

Wards	Absence of drainage	Blockages	Topography	All of the above
Moduganari	23	37	20	15
Dusuman	34	17	6	20
Kachallari	3	7	6	-
Ngomari	5	-	15	2
Mashimari	15	-	2	1
Maisandari	10	-	10	1
Total	90	61	62	39
%	36.0	24.4	24.8	14.8

Sources field survey 2013

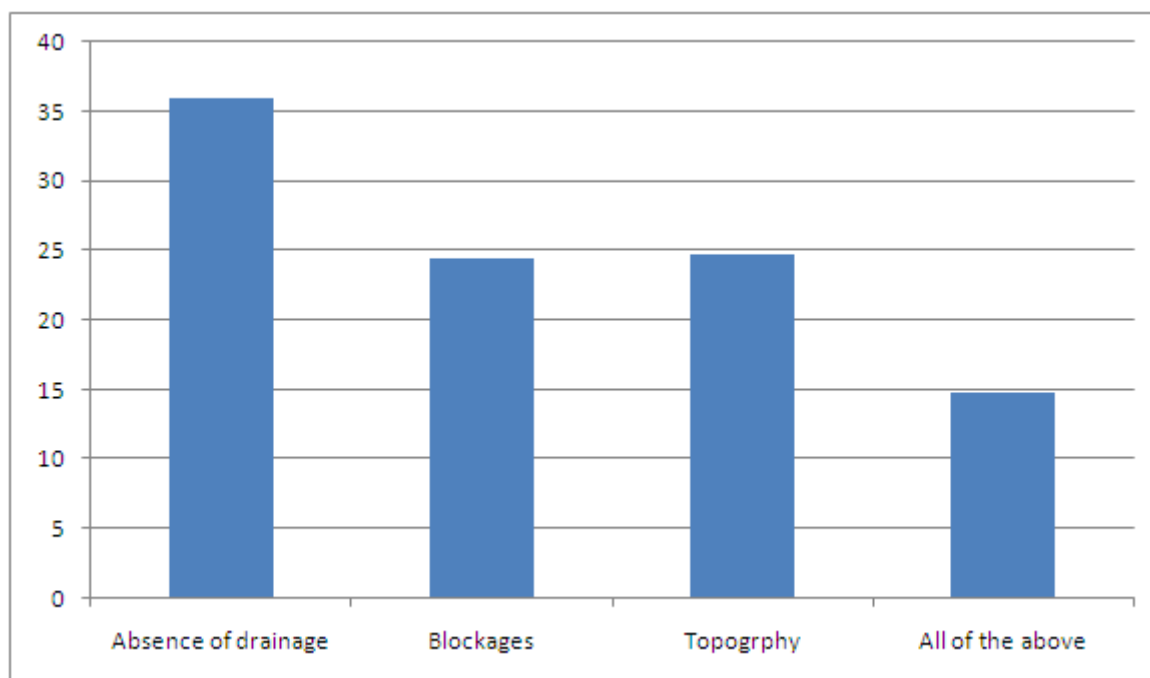


Figure 1: Causes of the floods in Maiduguri

The study revealed that 68.0% of the respondents stated that the peak Month of flood occurrences in Maiduguri is August with average Monthly Rainfall of 223.1 mm as shown in the Table 2 below

Table 2: Peak Months of Flood Occurrence in Maiduguri

Wards	Parameters	Peak Months of floods Occurrence in Maiduguri				Total
		May	June	July	August	
Moduganari	Count	12	14	13	57	96
	% of response from the respondents in each area	30.0%	33.3%	29.5%	44.5%	38.4%
Dusuman	Count	12	16	16	33	77
	% of response from the respondents in each area	30.0%	38.1%	38.1%	25.8%	30.8%
Kachallari	Count	3	1	4	8	16
	% of response from the respondents in each area	7.5%	2.4%	9.1%	4.4%	6.4%
Ngomari	Count	3	5	3	13	22
	% of response from the respondents in each area	7.5%	11.9%	7.5%	10.2%	8.8%
Mashimari	Count	5	3	4	8	21
	% of response from the respondents in each area	5.0%	7.1%	9.1%	7.0%	7.2%
Total	Count	40	42	44	128	250
	% of Total	9.2%	10.4%	12.4%	68.0%	100.0%

Sources: Field survey, 2013

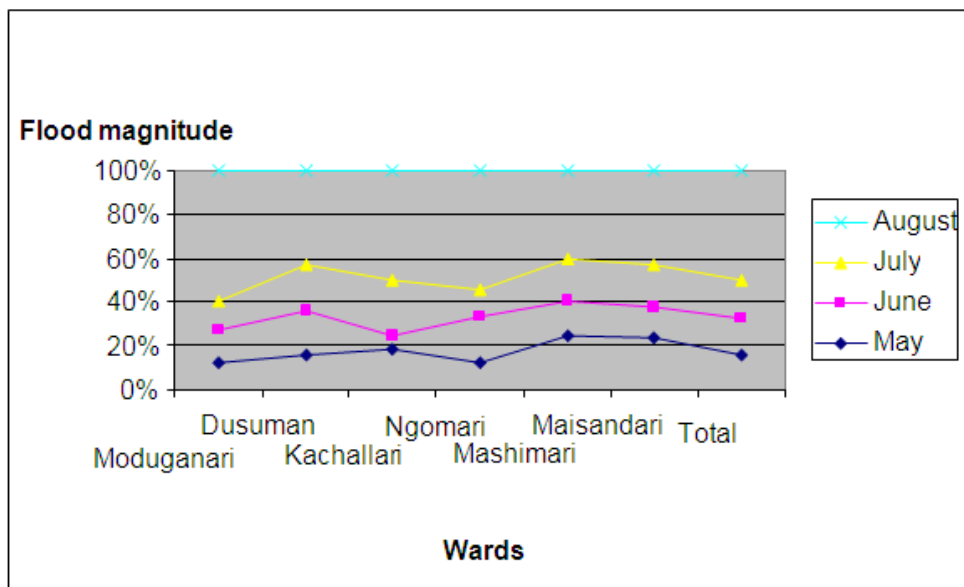


Figure 2: Month of flood experienced by households in each area

The study revealed as shown in Table 3 below, 41.4% of the respondents occupied the areas as a result of family tied as well as cheap rent while 39.2% attributed it to cheap land and available spaces for easy development. 18.4% is as a result of inadequate finances otherwise they will relocate out of the areas due to frequent flooding.

Table 3: Reasons of Occupying the Flood Affected Areas in Maiduguri

Wards	Inadequate finance	Family origin	Cheap rent	Cheap land	Available space
Moduganari	31	29	20	15	1
Dusuman	12	20	16	25	-
Kachallari	-	4	-	3	9
Ngomari	1	-	8	-	13
Mashimari	2	-	-	5	12
Maisandari	-	-	9	-	12
Total	45	53	53	49	49
%	18.4	21.2	21.2	19.6	19.6

Sources: Field survey, 2013

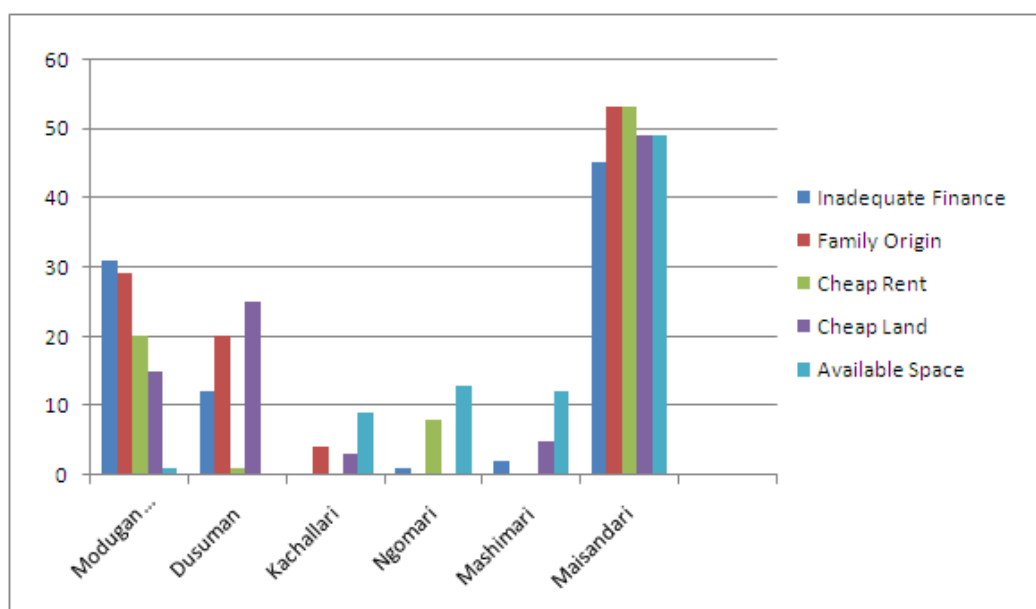


Figure 3: Reasons of Occupying the Flood Affected Areas in Maiduguri

The study revealed as shown in table 3 below that 48.0% of the observed strategies to cushion the effect of the flooding reduce it minimal while 52.0% of the respondents the strategies did not made any impact of combating the menace of flooding in the areas.

Table 4: Opinions of the Respondents Cross tabulated by observed strategies in Minimizing the Flood in Maiduguri Study areas.

Extent of minimizing the flood	Parameters	Observed strategies of minimizing the flood					Total
		drainage	channels	Sand filling	Sand bag	Culverts	
Minimal	Count	57	22	7	21	13	120
	% Opinions of the respondents on Extent of minimizing flood	47.5%	18.3%	5.8%	17.5%	10.8%	100.0%
	% Observed strategies of minimizing flood	42.9%	52.4%	46.7%	63.6%	48.1%	48.0%
	% of Total	22.8%	8.8%	2.8%	8.4%	5.2%	48.0%
Not at all	Count	76	20	8	12	14	130
	% Opinions of respondents on Extent of minimizing flood	58.5%	15.4%	6.2%	9.2%	10.8%	100.0%
	% Observed strategies of minimizing flood	57.1%	47.6%	53.3%	36.4%	51.9%	52.0%
	% of Total	30.4%	8.0%	3.2%	4.8%	5.6%	52.0%
Total	Count	133	42	15	33	27	250
	% Opinions of respondents on Extent of minimizing flood	53.2%	16.8%	6.0%	13.2%	10.8%	100.0%
	% Observed strategies of minimizing flood	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	53.2%	16.8%	6.0%	13.2%	10.8%	100.0%

Sources: Field survey, 2013



Plate 1: Building Foundation at the Fringe of River Ngadabul in Dusuma Ward



Plate 2: Empty House as a Result of Flood in Ngomari



Plate 3: Drainage filled with Garbage in Ngomari Ward in Maiduguri



Plate 4: Sand Filling Process (Reclamation) in Moduganari Ward in Maiduguri



Plate 5: Sand Bagging to Prevent Flood entering a House in Mashimari Ward in Maiduguri

IV. Recommendation

- Since the flooding last momentarily, government and communities at risk should rely on forecast and make effective communication via radio and television on the consequence of the flooding and its devastating impact to socio-economy.
- Height of building foundation in the flood prone areas should be well raised above the inundation zone as well as local building materials with high water resistance should be used for constructions

- Enlightenment campaigns by the government and advocacy groups should be a continues process on the danger of dumping waste in drainages, and channel as well as flood plain occupation should be avoided.
- Proper land use regulation by prohibiting any development that is close or directly on water channels.

V. Conclusion

The study revealed that Maiduguri flooding occurs in the month of august when the rainfall is at its peak. This is largely occurring due to lack of drainages, blockages of the existing available ones and depression and subsidence of the terrain as a result of man-made activities. Besides, clustering building structures heaps of garbage are scattered blocking water channels. However, there are measures taken in combating the menace of flooding, but due to poor design and maintainer's culture, those infrastructures are all silted with sediments. Therefore, with this problems at hand, proper care is needed to avert these situations if not, in less than few years to come, it will be difficult to handle due to continues urban sprawl taking place in the areas.

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