

DEVELOPMENT CONTROL: A STRATEGY FOR FLOOD VULNERABILITY ASSESSMENT IN SULEJA

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Urban centres in developing countries are experiencing rapid urbanization. This is often associated with lots of problems which range from improper waste management, building contraventions, non-adherence to building standards, pollution, overcrowding and flooding. In curtailing these problems, development control tools are frequently used. Against this background, the effectiveness of development control tools was used to assess flood vulnerability in Suleja, Local Government Area of Niger state. In achieving the aim of this study, buildings vulnerable to flooding were identified; factors influencing flood vulnerability and the implication of non adherence to development control measures were also examined. The theory of urban resilience forms the basis for this study. Primary and secondary sources of data were used for this study. A total of 278 questionnaires were administered using multi-stage sampling techniques. A quick bird image of 15meter resolution was used to map out the vulnerable and contravening buildings in Suleja using a 15 meter setback from the river banks. The study reveals that 799 buildings contravened building standard in Suleja, while indiscriminate solid waste disposal was found as a strong factor influencing flood vulnerability in Suleja. The study also revealed that 47% of the drainages in Suleja are blocked with solid waste. The study recommends that solid waste in Suleja should be collected promptly and development control mechanisms should strictly be enforced by the Niger State Urban Development Board, Suleja.

Keywords: Building Standards, Development control, Flood, Solid Waste and Vulnerability

INTRODUCTION

It is no doubt that cities in the world are experiencing rapid urbanization. The alarming pace of the rapid urbanization experienced in these cities is often accompanied with lots of challenges, especially in cities of the developing countries where less regard is given to urban planning. Problems that arise from the rapid urbanization experienced in cities of the developing countries range from housing shortage, insanitation, inadequate infrastructures, crime, congestion, creation of slums and flooding (Kadi *et al.*, 2012; Okorie, 2015). These problems are not far-fetched from the problems of rapid urbanization experienced in Suleja, Niger State. The quest for cheap housing/ property in Suleja has led to contraventions by developers, building on marginal lands, congestion and emergence of slums. This phenomenon often results in environmental problems such as indiscriminate solid waste disposal and flooding. In recent times these environmental problems have ravaged some communities in the country with Suleja inclusive. In July 2017, Suleja was wrecked by a devastating flood killing 18 persons and destroying properties worth millions of Naira. The raging flood was attributed to blockage of drainages by solid waste and erecting building along waterways (Warami, 2017). Expert believed that these obstructions (blockage of drainages by solid waste and buildings along waterways) will always keep the flood plain soil saturated with water and buildings erected along these channels will be vulnerable to flooding giving the slightest rise in water flow (Bwala *et al.*, 2015). Contrary to this claim, urban planners opined that the raging flood in Suleja was man-made and can be linked to the deficiencies in the implementation and enforcement of the Nigeria Urban and Regional Planning laws (Onwubiko, 2017) which development control is a subset.

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The Nigeria Urban and Regional Planning (1992) part two subsection 31(a) states that development should be rejected if not in accordance with an approved plan while subsection 31(e) of the same part stipulate that, any building that constitutes a nuisance to the inhabitants of the community or contains such additional facilities that are not within the estimation of the of the physical development plan for the community should not be approved by the planning authorities. This indicates that when development control tools are strictly enforced by planning authorities, buildings will not be erected on marginal lands or sited along waterways. Also skip bins will not be placed along drainage channels hence, reducing flood vulnerability. Development control is seen as a measure put in place by physical planning agencies to maintain standards which in turn will reduce the negative effects that accompany physical development (Obabori *et al*, 2007).

That is, development control measures aim at achieving a practical environment that will safe for working, recreating and living as envisaged by planning Utopias. Against this background, the effectiveness of development control measures was used to assess flood vulnerability in Suleja, Niger. This Study assesses the effectiveness of development control measure in flood vulnerability assessment. To achieve this assessment, buildings vulnerable to flooding were identified. Factors influencing flood vulnerability and the implication of non adherence to development control measure were also examined.

Study Area

Suleja Local Government Area (fig 1) lies between latitude $9^{\circ}6'13.8''$ and $9^{\circ}17'49.35''$ north of the equator and longitude $7^{\circ}6'58.6'$ and $7^{\circ}12'18.41'$ east of Greenwich Meridians. Suleja local government has a population of 216,578 with 10 political wards (NPC, 2006). The strategic location of Suleja has had the most profound effect on its development and its potential growth in the near future.

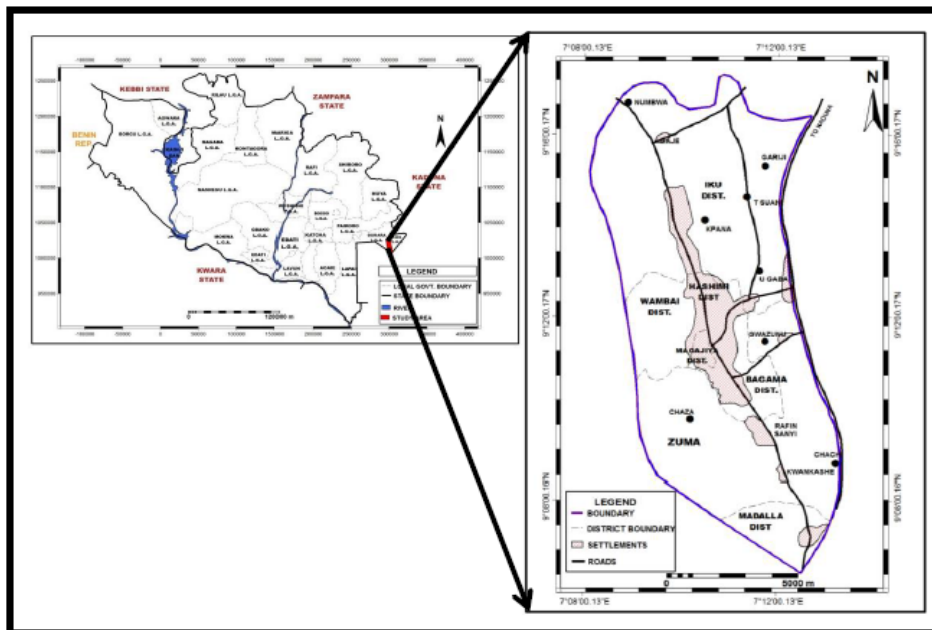


Figure 1: Administrative map of Suleja

Source: Department of Urban and Regional Planning Federal University of Technology, Minna

Theory of Urban Resilience

The word resilience originates from the Latin word "Resilio" meaning "to bounce back" (Meerow *et al.*, 2016). The theory of resilience is complex, because the theory fosters multidisciplinary scientific collaboration (staart and Griesemer, 1989 in Meerow *et al.*, 2016). In describing the relationship between living organisms and their natural or developed environment the theory of resilience was first used Crawford Holling in 1973. The theory by Holling defined the resilience of an ecosystem as the measure of its ability to absorb changes and still persist (McAslan, 2010). Relating the theory of resilience to urban research/urban setting, Meerow *et al.*, (2016) refers to urban resilience as the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly returned to desired functions in the face of disturbance.

The theory of urban resilience provides a useful framework for understanding how communities, organisation and ecosystems cope in a changing world of uncertainties and challenges. This theory focuses on the interaction between periods of plodding change to sudden change and provides better understanding on how society should respond to disruptive events (McAslan, 2010). The theory of urban resilience stresses the need, for awareness, detection, recovery, provision of utilities and essential services during an emergency or crisis.

The theory of urban resilience when applied in Suleja would help stakeholders in been proactive in the area of preparing strategic operational plans and programs which addresses risk and vulnerability. The theory of urban resilience will help policy makers; academics, urban planners and other practioner in understand how disaster (both manmade and natural) and other disruptive challenges can better be addressed. Since the theory of urban resilience embraces the concept of awareness, detection and avoidance, the populace in Suleja would be better sensitized on the dangers of building along waterways and indiscriminate solid waste disposals most especially in drainages.

Application of Development control measures in combating flood vulnerability

The neglect of planning laws and land use regulations has led to the ineffective urban planning in the developing countries. This fact has made development control measure impotent in the developing world. According to Goodfellow (2013) the weaknesses of development control measures have made the prospects for alleviating the problems faced by the urban poor dwellers in the use of land very slim. Since independence, various Africa countries have recorded a long repetitious list of failure in efforts to regulating urban space because of the ineffectiveness of development control measures (Mabogunje, 1990 in Goodfellow, 2013). The ineffectiveness of development control measures in the developing countries can be attributed to lack of political will by the government in enforcing planning laws and the corrupt practises found among planning officers. This experience is also evident in Nigeria, corrupt practices among planning officers are most common especially among site inspectors who are some absent from duties without necessary permission also; the political interference from the power that be has also contributed to the inadequacy of development in Nigeria (Aluko, 2011).

The laxity in the implementation of development control measures has led to many environmental problems in Nigeria from time immemorial. These environmental problems range from the bubonic plague of the 1920s, littering of the environment with uncollected solid waste and incessant flooding experienced in various states of the federation. In recent times, the latter (Flooding) still continues to ravage communities in the country destroying lives and properties. In this regard, experts have recommended the physical planning approach which includes development control as a strategy to mitigate the incidence of flooding and flood vulnerability (Bwala, *et al.*, 2015). Similarly, the reports from Marrickville Council (2015) and Ashfield Council (2015) also assert that, the primary method of flood risk, vulnerability assessment is through the application of development control measures. These reports indicate that the application of development control measures will help to minimise impending damage to properties, risk to life and ensure that any existing flood affected area is not adversely by future development (Marrickville Council, 2015). The deduction from these reports shows that development control strategy is a laudable approach to flood vulnerability.

METHODOLOGY

Data for this study were gathered through the primary and secondary sources. To determine the buildings vulnerable to flooding and those contravening development control measures, high resolution satellite (quickbird) of 15 meter resolution was acquired through "terra incognita" application. Data on development control standards as regards the actual setbacks for rivers and canals were searched out from the planning permit platform of Nigeria. While data on development permit were acquired from the Niger State Urban Development Board, Suleja.

In examining the factors influencing flood vulnerability in Suleja, oral interview and questionnaire survey via open data kits were used to gather data. These primary data were backed up with data acquired from past research work on Suleja. In the same vein, the

primary (oral interview and questionnaire survey) and secondary data (research from past work) source were used to gather data on the implication of non adherence to development control measures in Suleja. The multi-stage sampling techniques were adopted for this research. Using this technique, each member of the population has an equal chance of being sampled. At the first stage the study area was alienated into 10 geographical entities based on the 10 political wards (Bagama "A", Bagama "B", Magajiya, Iku South I, Iku South II, Hashimi "A", Hashimi "B" Kurmi Sarki, Maje and Wambai). Each ward was divided into constituent neighbourhoods at the second stage. Thus, 44 non-overlapping neighbourhoods were identified as shown in Table 1. Major streets were identified out of the 44 neighbourhoods at the third stage.

Table 1: Sample Frame and Sample Size

S/N	Wards	No. of Neighbourhoods	No. of Streets	Sample Frame	Sample Size (0.1%)
1	Bagama "A"	5	27	26,602	27
2	Bagama "B"	4	25	24,710	25
3	Magajiya	4	26	25,780	26
4	Iku South I	5	30	30,181	30
5	Iku South II	5	32	31,757	32
6	Hashimi A	3	24	23,709	24
7	Hashimi B	4	29	28,892	29
8	Kurmin Sarki	5	31	27,036	27
9	Maje	4	27	28,601	27
10	Wambai	5	27	31,467	31
	Total	44	278	278,735	278

Source: Author's Field survey, 2017

Method of Data Analysis

On the Satellite image acquired, a buffer (setback) of 15 meters as approved by the Niger State Urban Development Board for rivers was created along the water channels in Suleja. This task was performed using the analysis tool in Arc toolbox on ArcGIS 10.2 software. Buildings that falls within the buffer line were also digitized on ArcGIS 10.2 and their actual numbers were determined on the attribute table created for the building. Data gathered through the open data kits were downloaded in excel format and these data were imported into JASP 0.8.0.0 software and a descriptive statistic was ran. The data generated were processed and tabulated.

RESULTS AND DISCUSSION

Flood vulnerability in Suleja

To determine the buildings vulnerable to flooding in Suleja a buffer/set back of 15meters as stipulated by the Niger State Urban Development Board was created along the river channels in Suleja. Buildings that fall within the buffer tend to be contravening the development control standards also these buildings are vulnerable to flooding. The analysis reveals that a total of 799 buildings were contravening the development control standards and at the same time vulnerable to flooding. The vulnerable/contravening buildings are represented in red colour as shown in Figure 1.

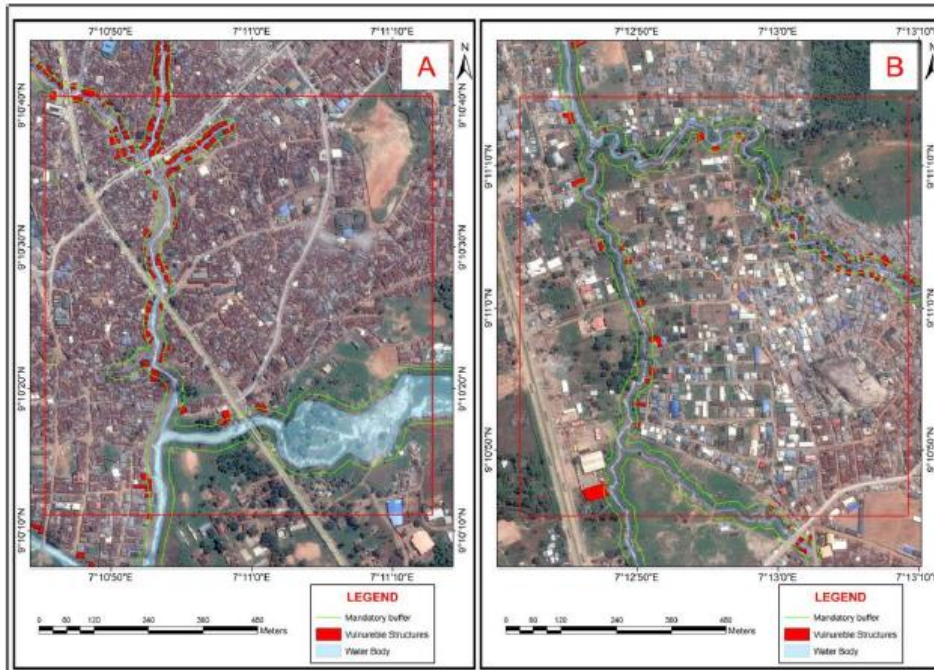


Figure 1: A section of the Vulnerable/Contravening Buildings in Suleja
Source: Author's Field Survey

The high number of contravening buildings in Suleja can be attributed to laxity in enforcing development control measures by the town planning inception officers and the bureaucracy involved in the approval of building plan by the Niger State Urban Development Board. According to the Board (NSUDB) only 35% of the building plans submitted to the board for approval were approved yearly. Between 1987 and 2015, only 932 building plans were approved by the Board (NSUDB) out of the 2656 plans submitted for approval (Adeleye, 2015). The inability of the Board (NSUDB) to approve more than 35% of the plans submitted often force developers to go ahead with their development without having their plans approved. This act encourages contravention and erection of buildings on marginal lands which in turn leads to flooding. Figure 2 shows a section of the vulnerability map of Suleja. The vulnerability areas in Suleja were classified into 3 that is, low risk area, moderate risk area and high risk areas. Low risk areas have a possibility of less than 3% chance of flood occurring, the moderate risk areas have a possibility of 50% - 90% of flood occurring while areas with high risk have a 90% chance of flood occurring in Suleja.

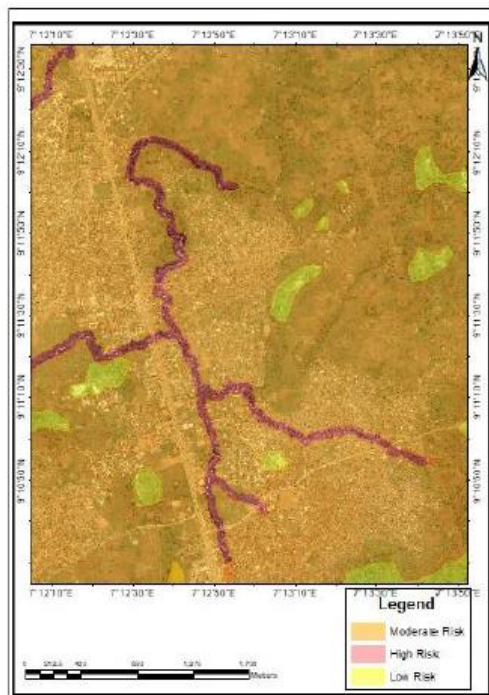


Figure 2: A section of the Vulnerability Map of Suleja
Source: Author's Field Survey, 2017

Factors influencing flood vulnerability in Suleja

Indiscriminate waste disposal in waterways, poor system, building on marginal lands, building along river banks and cultural belief were responsible for flood vulnerability in Suleja. Table 1 reveals that 43.5% of the respondents were of the view that indiscriminate waste disposal is a strong factor influencing flood vulnerability in Suleja; this claim was corroborated with field survey carried out. During the field survey, it was observed that uncollected solid waste littered the street and water channels in Suleja (see plate 1). A total of 308,940 cubic meters of Solid waste is said to be collected yearly in Suleja since 2013. But this statistic does not reflect the true record of solid waste collection in Suleja because solid waste is left uncollected daily in Suleja (Adeleye, 2015). This is a clear indication that indiscriminate solid waste disposal in Suleja is a menace that should be addressed with immediate urgency.

Table 2: Factors Influencing Flood Vulnerability in Suleja

Options	Frequency	Percentage
Indiscriminate Waste disposal in water ways	121	43.5
Poor Drainage System	50	18.0
Building on Marginal Lands	42	15.1
Building along River banks	63	22.7
Cultural Belief	2	0.7
Total	278	100

Source: Author's Field work 2017



Plate 1: Water Channel filled with solid waste in Suleja
Source: Author's Field Survey, 2017

Poor drainage systems were believed to influence flood vulnerability by 18.0% of the respondent (Table 1). Building on marginal lands was also seen as a factor influencing flooding by 15.1% of the respondents. However, 22.7% of the respondents were of the opinion that building along river banks influences, flood vulnerability in Suleja this assertion was also shared by Environ (2017) an online platform. Environ (2017) opined that the 2017 flooding in Suleja affected my people who built their houses along the river banks. Table 1 further shows that 0.7% of the respondents were of the view that Cultural belief were factor influencing flood vulnerability in Suleja. Those in this category were of the opinion that natural/manmade disaster is an act from God (Allah ne ya kawo).

Implication of Non Adherence to Development Control Measure in Suleja

The study revealed that emergence of slum, land degradation, flooding and poor accessibility are the effects of non-adherence to development control measures in Suleja. Table 2 reveals that 7.2% of the respondents were of the opinion that land degradation is an implication of non-adherence to development control measure in Suleja. This category of respondents believed that lands that ought to be conserved and those that should serve as carbon sink have either been converted or distorted because of the laxity in development control measures. Poor accessibility and Emergency of Slum was attributed to the implication of non-adherence to development control measures by 12.6% and 46.0% of the respondents respectively. The responses by the 46.0% of the respondents indicate that weakness in the enforcement of development control measure will lead to chaotic planning. Onwubiko (2017) also shared this belief and opined that houses in Suleja are mostly ramshackle,

associated with congestion as if there is a total absence of town planning authority in Suleja. The statement by Onwubiko (2017) is also an indication that development control measure is lacking.

Table 2: Effects of Non Adherence to Development Control measure in Suleja

Option	Frequency	Percentage
Land Degradation	20	7.2
Poor Accessibility	35	12.6
Emergence of Slum	128	46.0
Flooding	95	34.2
Total	278	100

Source: Author's Field work 2017

On the other hand, 34.2% of the respondents which is the second highest were of the opinion that flooding is an implication of non adherence to development control measures in Suleja. It is no doubt that hundreds of thousands of poor civil servants, petty traders and artisans who work in the Federal Capital Territory are resident in Suleja due to high cost of residential rents in the Abuja. The quest for cheap land and residential housing often force developers to build on any available space, be it Water channels or flood plains thus encouraging flooding. These findings can be attributed to the responses of the 34.2% respondents who believed that flooding is an implication of non adherence to development control measure.

CONCLUSION AND RECOMMENDATION

Buildings contravening development control laws should be marked and demolished as stipulated by the Town Planning Law of 1999, this Act will serve as a wakeup call to the public on the need to strictly adhere to development control measure. Inspection exercises by the planning officers should be on a regularly basis and planners should be cautioned on the dangers of bribery and other forms of indiscipline. This will help in effective management and planning of the Suleja.

The bureaucracy involved in building approval by the Niger State Urban development Board should be addressed by the Niger State government in order to have more plans approved as against the 15% benchmark set by the Ministry. This will encourage developers to always seek development permits and the rate of contravention will reduce.

The Niger State Environmental Protection Agency should sensitize the residents of Suleja on the dangers of indiscriminate Solid waste disposal especially in waterways. This will go a long way in avoiding the occurrence of flooding in years to come. Also more skip bins should be available and be properly sited by the Niger State Environmental Protection Agency (NSEPA). Further more Solid waste should be collected promptly by NSEPA.

To achieve an ideal city that will be practicable for living, working, and recreating, it is pertinent to fully enforce the development control measures amidst the rapid urbanization experienced in Suleja. This study has effectively identified the buildings contravening development measures and the implications of non adherence to development control measures.

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