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Public Dialogue in Disaster Situations and Physical Planning Inadequacies: Focus on the Devastating June 16, 2018 Bauchi Rainstorm

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Abstract
Bauchi experienced a catastrophic disaster event on 16 June, 2018. Consequently, there have been public discussions and irritations about the event and the inadequacies of public-sector town planning practitioners. 130 residents of Bauchi metropolis were sampled randomly and their concerns documented. The study revealed that poor housing conditions, urban poverty, corruption in planning authorities, substandard infrastructural provision and the non-adherence to development control regulations were the major human and administrative contributions to the catastrophic outcome of the disaster.
Keywords: Disaster, Physical planning, Rainstorm, Public, Dialogue, Inadequacies

1.0 Introduction

The occurrence of disasters is becoming an issue for concern in planning and public debates. The intention of planners in creating liveable spaces in neighbourhoods, regions and towns is to provide convenience, comfort, functionality, accessibility among others. In trying to do this, they apply tools such as land use zoning, setbacks, building line restrictions and others to prepare for an unexpected disastrous event. A storm with associated heavy rain is a rainstorm (Zhai *et al*., 2017) which is usually catastrophic, destroying lives, infrastructure and property. According to Kelman (2015, p.117), "the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR), analyses how climate change is mentioned in the framework's text and the potential implications for dealing with climate change within the context of disaster risk reduction". The Saturday evening, June 16, 2018 Rainstorm in Bauchi is no exception as lives were lost and infrastructure damaged. Following the catastrophic event, there have been concerns as to why the damage was severe and what were the planning inadequacies regarding same. In Germany for example, because of environmental effect, a law was enacted to prevent developers from surface sealing (Pauleit & Duhme, 2000). *Surface sealing* involves applying liquid sealant to pavement surfaces in order to stop water penetration and/or reduce oxidation of asphalt products (Sela *et al.*, 2015). Substandard building materials, substandard infrastructure provision, non-compliance to physical planning regulations and the acceptance of secret commission and kickbacks for the introduction of other structures not approved on the building plans submitted at local planning authorities are some of the human-induced contributions to the catastrophic damages of a rainstorm (Oloke *et al.*, 2017). This paper documented some of Bauchi residents' concerns about the rainstorm which occurred on 16 June, 2018 and the need for planners to be more proactive in their approach to development control.

2.0 Study Area and Methodology

Bauchi is a city in Northeast Nigeria, and the capital of Bauchi State, situated in Bauchi Local Government Area. Its geographical coordinates are Latitude 10^0 18' 57'' North and Longitude 9^0 50' 39'' East. Bauchi has an altitude of 690.2m above sea level with an annual rainfall of 1091.4mm. The hottest and coldest temperatures are noticeable in the months of April and (December, January), 40.56^0c and (6.11^0c and 7.22^0c) respectively. Bauchi Local Government Area is bordered in the North, West, East, Southwest and Southeast by Ganjuwa, Toro, Kirfi, Tafawa-Balewa and Alkaleri respectively. Field observations were employed in selecting the neighbourhoods or communities affected by rainstorm within the Districts in Bauchi metropolis. Some of these districts include Yelwa, Makama, Hardo, Makama and others (see Figure 1). The authors visited some of these communities and conveniently sampled 130 people who were at the scene of the damaged properties or who witnessed the damage caused by the rainstorm. The authors conducted road side interviews along streets of the selected towns of study

for four working days. Respondents documented their concerns and the information was reduced to a meaningful size. The human factors responsible for aggravating rainstorm damages were summarized into six themes, while the physical planning factors were reduced to six themes. The nature of damages of the rainstorm varies from uprooted roofs (see Plate 1), damaged infrastructure (see Plate 2) and others.

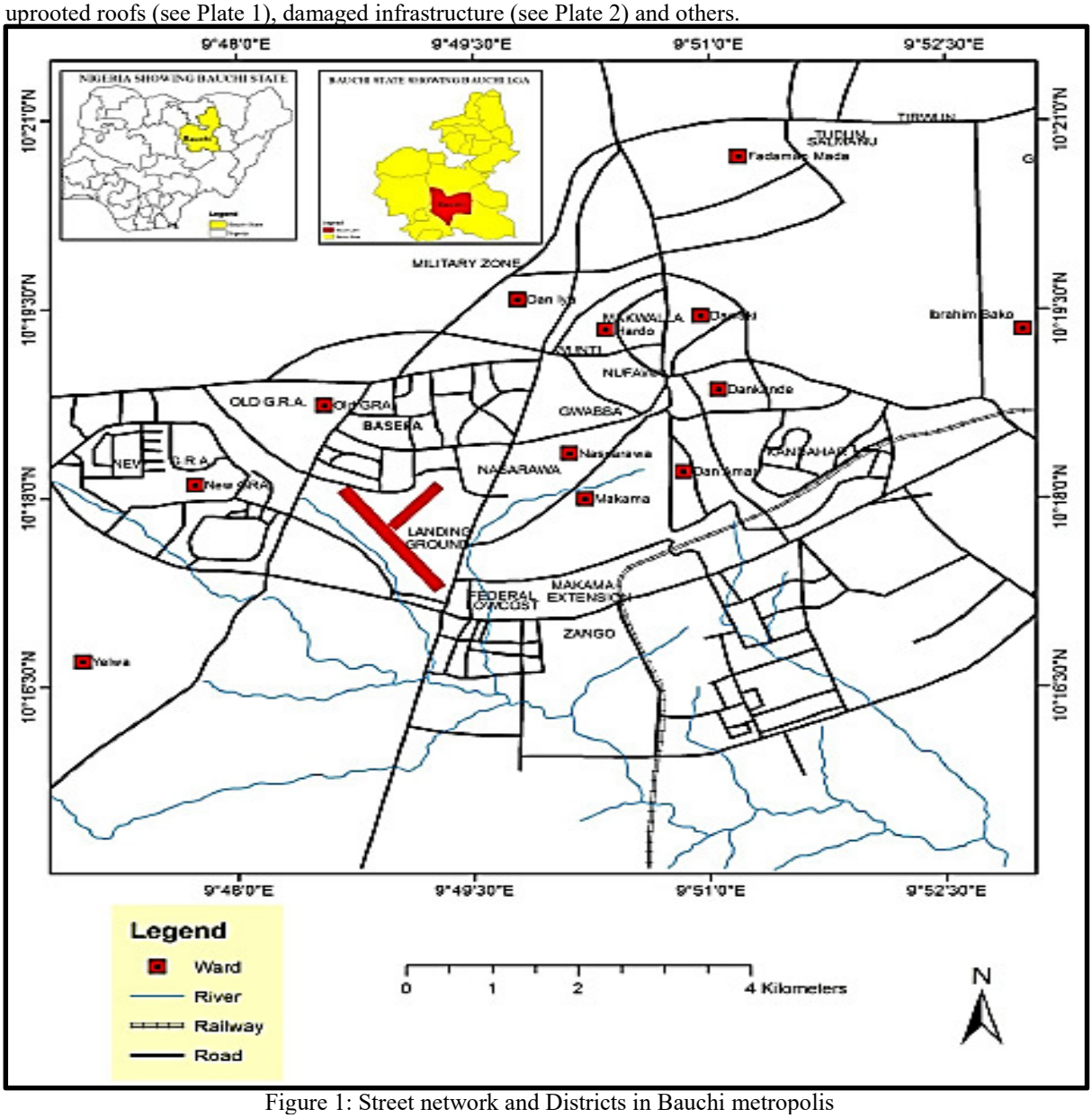

Figure 1: Street network and Districts in Bauchi metropolis
Source: Bauchi State Urban Development Board, 2008

Plate 1: Uprooted roof of Alfurqan International Academy along Abubakar Tafawa Balewa Road, Bauchi
Source: Researchers' Field Observations, 2018

Plate 2: Damaged street infrastructure along Bauchi-Jos Expressway.
Source: Researchers' Field Observations, 2018

Table 1: Selected towns affected by rainstorm in Bauchi metropolis

S/No	Affected Towns	Nature of Damage	Respondents
1	Tirwun	Loss of lives	39
2	Yelwa	Infrastructure destroyed	16
3	Kofar Dumi	Uprooted roofs	9
4	Wuntin Dada	Building collapse	13
5	Anguwan Hausawa	Loss of Vegetation	10
6	Zango	Building/ Wall collapse	17
7	Fadaman Mada	Uprooted roofs	14
8	Old GRA	Uprooted roofs	12
		Total	130

Source: Researchers' Field Survey, 2018

3.0 Review of Relevant Literature

Natural disasters such as rainstorm, windstorm and others are some of the debated areas in disaster research (Yin *et al*., 2011). Disaster risk assessments lack common procedures and programmes and extreme precipitation is thought to increase with warming at rates similar to or greater than the water vapour (Yin *et al*., 2011; Molnar *et al*., 2015).

The social media has also helped in generating and disseminating information about disasters because of the access to internet-enable devices (Wang *et al*., 2015), though this mode of dissemination is grossly inadequate as some older residents in urban settlements are not educated enough to maximise the full functions of their devices. Catastrophic rain events have occurred in many countries such as Nigeria, Canada and others (Szeto *et al*., 2011) and "due to rapid urban development, land use and land cover changes, the waterlogging induced by torrential rain or typhoon in urban areas has been a global challenge and a potential risk affecting the safety of urban buildings and interior property" (Quan *et al*., 2011). Juan *et al*. (2014), identified five rainstorm patterns (even, rising, falling, rising-falling, and falling-rising patterns), each with a different rainfall intensity pattern but with the same average rainfall intensity. However, the catastrophic effects of rainstorms also vary with places for example, falling-rising and rising-falling patterns are noticeable in African countries such as Nigeria, Ghana and others.

Rainstorms can induce waterlogging (Shi, 2013) and flood disaster (Shao *et al.*, 2014) causing heavy losses for people's lives and property and reducing the capacity of sustainable development of the national and local economy. Rainstorm waterlogging is one of the main urban natural disasters (Zhang *et al*., 2012) and "with the acceleration of urbanization processes, waterlogging problems in coastal cities are becoming more and more serious due to climate change. However, up until now, the common procedures and programs for rainstorm waterlogging risk assessment in coastal cities still have not formed" (Quan, 2014, p.1569). According to Chen *et al*. (2014, p.9964), "road waterlogging has a great influence on residents' travel and traffic safety. Thus, evaluation of residents' travel difficulties caused by rainstorm waterlogging disasters is of great significance for their travel safety and emergency shelter needs". In a study by Spekkers *et al*. (2015, p.261) on "the relative contribution of different failure mechanisms to the occurrence of rainstorm damage", roof and wall leakage was the most frequent failure mechanism causing precipitation-related claims. A study investigating whether social concern regarding disaster is greatly increased by an extraordinary rainstorm indicated that the level of public risk perception significantly increased post-disaster, with the degree of public concern regarding rainstorm risk and the number of people who implemented disaster prevention and preparedness measures being doubled (Su, 2015).

Adams and Dove (1984, p.1), opined that "underdeveloped land absorbs much of the water which falls during a rainstorm. However, urban development (which results in much of the land being covered by buildings and pavement) increases the extent of impervious land surface over pre-development conditions and this result in greater post-development runoff of the urban storm water". Dangers of potential disasters such as rainstorm are particularly high in low and mid-income nations like India where a major portion of the populace in urban communities lives in ghettos and extreme weather events have tremendous effects in urban zones. This situation demands a high need in identifying how urban planning and its related disciplines can contribute towards disaster risk reduction (Kundan, 2017). Urban rainstorm inundation is one of the major causes of urban flood disasters (Shen *et al*., 2016) and buildings on flood plains are prone to flooding in the event of over-bank spill accompanying high-intensity rainstorm (Wahab & Falola, 2017).

4.0 Results and Discussions

Urban poverty is documented as the underlining factor influencing aggravated damages of disasters (see Table 2). The use of inferior building materials in the construction of residential homes accounted for 17.7% of the general public response. Other human inadequacies aggravating rainstorm damages include the development of houses or structures by developers on risk prone zones (11.5%), Non-adherences to physical planning regulations such as setbacks, building codes, building lines and others (9.2%), urban decay and estate obsolescence (12.3%) and deviation from the plan approved by the planning authority in charge of jurisdiction (16.9%). There is a link between urban livelihoods and disaster. The more urbanites are employed or engaged in activities for wages or salary, the better their chances of coping with disaster. A higher income implies a decrease in poverty levels and increase in the construction of physically sound building and homes in non-risk zones. Private developers introduce structures such as corner shops, not approved in the building plans submitted in planning authorities. Usually these structures are constructed with substandard building materials which in turn increases risk levels in an event of a rainstorm. Obsolescence naturally sets in when building structure ages, this singular factor influenced the degree of damage caused by rainstorm in Bauchi.

Table 2: Human inadequacies aggravating rainstorm damages

S/No	Inadequacies	Number of Respondents	Per cent
1	Utilization of substandard building materials	23	17.7
2	Development on risk prone zones	15	11.5
3	Non-adherence to physical planning regulations	12	9.20
4	Urban poverty	42	32.3
5	Structural degeneration and obsolescence	16	12.3
6	Deviation from approved plan	22	16.9
	Total	130	100.0

Source: Researchers' Field Survey, 2018

The general public are of the opinion that corruption and bribery and the conduct of physical planning officers in public sector are the major factor aggravating the rainstorm damage on June 16, 2018 (see Table 3). Other factors responsible for the disastrous impact of June 16, 2018 rainstorm are poor policing of development by planners in their jurisdiction (19.2%), distortion of approved plans (9.20%), poor implementation of building regulations and execution of contravention notices (24.6%), poor integration of ecosystem services and green roofs into planning (12.3%) and poor urban governance and political interference (9.20%). Planning officers are offered bribe in the form of money to get irregularities of developers approved (Chiodelli & Moroni, 2015). This in turn leads to sharp deviation from the approved building plan or an introduction of a structure such as boys' quarters. Countries like Copenhagen and Myanmar have considered the emerging role of green roof technology as a strategy to reduce the impact of rainstorms. The impact of rainstorm is first intercepted by the roof and then gradually it seeps to the grounds (Taylor, 2007; Feng & Hewage, 2018). There are about 774 Local governments in Nigeria and about 6000 registered town planners in Nigeria. A careful look indicates that there are about eight (8) registered town planners per local government area in Nigeria, which is grossly inadequate. Efficient and adequate monitoring of developments is only achieved if the manpower base of planners is increased. Olufemi & Adebayo (2018) and Omollo, Hayombe, & Owino (2018) observed that non-compliance to building codes, physical and building regulations increases the negative impact of disasters. It is therefore pertinent that planners implement fully the penalties for contravention such as demolition and total clearance in the case of illicit slum developments. Governance of the city should be approached in a multidisciplinary manner by integrating different urban professionals such as surveyors, architects and relevant policy makers in the various arms of government.

Plate 3: Green roof technique in a low-income house in China
VanWoert, Rowe, Andresen, Rugh, Fernandez, & Xiao, 2005

Green roof technique is depicted in (Plate 3) as a strategy in coping with rainstorm disaster. As rainstorm increases, the vegetation and soil on the roof top traps the impact of rainstorm and invariably prevents it from uprooting the roof or destroying other house members.

Table 3: Physical planning inadequacies aggravating rainstorm damages

S/No	Inadequacies	Number of Respondents	Per cent
1	Acceptance of secret commissions and kick-backs for informal approval of deviation from approved plan	33	25.4
2	Planner's Inadequate monitoring of developments at jurisdiction	25	19.2
3	Distortion of approved plan to include illegal structures	12	9.2
4	Poor implementation of building regulations and execution of contravention notices	32	24.6
5	Integration of ecosystem services and green roofs into planning	16	12.3
6	Poor urban governance and political interference	12	9.2
	Total	130	100.0

Source: Researchers' Field Survey, 2018

5.0 Conclusion and Recommendation

The study concluded that disasters such as rainstorm will occur even if disaster mitigation issues are mirrored into physical planning. Certain disasters are acts of God and thus planning may not have a significant effect on rainstorm elimination because certain factors external to urban planning such as change in residents' income, and offering of money and gifts to planning officers can influence rainstorm outcomes. It is recommended that the processing of physical plan application be electronically managed from the point of application to the stage where the developer is given approval. This will prevent direct associations with planning officers and close the avenues for illegal deals. Improvement in wages and salaries by policy makers will have a positive effect on poverty reduction.

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