African Journal of Housing and Sustainable Development (AJHSD)
Volume 4, Number 1
http://ujh.unilag.edu.ng/index.php/ajhsd

Urban Fragility and the Aspiration for a Resilient City: Some Reflections on Jos Metropolis, Nigeria

Daniel, M. M.[1], **Molwus, J. J.**[2]

[1] Department of Estate Management, Faculty of Environmental Sciences, University of Jos, Nigeria
[2] Department of Building, Faculty of Environmental Sciences, University of Jos, Nigeria

To cite this article: Daniel, M. M. & Molwus, J. J. (2023). Urban Fragility and the Aspiration for a Resilient City: Some Reflections on Jos Metropolis, Nigeria. *African Journal of Housing and Sustainable Development, 4*(1), pp. 60-70.

Abstract

Urban fragility is a phenomenon that is conditioned by an accumulation of risks factors leading to crises, disruptions and destructions of varying scales in urban areas. Urban resilience seeks to mitigate fragility or counter its effects. It is on this theoretical footing that this empirical study is conducted in Jos metropolis in north central Nigeria, a location that has over the years accumulated devastating risks factors in spite of efforts to achieve resilience. Accordingly, the study undertakes an analysis of the scale of urban fragility along with the initiatives taken to improve resilience and mitigate the effects of fragilities in Jos metropolis. To this end, a wide range of secondary source material pertaining to nature and sources of fragilities and their impacts on humans, properties and supply of services was collected and combined with observations and lived experience for critical analysis. The analysis confirms that locational exposure of Jos to natural disasters in form of rainstorms and flash floods, as well as the absence of mitigation strategies, was responsible for fragilities leading to deaths, loss of property and disruptions of the supply of utility services on a seasonal basis. Other fragilities resulting from poor local governance, environmental degradation and overstretching of resources also produce environmental and socioeconomic impacts. It is concluded that human activities and the absence of adequate regulations at the city level expose the urban population to hazards. Further analysis suggests that resilient initiatives were tailored at improving urban governance, the institutional framework and the legal as well as regulatory mechanisms. While these efforts quite aligned with resilient intentions, they were, however, affected by inconsistencies and delayed implementation. Appropriate recommendations for upturning this situation in Jos metropolis are offered in the study.

Keywords: Aspiration; Jos metropolis; Resilient city; Urban fragility; Urban resilience

1.0 Introduction

Fragility has multiple connotations and in this study it is conceptualised in three-folds: one, it describes those threats to human lives that are largely environmental, economic, social and political in nature; two, it describes volatility of communities to natural or human induced shocks and the capacity of state institutions to deal with those shocks; and three, it refers to the level of weakness,

✉ mallod@unijos.edu.ng

sensitivity or disruptibility of a community or state institutions in the face of either natural or human induced threats (Bosetti, Ivanovic & Munshey, 2016). In the urban context, fragility is viewed as a major challenge because cities are faced with growing pressures from the environment and rising tensions from social systems (Trovato, 2022). Fragility is conditioned by an accumulation of risks, with its intensity varying considerably across time and location. While some locations are subject to moderate fragility, others experience acute fragility to the point of collapse. Fragility affects small and big cities; as such, it is a challenge for both developing and developed cities (Muggah, 2016).

The idea of urban resilience resulted from growing concerns about urban fragilities and the need to mitigate risks, ameliorate stresses and shocks or even adapt to or transform fragile conditions into resilient ones (Shamsuddin, 2020). Resilience is the capacity of a system to continue functioning through adaptation and transformation when under stress (Flax et al., 2020). Accordingly, the concept of resilience has become relevant in the context of strengthening and improving systems, especially within the realms of disaster risk reduction, climate action and urban development (Flax et al., 2020).

This article provides a context-specific analysis of the sources of fragility and the aspirations for resilience in Nigeria's Jos metropolis of Plateau State, a location that has over the years accumulated risk factors that have continually devastated it in spite of government's efforts to achieve stability. The overall aim of the study is to undertake a context-specific analysis of the scale of urban fragility in Jos metropolis while also highlighting the initiatives taken by the city's authorities to improve on urban resilience and to mitigate the effects of fragilities. This aim is addressed by two broad objectives. Firstly, the scale of urban fragility in Jos metropolis is analysed. Secondly, the initiatives taken by city authorities to improve urban resilience and mitigate the effects of fragilities are scrutinised.

2.0 Literature Review

The concept of urban resilience has received considerable academic attention, hence the presence of numerous definitions and strategies on it in the literature. Despite the heterogeneity in the characteristics and definitions of urban resilience, consensus appears not to have been reached. This has led to the depth and breadth of urban resilience research being expanded and shifted from theoretical exploration to practical application. Consequently, the multidimensional nature of urban resilience has been recognised and indicators covering a wide variety of issues have been proposed, including self-help and state action (Kong et al., 2022). For instance, cities have stayed fragile because of limited government attention to improving infrastructure and a lack of commitment to assist vulnerable urban communities to build resilience to natural shocks. Nevertheless, urbanisation and competition for scarce resources and basic infrastructure have been on the increase, thus hampering the capacity of urban communities and government to cope with shocks and stress (Nop and Thornton, 2019).

The Intergovernmental Panel on Climate Change (IPCC, 2014) defined resilience as:

> *"the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation."*

Urban resilience has also been defined 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 return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity" (Meerow et al., 2016:45).*

Meerow et al. (2016) note that "urban resilience" manifests as an urban system that can maintain

or rapidly return to desired functions in the face of a disturbance or that can adapt to change and quickly transform social and ecological systems that limit current or future adaptive capacity. This has hardly been absolutely obtainable in any city or urban system, hence the need for further efforts towards attaining urban resilience.

Urban resilience is highly dependent on socioeconomic development and urbanisation. Nop and Thornton (2019) suggested supporting livelihood improvement programmes, addressing land tenure insecurity and improving basic infrastructure in informal settlements in order to attain urban resilience, since these factors play a role in issues of urban fragility (Avis, 2016). Despite widespread efforts at curbing urban fragility through the creation of urban resilience, as noted in the introduction, there is still no universal solution, as underdeveloped, developing and developed cities have all been found to experience some level of fragility (Heinzlef et al., 2020). Strategies for building urban resilience in cities have been found to include analysing the benefits of the diagnostic phase of resilience planning, evaluating resilience goals to determine the most responsible stakeholders, understanding local barriers, identifying the need for trade-offs and adopting a broad systems approach (Fastiggi et al., 2021). More recently, however, Chen et al. (2022) found that even cities with many similar characteristics have different elements of attention for enhancing urban resilience owing to their differing priorities, economic development and governance backgrounds, hence our context-specific investigation of Jos metropolis.

Muggah (2016) identified the risk factors shaping urban fragility, including rapid urbanisation, income and social inequality, youth unemployment, homicidal and criminal violence, and climate threats. In addition, Avis (2016) attributed urban fragility to the failure of authorities to deliver basic services as well as to inaccessibility of basic services by the urban poor. Furthermore, a recent report (Corral et al., 2020) indicates that conflict situations are a major catalyst for fragility and that the prevalence of fragile and conflict-affected situations are on the rise. The report also confirmed that fragility and conflict-affected situations are the main reasons for the rise in global poverty. The study estimated that up to two-thirds of the global extreme poor would be living in fragile and conflict-affected situations by 2030. It is sadly noted that 43 countries with the highest poverty rates are in fragile and conflict-affected situations, and that most of these countries are in Sub-Saharan Africa. Therefore, it is advocated that global attention should be given to fragility and conflict in order to eliminate global poverty and create liveable spaces.

The literature on urban resilience reveals an important gap in terms of implementation of resilient strategies. Extant proposals on how to make cities resilient include the International Strategy for Disaster Reduction (UN/ISDR, 1999), the Sendai Framework for Disaster Risk Reduction 2015-2030 (UNISDR, 2015) and the UN office for Disaster Risk Reduction (UNIDR, 2017). These proclamations provide strategies and essentials for making cities more resilient, especially since they are meant to guide local government leaders. However, scholars such as Bush and Doyon (2019) and Shamsuddin (2020) have raised concerns over the challenge of implementation. Shamsuddin (2020) identified the fuzziness of the concept of urban resilience as well as the multiplicity of issues involved, leading to difficulty in its implementation. In addition, Shamsuddin observed that urban resilience implementation requires authorities to establish where implementation begins and ends, what to include or exclude, how to coordinate both government and non-governmental organisations, as well as how to adapt to changing socioeconomic and political conditions. These are critical implementation challenges that deserve academic attention. Furthermore, it is only through context-specific analysis that a location's resilience may be determined in relation to its fragilities. Accordingly, there is need for more context-specific analysis of urban resilience policies and their implementation.

3.0 Methodology

The data for this study was collected from Jos, the capital city of Plateau State. The study

adopts a multi-method approach involving use of documentary evidence, observations and the lived experiences of the researchers. Multiple methods may prove quite useful toward gaining a rich understanding of a complex phenomenon (Roller & Lavrakas, 2015) such as the idea of urban fragilities.

The record of documentary evidence collected, their sources and date of publication are outlined in Table 1. In all 12 newspapers (published between 2015 and 2021), one press statement (issued in 2022), and two news commentaries (published in 2012 and 2018 respectively), and three publications of the Plateau State Government were collected for analysis. The documents were sourced from the websites of their publishers during internet search starting from March 2022 to June 2022.

Table 1: Types and sources of documentary evidence used

Type of data	Source of data and publication date /date collected
Newspapers	Blue Print, 2016, April 5 Daily Trust, 2015, Jul 15 Daily Trust, 2019, July 3 Daily Trust, 2020, October 16 Daily Trust, September 5, 2018 Herald, 2019, July 11 Premium Times, 2015, September 29 Sundiata post, 2020, March 12 The Guardian, 2018, July 21 Vanguard, 2012, July 24 Vanguard, 2021, August 25 View Point, Nigeria, 2018, June 3
Press Statement	University of Jos, 2022, April 24
News Commentaries	BBC New, 2012, July 24 NAN, 2018, July 21
Documents from Plateau State Government	Statistics of conflicts in Plateau State (March 2022) Project executed by Plateau State Government (March 2022) Activities of Ministries, Departments and Agencies (March 2

Source: Author's compilation (2022)

The documents collected were subjected to content analysis. In this respect the focus was on the occurrences of rainstorms, flash floods, deaths recorded, quantum of property destroyed, and the interruptions to utility services in Jos metropolis. Others aspects of the analysis covered vulnerability, local governance, environmental degradation and its attendant consequences, and the resilient initiatives introduced by the authorities in Jos. The content analysis of the documents was enriched with data collected from observations for the discussion. Finally, the bits of evidence were triangulated before conclusions were reached. The results of the analysis were tabulated for easy visualization and reference.

4.0 Results and Discussion

4.1 The Scale of Urban Fragility in Jos

The scale of urban fragility in Jos metropolis is discussed in this sub-section, which corresponds with the first objective as presented in the introductory section. Risks and fragilities can arise either from location and exposure to hazards or from increased vulnerability due to poor local governance, environmental degradation and the overexploitation of resources (UNDP, 2010). The data obtained and analysed confirmed two risk factors (as presented in Table 2) that are often triggered by location and exposure to hazards in Jos metropolis. One of the risk factors is rainstorm or windstorm, which usually occurs at the first rains of April and May, and lasts all through the rainy

season. In the last decade, for instance, there were four occurrences of rainstorms and windstorms that caused different scales of destruction in Jos metropolis as shown in Table 2. Jos is considered a fragile city, given its exposure to these weather events. Furthermore, the location is susceptible to flash flooding that happens occasionally as a result of heavy rains causing overflowing of dams around Jos (a situation worsened by lack of drainage for rainwater). As outlined in Table 2, four incidences of flash flooding were recorded from 2012 to 2021 and these led to loss of property and human lives, as well displacement of settlements and interruption of livelihoods.

As seen in Table 2, rainstorms, windstorms and flash flooding have devastating effects on Jos metropolis. It is therefore surprising that local authorities have continued to ignore forecasts and warnings from the Nigerian Metrological Agency (NiMet) and the Nigeria Hydrological Services Agency (NIHSA), especially when such warnings affect Jos in particular and Plateau State in general (Yakubu & Eromosele, 2021). Thus, absence of local action in Jos is one of the reasons why rainstorms and flash floods have claimed lives and caused wanton destruction of property (see Table 2).

Table 2: Risks and Fragilities Arising from Location and Exposure to Hazards in Jos

Risks and Fragilities	**Recent Timelines**	**Impact**
Rainstorm and Windstorm usually at the inception of rains and through the rainy season	September 2015	Unrecorded deaths and injuries; power lines, vehicles and billboards destroyed; electricity and businesses interrupted; and unrecorded human settlements temporarily displaced (Ajijah, 2015)
	July 2017	Two deaths recorded, unrecorded houses destroyed and businesses interrupted ("Plateau: Rainstorm Kills 2", 2015)
	August 2018	Damage to electricity installation caused power supply interruption for Jos Electricity Distribution Company (JEDC) for several days ("Windstorm: Power Restoration", 2018)
	April 2022	Damage to public buildings and facilities (University of Jos, 2022)
Flash flood as a result of heavy rain lasting several hours, overflowing of dams, and lack of rain water drainage	July 2012	35 deaths, 200 houses destroyed, and 3,000 people left homeless (Obateru, 2012; BBC, 2012).
	July 2015	Unaccounted number of houses flooded ("Plateau: Rainstorm Kills 2", 2015)
	July 2019	Three deaths, nine houses destroyed and several flooded ("Flood Kills Family of 3", 2019)
	August 2021	Unaccounted number of houses destroyed or flooded (lived experience)

Source: Authors' compilation (2022)

As noted already, certain risks and fragilities arise from increased vulnerability due to poor local governance, environmental degradation and overstretching of resources. These findings suggest a need for authorities in Jos to develop an early warning system for natural and human-made disaster as it obtains elsewhere for example, in Pakistan (Mukhtar, 2018) and Jordan (Momani & Alzaghal, 2009), where governments have developed early warning systems for use at the city level. Broader examination of the literature (see Suárez et al. 2016; Zheng et al. 2018) suggests that city-level solutions, which are evidently lacking in Jos, are crucial to building city resilience. In building urban resilience, there is also a call (Rogers & Tsirkunov, 2011) for the adoption of people-centred early warning systems that incorporate risk knowledge, monitoring and warning service, dissemination and communication, and response capability. These are important aspects that city authorities in Jos need to pay attention to in order to realise the aspirations for a resilient city.

The information presented in Table 3 suggests that poor local governance alone is a major reason for lack of urban resilience in Jos. The evidence proves that poor local governance has consequences for urban resilience in Jos, including inadequate fire safety arrangements, poor enforcement of planning standards, ethno-religious conflicts, urban crime, inadequate electricity supply, poor enforcement of building regulations, and weak enforcement of traffic regulations. These failures have continuously produced a wide range of impacts as highlighted in Table 2.

Table 3: Vulnerability due to Poor Local Governance, Environmental Degradation and Overstretching of Resources in Jos

Sources of Risks and Fragilities	Outcomes	Impact
Vulnerability due to Poor Local Governance	Inadequate fire safety arrangement (NAN, 2018; Ozigis, Gajere, Emmanuel & Hyelpambuwa, 2013)	Incidence of fire disasters leading to deaths and loss of properties
	Poor enforcement of planning standards (Dung-Gwon & Jugu, 2017)	Unplanned settlements; overcrowded homes; fire disasters; and erection of buildings on surface and storm water drains
	Ethno-religious conflicts (PPBA, 2021)	Killings; destruction of properties; loss of social cohesion and city balkanization
	Gang rivalry and violence (Odey, 2016)	Killings; interruption of economic activities; theft; loss of nightlife
	Inadequate electricity supply, maintenance of installations, and surveillance *(Observation)*	Power outages; unauthorized electricity connection; deaths arising from electrocutions; vandalism of installation
	Ineffective healthcare system	Poor management of epidemics (Lassa fever, Cholera, COVID, etc.)
	Poor municipal waste management (Peter, 2016)	Uncontrolled discharge of waste; unpleasant odour, poor sanitation conditions
		Indiscriminate dumping of refuse, unpleasant odour; contamination
	Urban crime (Bako, 2018)	Armed robbery and theft
	Poor enforcement of building regulations (*Observation)*	Incidences of building collapse; substandard construction
	Weak enforcement of traffic regulations (*Observation)*	Traffic congestion; road traffic accidents
	Inadequate water supply (Agas, 2019)	Poor sanitation and hygiene conditions; outbreak of epidemics
	Inadequate road network (Oluwole, 2014)	Road traffic accidents; traffic congestions; loss of productive time
Vulnerability due to Environmental Degradation and Overstretching of Resources	Increase in urban population (PPBA, 2021; Akintunde, Adzandeh, & Fabiyi, 2016; Ryeshak et al. 2015)	Pressure on natural resources; over-exploitation of trees (for timber and heating), soil, stones, underground and surface water; destruction to environment during extraction and utilization; urban sprawl; deficiencies in delivery of basic services
	Deforestation and absence of afforestation programs (Agas, 2020)	Loss of vegetation; environmental erosion, damage to ecosystem; biodiversity loss; animal extinction
	Landfills	Reclamation of mining for use as building land; filling of ponds with wastes that contain hazardous chemicals; contamination of land and water bodies
	Absence of clean energy sources; Inadequate electricity supply and failure to develop renewable energy alternatives *(lived experience)*	Excessive emission of carbon monoxide from power generators and noise pollution; rising carbon emission from use of charcoal, firewood and kerosene for heating; air pollution

Source: (Authors' compilation, 2022)

4.2 Resilient Decisions and Actions in Jos

This sub-section addresses the second objective of the study, which seeks to establish progress, gaps and lapses in building resilience for Jos metropolis. Consequently, the analysis focuses on decisions and actions relating to the idea of resilient cities as documented by Shamsuddin (2020) and Meerow et al. (2016). Table 4 provides an outline of the thematic areas in which resilient actions and decisions are evident in Jos, one of which is disaster preparedness and prevention. Because this is a priority area, government has paid attention to it by establishing an agency corresponding with one at the federal government level. Similarly, conflict management and prevention has received due attention. As at the time of the study, the agency was implementing a strategic action plan that was formulated in 2018. However, there are no similar arrangements at the local government level, a situation that makes the task of peace building more difficult for the Plateau Peace Building Agency.

Another area of significant action concerns efforts made to strengthen the institutional framework for environmental protection and the management of natural resources, although there is inconsistency in the execution of plans and programmes. Examples include abandonment of the tree-planting scheme/campaign (Agas, 2020) and the failure to reclaim mining ponds while curbing further land degradation as a result of artisanal mining activities within and around Jos. Regarding critical infrastructure and services, some roads and overpasses are visible, as well as donor intervention in micro-infrastructure. These, however, are only made possible through huge domestic and foreign loans that are often poorly applied in the face of criticism for raising the state's debt profile. This is a potential threat to the sustainability of governance.

Currently, a robust institutional and legal framework exists for urban planning, development control and housing, as indicated in Table 4. Nonetheless, coordination is lacking in the area of urban planning and enforcement of building regulations. The Sendai Framework for Disaster Risk Reduction (UNISDR, 2015) particularly emphasised the need for coordination in building a resilient framework. However, successive governments have not managed to provide affordable housing in Jos. Taken together, these factors have exacerbated vulnerabilities for residents, thus exposing them to varying kinds of risks as observed in preceding discussions (see Tables 2 and 3). On a positive note, however, the ongoing transition to petroleum cooking gas, is quite commendable as far as the use of clean energy is concerned. Similarly, urban agriculture is gaining currency in Jos, thereby adding to the environment's green cover while also contributing to food sustainability. It also promotes waste recycling, as farmers use organic manure on their gardens (Wuyep, 2021). Moreover, more green spaces are emerging from private investment in commercial parks and gardens, bringing with it eco-friendly benefits. No doubt, these practices drive urban resilience for the city of Jos.

Table 4: Outline of Resilient Actions and Decisions in Jos

Thematic Areas	Decision and Action
Disaster preparedness and prevention	Emergency management agency created in 2012 for the purpose of building a culture of preparedness, prevention, response and community resilience to disaster (Plateau State Government, 2021a)
Conflict management and prevention	Peace building agency created 2015 and saddled with the responsibility of nurturing and promoting mutual trust (Plateau State Government, 2021a)
	Peace building agency formulated a roadmap for peace/strategic action plan from 2018 – 2022 (Plateau State Government, 2021a)
Strengthening Institutional Framework for Environmental Protection and natural resource management	Ministry of Environment was established in 1999 with a mission to preserve and protect the environment from both natural and human-made disaster
	Ministry of Mineral Development created in 2009 with a mission to regulate and coordinate mineral extraction and reclaim 4000 mining ponds that are scattered in and around Jos for economic use (Plateau State Government, 2021a)
	Environmental protection and sanitation agency established and saddled with the responsibility of ensuring safe, clean and orderly environment, and keeping the ecosystem at a state of equilibrium for healthy human habitation
	Ecological master plan developed in 2010 (Plateau State Government, 2021a)
	Annual tree planting campaign reintroduced as part of efforts to check deforestation (Agas, 2020).
Critical urban infrastructure and basic services	Community and Social Development Agency created in 2009 to implement a World Bank assisted community and social development program
	Beginning from year 2000, massive urban road infrastructure projects embarked upon, focusing on road expansion, road resurfacing, construction of storm drains and drainages, construction flyover bridges, solar power street lighting project (Plateau State Government, 2021b)
	Universal health coverage scheme introduced for state and local government workers (Plateau State Government, 2021a)
	Dredging and expansion of Dams, expansion of pipeline network for treated water, construction of new reservoirs for treated water.
Urban Planning, Development control and housing	Greater Jos Master was updated in 2009. Geographic Information System created
	Several agencies including Ministry of Lands & Survey, Ministry of Physical Planning, Ministry of Housing & Urban Development, Ministry of Works, and the Jos Metropolitan Board have been in existence and are saddled with statutory responsibilities (Plateau State Government, 2021a)
Use of clean energy as source of heating	Households are gradually shifting from the use of fossil fuels to liquefied petroleum gas, which is a clean cooking fuel (*observation and live experiences*)
Urban Agriculture and Green landscaping	Urban agricultural in Jos is increasing cover and recycling of waste as organic manure is utilised in growing plants (Wuyep, 2021; "How Jos Residents", 2020). Green spaces are increasing owing to private investment in commercial parks and gardens, which have eco-friendly benefits (*observation and lived experiences*)

Source: Authors' Compilation

5.0 Conclusion

This study analysed the scale of urban fragility in Jos metropolis and the initiatives taken by city authorities to boost its resilience status while mitigating the effects of fragility. To this end, the first line of analysis focused on the scale of urban fragility in Jos metropolis and the findings revealed two phenomena of concern. One, seasonal rainstorms and windstorms alongside flash flooding arising from heavy rains, dam overflows and lack of drainage channels are important

sources of risks and fragilities in Jos. These fragilities were found to account for human deaths, loss of property and disruptions to the supply of utility services on a seasonal basis. Consequently, it is concluded that the locational exposure of Jos city to natural disasters, coupled with poor natural disaster mitigation arrangements, is responsible for the risks and fragilities experienced on a seasonal basis. Two, further analysis reveals other dimensions of fragilities resulting from poor local governance, environmental degradation and overstretching of resources. These fragilities often produce a wide range of environmental and social impacts, including poor urban planning, shortage of infrastructure services and loss of vegetation, among others. It is concluded that human activity and the absence of regulations on the local scale combine to produce risks and fragilities that make urban populations vulnerable.

The second objective was concerned with the initiatives taken by relevant authorities to improve on urban resilience and to mitigate the effects of fragility. The analysis suggests that the actions and decisions of government aimed to improve the governance of resilience, the building of institutional frameworks and the formulation of legal and regulatory frameworks. While these efforts are consistent with resilient thinking and intentions (UNISDR, 2015), the initiatives were affected by inconsistencies despite strident calls (see UNDP, 2010; UN/ISDR, 1999; and UNISDR, 2015) for countries and their cities to adopt frameworks for disaster risk reduction and mitigation. This is an aspect that needs attention by Jos authorities in view of the recurrence of seasonal natural disasters in the city.

References

Agas, M. (2019, July 11). Open defecation, major cause of water pollution, diseases in Jos North – Official. *Herald.* https://www.herald.ng/open-defecation-major-cause-of-water-pollution-diseases-in-jos-north-official/.

Agas, M. (2020, March 12). Deforestation: Plateau Govt to reintroduce annual tree planting. *Sundiata Post.* https://sundiatapost.com/deforestation-plateau-govt-to-reintroduce-annual-tree-planting/.

Ajijah, A. (2015, September 29). Rainstorm wreaks havoc on Plateau Communities. https://www.premiumtimesng.com/regional/north-central/190805-rainstorm-wrecks-havoc-on-plateau-communities.html

Akintunde, J. A., Adzandeh, E. A., & Fabiyi, O. O. (2016). Spatio-temporal pattern of urban growth in Jos Metropolis, Nigeria. *Remote Sensing Applications: Society and Environment*, *4*, 44-54.

Avis, W. R. (2016). *Urban governance: Topic guide*. Birmingham, UK: GSDRC, University of Birmingham.

Bako, F. (2018, June 3). Nigeria: 'Cultism Affecting Night Life in Jos'. *Viewpoint.* https://viewpointnigeria.org/nigeria-cultism-affecting-night-life-jos/

BBC (2012, July 24). *Nigeria: Deadly flooding in Jos in Plateau State*. https://www.bbc.com/news/world-africa-18966160

Bosetti, L., Ivanovic, A., & Munshey, M. (2016). Fragility, Risk, and Resilience: A Review of Existing. United Nations University Centre for Policy Research Background Paper.

Bush, J., & Doyon, A. (2019). Building urban resilience with nature-based solutions: How can urban planning contribute? *Cities*, *95*, 24-35.

Chen, M., Lu, Y., Peng, Y., Chen, T. & Zhang, Y. (2022). Key Elements of Attentions for Enhancing Urban Resilience: A Comparison of Singapore, Hong Kong and Hangzhou. *Buildings*, *12*(3), 1-21. https://doi.org/10.3390/buildings12030340

Corral, P., Irwin, A., Krishnan, N., Mahler, G. G. & Vishwanath, T. (2020). Fragility and Conflict on the Front Lines of the Fight Against Poverty. International Bank for Reconstruction and Development / The World Bank.

Dung-Gwom, J. Y., & Jugu, A. S. (2017). Characteristics and planning challenges of hilltop settlements in Jos Metropolis, Nigeria. *UPLanD-Journal of Urban Planning, Landscape & environmental Design*, *2*(2), 129-149.

Fastiggi, M., Meerow, S., & Miller, T. R. (2021). Governing urban resilience: Organisational structures and coordination strategies in 20 North American city governments. *Urban Studies*, *58*(6), 1262-1285.

Flax, L., Altes, R. K., Kupers, R., & Mons, B. (2020). Greening schoolyards—An urban resilience

perspective. *Cities*, *106*, 10-28.
Flood Kills Family of 3, destroys 9 houses in Jos North. (2019 July 3). *Daily Trust*. https://dailytrust.com/flood-kills-family-of-3-destroys-9-houses-in-jos-north.
Heinzlef, C., Robert, B., Hémond, Y., & Serre, D. (2020). Operating urban resilience strategies to face climate change and associated risks: Some advances from theory to application in Canada and France. *Cities*, *104*, 102762.
How Jos Residents take to Gardening. (2020 October 16). *Daily Trust.* https://dailytrust.com/how-jos-residents-take-to-gardening.
IPCC, I. (2014). Climate change 2014: Synthesis report. Contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change. 1-112.
Kong, L., Mu, X., Hu, G. & Zhang, Z. (2022). The application of resilience theory in urban development: a literature review. *Environ Sci Pollut Res. 29***,** 49651–49671. https://doi.org/10.1007/s11356-022-20891-x
Meerow, S., Newell, J. P., & Stults, M. (2016). Defining urban resilience: A review. *Landscape and urban planning*, *147*, 38-49.
Momani, N., & Alzaghal, M. H. (2009). Early warning systems for disasters in Jordan: current and future trends. *Journal of Homeland Security and Emergency Management*, *6*(1).
Muggah, R. (2016, February). How fragile are our cities? In *The World Economic Forum*. https://www.weforum.org/agenda/2016/02/how-fragile-are-our-cities.
Mukhtar, R. (2018). Review of national multi-hazard early warning system plan of Pakistan in context with sendai framework for disaster risk reduction. *Procedia engineering*, *212*, 206-213.
NAN (2018 July 21). Jos main market gutted by midnight fire. *The Guardian*. Available at**:** https://guardian.ng/news/jos-main-market-gutted-by-midnight-fire/.
Nop, S., & Thornton, A. (2019). Urban resilience building in modern development. *Ecology and Society*, *24*(2).
Obateru, T. (2012, July 24). 35 killed, 200 houses destroyed in Jos flood. *Vanguard.* Retrieved from: https://www.vanguardngr.com/2012/07/35-killed-200-houses-destroyed-in-jos-flood/
Odey, U. (2016 April 5). Plateau Police Command Vows to Curb Cultism. *Blueprint.* Available at: https://www.blueprint.ng/plateau-police-command-vows-to-curb-cultism/.
Oluwole, O. A. (2014). Characterization of Jos City Road Network, Nigeria. *The Indonesian Journal of Geography*, *46*(2), 177.
Ozigis, S. M., Gajere, E. N., Emmanuel, E. A., & Hyelpambuwa, Y. (2013, August 12-14). Spatial analysis of fire disaster and emergency service location in Jos Metropolis. *Proceedings of the West Africa Built Environment Research (WABER)*, British Council, Accra, Ghana 1023-1031.
Peter, G. (2016). *Planning for municipal solid waste management: the case of Greater Jos, Nigeria* (Doctoral dissertation, Heriot-Watt University).
Plateau State Government (2021a). *Ministries, Department and Agencies.* Plateau State ICT Development Agency. https://www.plateaustate.gov.ng.
Plateau State Government (2021b). *Projects.* Plateau State ICT Development Agency. https://www.plateaustate.gov.ng.
Plateau: Rainstorm Kills 2, destroys houses in Jos. (2015, Jul 15). *Daily Trust*. https://dailytrust.com /plateau-rainstorm-kills-2-destroys-houses-in-jos.
PPBA (2021). Breakdown of conflict issues and emerging fault lines in Plateau State. Accessed at https://plateaupeacebuilding.org.
Rogers, D., & Tsirkunov, V. (2011). Implementing hazard early warning systems. *Global Facility for Disaster Reduction and Recovery*, *11*, 1-47.
Roller, M. R., & Lavrakas, P. J. (2015). *Applied qualitative research design: A total quality framework approach*. Guilford Publications.
Ryeshakº, A. G., Amobi¹, A. K., Lekwot, V. E., Yakubu, A. A., Kwesaba, D. A., & Sahabo, A. A. (2015). Population Increase and Water Supply in Nigerian Cities: Case Study of Jos in Plateau State, Nigeria. *Int. J. of Multidisciplinary and Current research*, *3*.
Shamsuddin, S. (2020). Resilience resistance: The challenges and implications of urban resilience implementation. *Cities*, *103*, 1-8.
Suárez, M., Gómez-Baggethun, E., Benayas, J., & Tilbury, D. (2016). Towards an urban resilience Index: a case study in 50 Spanish cities. *Sustainability*, *8*(8), 774.
Trovato, M. R. (2022). Urban Fragility Subjects: Economics. Scholarly Community Encyclopedia. Retrieved from https://encyclopedia.pub/item/revision/a4da62c11314f454f763bc738f6daa3c

UN/ISDR (1999). International Strategy for Disaster Reduction: A Safer World in the 21st Century: Disaster and Risk Reduction. Newsletter for Latin America and the Caribbean, *Issue No. 15.*

UNDP (2010). *Urban Risk Management.* New York: Bureau for Crisis Prevention and Recovery.

UNISDR (2015). *Sendai Framework for Disaster Risk Reduction 2015 – 2030*. Geneva: United Nations.

UNISDR (2017). *How to Make Cities More Resilient. A Handbook for Local Government Leaders P.3*

University of Jos (2022, April 24). *Windstorm Wreaks Havoc in UniJos*. [Press Release]. https://www.unijos.edu.ng/index.php/WindstormWreaksHavocinUnijos

Windstorm: Power Restoration at 95%, Says Jos Disco. (September 5, 2018). *Daily Trust.* https://dailytrust.com/windstorm-power-restoration-at-95-says-jos-disco-264261.

Wuyep, S. (2021). The role of urban vegetable production in Jos (Nigeria) as a source of livelihood. *African Journal of Food, Agriculture, Nutrition and Development, 21*(8), 18533-18551.

Yakubu, D. & Eromosele, F. (2021, August 25). NiMet predicts flash flood in Lagos, Delta, Enugu, Kaduna, 30 other states. *Vanguard.* https://www.vanguardngr.com/2021/08/nimet-predicts-flash-flood-in-lagos-delta-enugu-kaduna-30-other-states/.

Zheng, Y., Xin-Lu, X., Chen-Zhen, L., Mou, W., & Xiao-Jia, H. E. (2018). Development as adaptation: Framing and measuring urban resilience in Beijing. *Advances in Climate Change Research*, *9*(4), 234-242.