IPS Interdisciplinary Journal of Social Sciences
IPS Int. J. Soc. Sci., 3(1): 54-60 (2025)
DOI: https://doi.org/10.54117/44kyg015

Disaster Risk Governance and Microbial Infection Transmission in Nigeria: Public Administration Implications

Obioma Davison Mbanefo[1], Madumelu H. C. Madubueze[1], James Kodilichukwu Anekwe[2], Nnamdi Michael Nwadiogbu[1], Anthony Ejue Egberi[3]

[1]Department of Public Administration, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, Nigeria.
[2]Department of Political Science & Public Administration, Federal University Otuoke, Bayelsa State, Nigeria.
[3]Department of Public Administration, Federal University Wukari, Taraba State, Nigeria.

*Corresponding authors' email: od.mbanefo@coou.edu.ng

Abstract

Climate change has become an increasingly important factor influencing the emergence and spread of microbial infections, particularly in developing countries with fragile health systems. This review examines the relationship between climate change and emerging microbial infections within Nigerian public health systems, focusing on how rising temperatures, altered rainfall patterns, flooding, drought, and extreme weather events affect pathogen survival, transmission dynamics, and disease distribution. Nigeria's diverse ecological and climatic zones provide a unique setting in which climate variability reshapes microbial ecology, promotes the emergence of waterborne, foodborne, vector-borne, zoonotic, and respiratory infections, and intensifies seasonal disease outbreaks. Climate-driven environmental changes, including poor water quality, ecosystem disruption, and population displacement, further increase exposure risks and challenge disease prevention and control efforts. These pressures are compounded by existing public health limitations such as inadequate sanitation, weak disease surveillance, limited laboratory capacity, and the growing burden of antimicrobial resistance. The review highlights the implications of climate change for infectious disease surveillance, outbreak preparedness, and healthcare delivery in Nigeria.

Keywords: Disaster Epidemiology, Flood-Related Outbreaks, Nigeria, Waterborne Diseases, Public Health Infrastructure

Article History
Received: 30 Oct 2025
Accepted: 25 Nov 2025
Published: 10 Dec 2025

Scan QR Code to view[1]

How to cite this paper: Mbanefo, O. D., Madubueze, M. H. C., Anekwe, J. K., Nwadiogbu, N. M., & Egberi, A. E. (2025). Disaster risk governance and microbial infection transmission in Nigeria: Public administration implications. *IPS Interdisciplinary Journal of Social Sciences, 3*(1), 54–60. https://doi.org/10.54117/44kyg015

1. Introduction

The increasing frequency and intensity of climate-related disasters, such as catastrophic flooding, extreme droughts, and intensified storms, pose a profound and escalating threat to global public health, with devastating local impacts. In Nigeria, a nation acutely vulnerable to climatic shifts, these events are not merely environmental crises but potent catalysts for the transmission and amplification of microbial infections. The interplay between disaster-induced environmental disruption, compromised infrastructure, and human vulnerability creates a dangerous syndemic, overwhelming fragile health systems and deepening socio-economic inequities (Phalkey and Sauerborn, 2020). For instance, widespread flooding, which has become more frequent and severe, consistently leads to the contamination of drinking water with fecal pathogens, directly driving cyclical epidemics of cholera and other diarrheal diseases, as evidenced by post-flood outbreak data from states like Kogi, Bayelsa, and Anambra (Olanrewaju *et al.*, 2022; Azuogu *et al.*, 2021). Concurrently, the large-scale displacement of populations into overcrowded, informal camps creates conditions ripe for the transmission of respiratory pathogens, including *Mycobacterium tuberculosis* and influenza viruses, and can disrupt childhood immunization programs, leading to resurgences of measles and pertussis (Bowen *et al.*, 2021; Dairo and Bamidele, 2020). Furthermore, drought and desertification in the Sahelian regions of Nigeria alter vector ecology and human habitation patterns, potentially expanding the geographic range of malaria and facilitating zoonotic spillover events, such as Lassa fever, through increased human-rodent contact (Okaka and Omondi, 2021; Okorie *et al.*, 2023). This complex nexus underscores climate change as a critical determinant of infectious disease burden, revealing a direct pathway through which environmental shocks translate into public health emergencies. A robust understanding of these context-specific transmission mechanisms, grounded in local epidemiological and climatological data, is therefore indispensable for crafting effective, integrated policies that combine climate adaptation with infectious disease control to safeguard Nigeria's population.

1.2 Concept of Microbial Infection Transmission

Microbial infection transmission refers to the mechanisms by which pathogenic microorganisms—including bacteria, viruses, fungi, and parasites—spread from a source to a susceptible host, leading to infection and potential disease. In the context of disaster scenarios, these transmission dynamics are significantly amplified and altered. The primary routes of transmission include waterborne (e.g., cholera, typhoid, and hepatitis E from contaminated water), vector-borne (e.g., malaria, dengue, and Lassa fever transmitted by mosquitoes or rodents), airborne/respiratory (e.g., tuberculosis, influenza, and measles), direct contact (including through wounds or skin contact in crowded, unhygienic conditions), and foodborne pathways (WHO, 2021). Disasters disrupt the environmental and social determinants of health, creating "pathogenic landscapes" where these routes converge. For instance, flooding simultaneously compromises water sanitation (enabling waterborne spread), creates stagnant water (expanding vector breeding sites), and forces displacement (increasing person-to-person contact). Understanding this concept requires a One Health perspective, recognizing the interconnectedness of human, animal, and environmental health, especially in resource-constrained settings like Nigeria where infrastructure and surveillance systems are often fragile (Okwor and Ugochukwu, 2022).

1.3 Overview of Climate-Related Disasters

Climate-related disasters in Nigeria are predominantly hydrometeorological in nature, driven by the country's vulnerability to climate variability and change. The most prevalent and devastating type is flooding, which occurs annually, with catastrophic events often linked to heavy rainfall, river overflow, and inadequate urban drainage, as seen in the 2012 and 2022 nationwide floods that displaced millions and submerged vast agricultural lands (NEMA, 2022). The southern coastal and riverine regions are particularly susceptible. Conversely, the northern regions face intensifying drought and desertification, driven by rising temperatures and erratic rainfall, which lead to water scarcity, crop failure, and pastoralist conflicts (Federal Ministry of Environment, 2020). Other significant disasters include extreme heatwaves, which pose direct health risks, and intense storms. These events are not isolated but are increasing in frequency, intensity, and unpredictability due to anthropogenic climate change, as indicated by the Nigerian Meteorological Agency's (NiMet) long-term climate trend analyses (NiMet, 2023). The socio-economic impacts are profound, destroying livelihoods, displacing populations, and crippling the very infrastructure—such as healthcare facilities, roads, and water systems—essential for resilience and response.

1.4 Climate Change and Public Health in Nigeria

Climate change acts as a threat multiplier for public health in Nigeria, exacerbating existing burdens of disease and stretching an already overburdened health system. The relationship is multifaceted: directly, through injuries and deaths from extreme events like floods; and indirectly, through complex pathways that alter disease ecology and strain social systems. Rising temperatures and altered precipitation patterns expand the geographic and seasonal range of disease vectors like *Anopheles* mosquitoes, potentially increasing malaria transmission in previously low-burden areas (Bello and Garba, 2023). Water scarcity from drought forces communities to use unsafe water sources, while floods contaminate supplies, both scenarios leading to outbreaks of diarrheal diseases. Furthermore, climate-induced food insecurity and malnutrition, especially in the drought-prone north, lower population immunity, increasing susceptibility to infections (Ebele and Emodi, 2016). The public health response is hampered by systemic challenges including weak surveillance systems, inadequate funding, inadequate WASH (Water, Sanitation, and Hygiene) infrastructure, and limited inter-sectoral coordination between environmental, agricultural, and health ministries. Addressing this nexus is critical for achieving national health goals and building climate-resilient health systems, as emphasized in Nigeria's National Climate Change Policy and National Action Plan for Health Security (Federal Ministry of Health, 2019).

2. Climate Disaster Dynamics and Environmental Vulnerability in Nigeria

2.1 Types of Climate-Related Disasters in Nigeria

Nigeria experiences a diverse range of climate-related disasters, each with distinct spatial patterns and mechanisms. These disasters are broadly categorized into hydrometeorological and geophysical events, with the former being overwhelmingly predominant and directly linked to climate variability (Adefisan, 2018). The major types include:

- **Flooding:** The most frequent and devastating, including riverine (fluvial) floods, flash floods, and coastal floods. Urban flooding, exacerbated by poor drainage and planning, is increasingly common.
- **Drought and Desertification:** Slow-onset disasters primarily affecting the 11 frontline states in the Sahelian north, characterized by prolonged rainfall deficits and land degradation.
- **Extreme Heat Events:** Characterized by prolonged periods of abnormally high temperatures, often coinciding with drought.
- **Severe Windstorms:** Including thunderstorms, squalls, and precursor events to heavier rainfall, which cause structural damage and casualties.
- **Coastal Erosion and Sea-Level Rise:** Particularly acute in the Niger Delta and along the Gulf of Guinea coastline, leading to land loss and salinization.

These disasters rarely occur in isolation; for example, drought can be followed by intense, runoff-prone rains, leading to flooding on parched land—a phenomenon that compounds their impacts (Ekwueme and Agunwamba, 2021).

2.2 Flooding and Its Environmental Impacts

Flooding is Nigeria's most recurrent and socio-economically destructive climate disaster. Its environmental impacts are profound and multifarious. Primarily, floods cause widespread water contamination as latrines, sewage systems, and waste dumps are inundated, releasing pathogens and chemical pollutants into rivers and groundwater sources used for drinking (Oloruntade *et al.*, 2020). This directly degrades water quality and ecosystem health. Secondly, flooding leads to soil erosion and land degradation, washing away nutrient-

rich topsoil, damaging soil structure, and reducing agricultural productivity. Thirdly, floods alter landscape ecology, destroying habitats and creating new, temporary aquatic environments. These newly formed stagnant water bodies become prolific breeding grounds for mosquitoes and other vectors, while also displacing wildlife, potentially increasing human-animal contact and zoonotic risk (Kamau *et al.*, 2022). The cumulative environmental damage undermines natural buffers against future disasters, creating a cycle of increasing vulnerability.

2.3 Drought, Desertification and Heat Extremes

In northern Nigeria, the synergistic hazards of drought, desertification, and heat extremes represent a critical environmental and humanitarian crisis. Drought, defined by prolonged moisture deficiency, leads to crop failure, livestock death, and acute water scarcity. This forces migrations and intensifies competition over dwindling resources. Desertification, the persistent degradation of dryland ecosystems, is driven by climate variability and unsustainable land use, resulting in the southward advance of the Sahara Desert at an estimated rate of 0.6 km per year (FMEnv, 2020). This process diminishes biodiversity, reduces carbon sequestration, and destroys arable land. Concurrently, heat extremes are becoming more frequent and intense. Prolonged heatwaves not only cause direct heat-related illnesses but also exacerbate drought severity through increased evapotranspiration, reduce labour productivity, and can indirectly increase the incidence of certain infectious diseases by influencing vector survival rates and human behaviour (Odjugo, 2021). Together, these interlinked phenomena degrade the natural resource base that communities depend upon for survival.

2.4 Storms, Erosion and Sea Level Rise

The southern coastal regions of Nigeria face a distinct set of climate-related threats dominated by storms, erosion, and sea-level rise. Intense wind and rainstorms damage infrastructure, disrupt livelihoods, and contribute to flooding. More chronically, coastal erosion is a severe problem, with waves and storm surges claiming vast stretches of land, displacing communities, and destroying property—as seen acutely in states like Bayelsa, Delta, and Lagos. This erosion is significantly exacerbated by relative sea-level rise, a combination of global eustatic rise and local subsidence (often due to fluid extraction). The Intergovernmental Panel on Climate Change (IPCC) projects that sea-level rise will increase the frequency and severity of coastal flooding and lead to the salinization of freshwater aquifers and agricultural soils, threatening water security and food production (IPCC, 2022). These processes render coastal communities increasingly vulnerable, undermining their resilience and forcing difficult adaptation choices.

2.5 Socio-Environmental Vulnerability of Nigerian Communities

The impacts of climate disasters are not felt uniformly; they are filtered through the lens of socio-environmental vulnerability. This vulnerability is determined by a community's exposure to a hazard, its sensitivity to that exposure, and its capacity to adapt or cope. In Nigeria, vulnerability is highly stratified. Poverty is a primary driver, as impoverished households often reside in high-risk areas (e.g., floodplains, erosion-prone slopes) in poorly constructed dwellings and lack resources for recovery. Gender plays a critical role, with women often bearing a disproportionate burden due to gendered roles in water collection, agriculture, and caregiving during crises. Livelihood dependence on climate-sensitive sectors like rain-fed agriculture or fishing increases sensitivity. Furthermore, weak governance, inadequate infrastructure, and limited access to early warning systems diminish adaptive capacity (Ajibade *et al.*, 2020). This confluence of factors means that climate disasters often hit the most marginalized communities hardest, exacerbating existing inequalities and trapping them in cycles of risk and deprivation.

3. Microbial Infection Transmission Dynamics

3.1 Overview of Microbial Pathogens of Public Health Importance

Nigeria faces a high burden of infectious diseases caused by a diverse array of microbial pathogens. These pathogens, which thrive in the nation's tropical climate and are amplified by systemic vulnerabilities, include bacteria (e.g., *Vibrio cholerae*, *Salmonella* Typhi, *Mycobacterium tuberculosis*, *Neisseria meningitidis*), viruses (e.g., Lassa virus, Hepatitis A and E viruses, Rotavirus, Measles virus, Yellow Fever virus), parasites (e.g., *Plasmodium* spp. causing malaria, intestinal helminths), and fungi. Their public health importance is measured by their incidence, morbidity and mortality rates, epidemic potential, and socio-economic impact. Many of these pathogens are environmentally mediated or vector-borne, meaning their life cycles and transmission dynamics are intrinsically sensitive to climatic and ecological conditions, making them prime candidates for climate-related amplification (FMoH, 2019).

3.2 Modes of Transmission of Microbial Infections

The spread of microbial infections occurs through specific pathways, or modes of transmission. Key modes highly relevant in disaster settings include:

- **Waterborne/Fecal-Oral:** Pathogens are ingested via water or food contaminated with human or animal feces (e.g., cholera, typhoid, hepatitis E).
- **Vector-Borne:** Pathogens are transmitted by arthropod vectors like mosquitoes (malaria, dengue), ticks, or fleas, or by animal reservoirs like rodents (Lassa fever).
- **Airborne/Respiratory:** Pathogens are spread via respiratory droplets or aerosols from infected individuals (e.g., tuberculosis, measles, influenza, meningitis).
- **Direct Contact:** Includes skin-to-skin contact, contact with contaminated surfaces (fomites), or contact with infected bodily fluids (e.g., in crowded shelters or during unsafe burial practices).
- **Zoonotic:** Infections transmitted from animals to humans through direct contact, vectors, or contaminated environments.

Disasters often disrupt normal hygiene and environmental controls, facilitating the simultaneous activation of multiple transmission routes, leading to concurrent outbreaks.

3.3 Environmental Reservoirs and Climate Sensitivity of Pathogens

Many pathogens persist in environmental reservoirs—niches outside a human host where they survive and multiply. These include water bodies (for *Vibrio cholerae*), soil (for *Bacillus anthracis*), and animal hosts (rodents for Lassa virus). The survival, growth, and geographic distribution of pathogens in these reservoirs are acutely sensitive to climatic factors. Temperature influences replication rates of viruses and bacteria, vector development cycles, and parasite maturation within vectors. Precipitation and humidity affect the availability of aquatic habitats for vectors (e.g., mosquito breeding sites), the survival of pathogens in the environment, and the contamination of water sources (Colwell, 2021). Climate change is thus shifting the spatial and temporal windows of opportunity for many pathogens, potentially introducing them to new, susceptible populations.

3.4 Vector-Borne and Water-Borne Infections

Vector-borne diseases are a leading cause of illness in Nigeria. Malaria, transmitted by *Anopheles* mosquitoes, is endemic and hyperendemic in many areas. Changes in rainfall patterns can create new breeding sites, while temperature increases can accelerate mosquito larval development and the sporogonic cycle of the *Plasmodium* parasite, potentially increasing transmission intensity (Bello *et al.*, 2023). Other vector-borne threats include yellow fever, dengue, and lymphatic filariasis. Water-borne diseases are equally significant and are the most directly linked to flood disasters. The ingestion of water contaminated with human waste leads to explosive outbreaks of cholera, typhoid, and shigellosis. Drought can also concentrate pathogens in limited water sources. The burden of these diseases is a direct reflection of the state of Water, Sanitation, and Hygiene (WASH) infrastructure, which is frequently compromised during climate disasters (Olanrewaju *et al.*, 2022).

3.5 Zoonotic Transmission and Human–Animal Interfaces

Zoonoses—diseases transmitted from animals to humans—constitute a major portion of Nigeria's emerging and re-emerging infectious disease threats. Key examples include Lassa fever (from multimammate rats), avian influenza, rabies, and potential spillovers of pathogens like Monkeypox or novel coronaviruses. Climate disasters perturb the human-animal interface in critical ways: flooding can displace rodent populations into human dwellings, drought can force wildlife and livestock to congregate at scarce water points alongside humans, and deforestation/fragmentation driven by environmental change increases contact between humans and wildlife (Okorie *et al.*, 2023). These disruptions heighten the risk of pathogen spillover, highlighting the necessity of a One Health approach that integrates human, animal, and environmental health surveillance and response.

4. Interactions Between Climate-Related Disasters and Infection Transmission

4.1 Flood-Induced Water Contamination and Disease Outbreaks

Floods act as a powerful mechanical and biological agent for dispersing pathogens. They overwhelm sanitation systems, inundate pit latrines, and wash agricultural and industrial waste into rivers, lakes, and wells used for drinking. This leads to the fecal contamination of water supplies with enteric pathogens like *Vibrio cholerae*, *Salmonella*, and *E. coli*. The link is unequivocal: post-flood cholera outbreaks have been documented repeatedly across Nigeria, from the major 2012 floods to annual seasonal flooding in states like Adamawa, Kogi, and Rivers (Azuogu *et al.*, 2021). The risk is highest where pre-existing WASH infrastructure is weak and where communities rely on surface water. Floods also disperse chemical contaminants, but the immediate public health crisis is typically dominated by acute microbial gastroenteritis.

4.2 Impact of Disasters on Sanitation, Hygiene and Healthcare Access

Disasters cripple the foundational systems for infection prevention and control. Sanitation infrastructure (toilets, sewage lines) is destroyed, leading to open defecation. Access to clean water for hygiene (handwashing) becomes severely limited. Simultaneously, healthcare access is disrupted as health facilities may be damaged, flooded, or inaccessible due to ruined roads. Medical supplies are often depleted, and healthcare workers may themselves be displaced. This triple failure of sanitation, hygiene, and healthcare creates a perfect storm: it increases the risk of infection while simultaneously reducing the capacity to detect, treat, and contain outbreaks. The collapse of routine services, including immunization, further leaves populations susceptible to vaccine-preventable diseases during crises (Dairo and Bamidele, 2020).

4.3 Population Displacement, Crowding and Infection Spread

A hallmark of major climate disasters is the large-scale displacement of populations. People flee flooded homes or drought-stricken lands, often seeking refuge in Internally Displaced Persons (IDP) camps, makeshift shelters, or the homes of relatives. These settings are typically characterized by severe overcrowding, inadequate shelter, poor ventilation, and insufficient water and sanitation. Such conditions are ideal for the rapid transmission of person-to-person infections. Outbreaks of acute respiratory infections (like measles, influenza, and COVID-19), meningitis in the "meningitis belt," and skin infections like scabies are common in these congested environments. The stress of displacement also weakens immune systems, increasing susceptibility (Bowen *et al.*, 2021).

4.4 Changes in Vector Ecology During Climate Disasters

Climate disasters directly and rapidly alter the ecology of disease vectors. Flooding creates myriad new, sunlit, stagnant water bodies—ideal breeding sites for *Anopheles* (malaria) and *Aedes* (dengue, yellow fever) mosquitoes. This can lead to a surge in vector populations weeks after floodwaters recede. Conversely, drought can also increase risk by causing rivers to form stagnant pools and forcing people to store water in containers near homes, creating *Aedes* breeding sites.

Furthermore, disasters can cause vector displacement, driving rodents or insects into human settlements in search of food and shelter, as seen with Lassa fever outbreaks linked to post-harvest rodent infestations, which may be influenced by rainfall patterns (Okorie *et al.*, 2023). These shifts can change the geographic distribution and seasonal patterns of vector-borne diseases.

4.5 Case Studies of Climate-Related Disease Outbreaks in Nigeria

- **The 2012 Nationwide Floods and Cholera:** Following catastrophic flooding across 30 states, a major cholera outbreak ensued, with over 5,000 cases and hundreds of deaths reported. The floods were identified as the primary driver, contaminating water sources in already vulnerable communities (NCDC, 2012).

- **Drought and Meningitis in the North:** The dry, dusty Harmattan conditions in northern Nigeria, exacerbated by drought, are strongly correlated with seasonal epidemics of Cerebrospinal Meningitis (CSM). The 2016-2017 outbreak, one of the worst in decades, occurred in a context of prolonged dry conditions and extreme heat, which facilitate nasopharyngeal mucosal damage and bacterial transmission (Yahaya and Garba, 2018).

- **Lagos Flooding and Leptospirosis Risk:** Annual flooding in Lagos, a densely populated coastal megacity, raises significant concerns about leptospirosis, a zoonotic bacterial disease spread by rat urine in water. Although under-reported, environmental studies confirm the presence of *Leptospira* in floodwaters, highlighting a direct climate-infection link in an urban setting (Kamau *et al.*, 2022).

These case studies demonstrate the concrete and often devastating pathways linking specific climate disasters to infectious disease emergencies in Nigeria.

5. Public Health Implications and Institutional Responses to Climate-Sensitive Infections in Nigeria

5.1 Burden of Climate-Sensitive Infections in Nigeria

The burden of climate-sensitive infections in Nigeria is substantial and escalating, representing a critical public health and economic challenge. Malaria remains hyperendemic, accounting for approximately 30% of childhood deaths and 60% of outpatient visits annually, with transmission intensity closely tied to rainfall patterns and temperature (NMEP, 2022). Cholera exhibits clear seasonal peaks during the rainy season, with major outbreaks frequently following floods; between 2021 and 2023, Nigeria reported over 100,000 suspected cholera cases, highlighting its endemicity and epidemic potential (NCDC, 2023). Lassa fever, a rodent-borne viral haemorrhagic disease, has transitioned from sporadic to perennial outbreaks, with the geographic expansion of cases potentially linked to changing rainfall and land-use patterns that affect rodent reservoir ecology (Ilori *et al.*, 2019). Meningitis epidemics in the "meningitis belt" are exacerbated by dry, dusty Harmattan conditions. Additionally, the burdens of diarrheal diseases, typhoid fever, and vector-borne diseases like yellow fever are all significantly modulated by climatic factors. This collective burden strains the healthcare system, exacerbates poverty through catastrophic health expenditures, and reduces workforce productivity, thereby hindering national development (World Bank, 2021). The true burden is likely underestimated due to surveillance gaps, particularly in hard-to-reach and disaster-affected areas.

5.2 Disaster Preparedness and Disease Surveillance

Effective mitigation of disaster-related infection transmission hinges on robust disaster preparedness and agile disease surveillance systems. Currently, Nigeria's preparedness is fragmented, with response often being reactive rather than proactive. Key gaps include inadequate multi-hazard early warning systems that integrate meteorological data with public health alerts, and insufficient pre-positioning of emergency health kits in high-risk areas. The Integrated Disease Surveillance and Response (IDSR) system, while established, faces challenges in timeliness, data completeness, and integration with climate data during disasters. Surveillance often collapses when health facilities are damaged and communication networks fail. Strengthening this nexus requires One Health surveillance that monitors human, animal, and environmental health indicators simultaneously to predict spillover events. Investment in digital health technologies (e.g., mobile reporting, geographic information systems) and community-based surveillance to act as an early warning network in vulnerable communities is critical. Furthermore, simulation exercises and contingency planning specifically for post-disaster outbreak scenarios are essential components of a resilient preparedness strategy (FMoH, 2019; Otu *et al.*, 2021).

5.3 Community-Based Prevention and Risk Communication

Communities are the first responders in any disaster, making community-led strategies paramount for effective prevention. Community-Based Prevention involves empowering local populations to implement context-specific interventions. This includes forming Water, Sanitation, and Hygiene (WASH) committees to manage and protect water points post-flood, promoting household water treatment and safe storage (HWTS), and organizing environmental sanitation drives to eliminate mosquito breeding sites. Community Health Workers (CHWs) are pivotal in extending healthcare reach, conducting active case finding, and distributing prevention commodities like insecticide-treated nets (ITNs) and oral rehydration salts (ORS).

Complementing this, effective Risk Communication is vital. Messages must be timely, clear, culturally appropriate, and delivered through trusted channels (religious leaders, town criers, local radio) before, during, and after disasters. Communication should inform communities on specific risks (e.g., "boil water" advisories post-flood, symptoms of cholera) and protective actions. Participatory approaches, such as community dialogue sessions and the use of local languages, increase message uptake and foster a shared sense of responsibility for outbreak prevention (Biran *et al.*, 2020).

5.4 Policy Responses and Institutional Frameworks

Nigeria has developed several policies and frameworks, but implementation and coordination remain significant challenges. Key documents include the National Climate Change Policy and Action Plan, the National Adaptation Plan Framework, and the National Action Plan for Health Security (NAPHS), which explicitly addresses health threats from hazards. However, there is often a siloed approach, with weak operational linkages between ministries of environment, health, agriculture, water resources, and disaster management. The technical capacity for Health Impact Assessment (HIA) of climate projects and climate-informed health budgeting is limited.

Moving forward, policy must prioritize mainstreaming climate resilience into all health sector planning. This requires establishing a dedicated climate and health unit within the Federal Ministry of Health with a clear mandate and budget. Strengthening legislation for urban planning and environmental sanitation to reduce flood risk is crucial. Furthermore, enhancing sub-national capacity for policy implementation at state and local government levels is essential, as they are at the frontline of both disaster response and healthcare delivery. International partnerships and climate financing (e.g., Green Climate Fund) should be leveraged to support these institutional strengthening efforts (Echendu and Iyare, 2022).

5.5 Conclusion

The interplay between climate-related disasters and microbial infection transmission presents one of the most pressing public health challenges for Nigeria in the 21st century. This review has delineated the pathways—from floodwaters contaminating drinking sources to drought-driven human-animal contact—through which climatic shocks amplify the transmission of pathogens like *Vibrio cholerae*, *Plasmodium* spp., and Lassa virus. The burden is borne disproportionately by the most vulnerable communities, those with the least capacity to adapt.

Addressing this complex threat demands an integrated, forward-looking approach. Reactive disease control must be supplanted by proactive, climate-resilient health systems. This entails: (1) investing in climate-smart surveillance and cross-sectoral early warning; (2) empowering communities through WASH infrastructure and participatory risk communication; (3) building adaptive capacity in the health workforce and infrastructure; and (4) fostering stronger policy coherence and institutional collaboration under a One Health umbrella.

Ultimately, safeguarding Nigeria's population from the converging crises of climate change and infectious disease is not merely a technical health issue but a fundamental imperative for sustainable development and social equity. Failure to act systemically will result in cyclical health emergencies that erode human capital and reverse hard-won development gains. The time for integrated action is now.

.

References

Adefisan, E. A. (2018). Climate change and disaster risk management in Nigeria. *Journal of Disaster Risk Studies*, 10(1), a515.

Ajibade, I., et al. (2020). Climate change and urban vulnerability in Africa. *Urban Climate*, 34, 100685.

Azuogu, J. C., et al. (2021). Flood disasters and cholera incidence in Nigeria. *International Journal of Environmental Research and Public Health*, 18(21), 11256.

Azuogu, J. C., Ogbonnaya, L. U., and Alo, C. (2021). Flood disasters and cholera incidence in Nigeria: A review of the literature. *International Journal of Environmental Research and Public Health*, 18(21), 11256.

Bello, H. and Garba, S. (2023). Climate variability and malaria transmission dynamics in northern Nigeria: A retrospective analysis. *Journal of Environmental and Public Health*, 2023, 1-9.

Bello, H., and Garba, S. (2023). Climate variability and malaria transmission dynamics in northern Nigeria. *Journal of Environmental and Public Health*, 2023, 1-9.

Biran, A., et al. (2020). Community health promotion and medical relief in disaster settings. *Disaster Medicine and Public Health Preparedness*, 14(2), 272-280.

Bowen, K. J., Ebi, K. L., and Friel, S. (2021). Climate change, health, and equity: A guide for local health departments. *Public Health Reports*, 136(1_suppl), 45S-53S.

Bowen, K. J., et al. (2021). Climate change, health, and equity. *Public Health Reports*, 136(1_suppl), 45S-53S.

Colwell, R. R. (2021). Climate change and infectious diseases. *The Journal of Infectious Diseases*, 224(Supplement_4), S367-S370.

Dairo, M. D., and Bamidele, O. J. (2020). Disease outbreaks in IDP camps in Nigeria. *Pan African Medical Journal*, 37(Suppl 1), 22.

Dairo, M. D., and Bamidele, O. J. (2020). The challenge of disease outbreaks in internally displaced persons (IDP) camps in Nigeria: The case of measles in Borno State. *Pan African Medical Journal*, 37(Suppl 1), 22.

Ebele, N. E. and Emodi, N. V. (2016). Climate change and its impact in Nigeria. *Nigerian Journal of Technology*, 35(4), 502-509.

Echendu, A. J., & Iyare, M. O. (2022). Climate change policy and institutional frameworks in Nigeria. *Environmental Policy and Governance*, 32(3), 225-238.

Ekwueme, B. N., and Agunwamba, J. C. (2021). Urban flooding and its management in Nigeria. *Nigerian Journal of Technology*, 40(5), 809-819.

Federal Ministry of Environment (2020). *National Drought Plan for Nigeria*. Abuja: Federal Ministry of Environment.

Federal Ministry of Environment (FMEnv). (2020). *National Drought Plan for Nigeria*. Abuja.

Federal Ministry of Health (2019). *National Action Plan for Health Security (NAPHS)*. Abuja: Federal Ministry of Health.

Federal Ministry of Health (FMoH). (2019). *National Action Plan for Health Security (NAPHS)*. Abuja: FMoH.

Federal Ministry of Health (FMoH). (2019). *Nigeria National Action Plan for Health Security*. Abuja.

Ilori, E. A., et al. (2019). Epidemiologic trends of Lassa fever in Nigeria, 2012–2017. *Emerging Infectious Diseases*, 25(5), 1066-1068.

IPCC. (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Cambridge University Press.

Kamau, J., et al. (2022). Environmental determinants of leptospirosis in a tropical urban setting. *PLoS Neglected Tropical Diseases*, 16(5), e0010410.

National Emergency Management Agency (NEMA) (2022). *Post-Disaster Needs Assessment: 2022 Floods*. Abuja: NEMA.

NCDC. (2012). *Cholera Outbreak Situation Report*. Abuja: Nigeria Centre for Disease Control.

Nigeria Centre for Disease Control (NCDC). (2023). *Cholera Situation Report*. Abuja: NCDC.

National Malaria Elimination Programme (NMEP). (2022). *Annual Report*. Abuja: Federal Ministry of Health.

Nigerian Meteorological Agency (NiMet) (2023). *Climate Review and Seasonal Climate Prediction*. Abuja: NiMet.

Odjugo, P. A. O. (2021). Heatwave intensity and frequency in Nigeria. *Weather and Climate Extremes*, 34, 100375.

Okaka, F. O., and Omondi, C. J. (2021). Drought severity and its impact on rural livelihoods in northern Nigeria. *Natural Hazards*, 108(2), 1943-1961.

Okorie, P. N., Adepoju, K. A., and Ogunniyi, A. (2023). Environmental drivers of Lassa fever dynamics in Nigeria: A review. *One Health*, 16, 100517.

Okorie, P. N., et al. (2023). Environmental drivers of Lassa fever dynamics in Nigeria. *One Health*, 16, 100517.

Okwor, T. J. and Ugochukwu, I. C. (2022). One Health approach in Nigeria: Gaps and opportunities for addressing zoonotic diseases in a changing climate. *Nigerian Veterinary Journal*, 43(2), 155-165.

Olanrewaju, C. C., Chitakira, M., and Olanrewaju, O. A. (2022). Impacts of flood disasters in Nigeria: A critical evaluation of health implications and management. *Jàmbá: Journal of Disaster Risk Studies*, 14(1), a1209.

Olanrewaju, C. C., et al. (2022). Impacts of flood disasters in Nigeria. *Jàmbá: Journal of Disaster Risk Studies*, 14(1), a1209.

Oloruntade, A. J., et al. (2020). Water quality and public health impacts of flooding. *Environmental Monitoring and Assessment*, 192(4), 250.

Otu, A., et al. (2021). Strengthening health security at points of entry in Nigeria. *BMJ Global Health*, 6(Suppl 6), e005246.

Phalkey, R. K., and Sauerborn, R. (2020). A systematic review of the health impacts of climate change in Nigeria. *BMC Public Health*, 20(1), 1-15.

World Bank. (2021). *Climate and Health Vulnerability Assessment for Nigeria*. Washington, DC: World Bank Group.

World Health Organization (WHO) (2021). *Water, sanitation, hygiene and health: A primer for health professionals*. Geneva: World Health Organization.

Yahaya, A., and Garba, S. N. (2018). Epidemiology of meningitis outbreaks in Nigeria. *Journal of Infectious Diseases and Epidemiology*, 4(3), 064.