ARCHITECTURE

Multifunctionality in Disaster Management Centre Design: Architectural Principles and Case Study Evidence for Yola, Adamawa State, Nigeria

Salviya Tarfa Yakubu, Usman B. Wakawa, Ja'a Adamu Kadi, Bitrus Solomon Babangida, Pius Lawal Kodei

Abubakar Tafawa Balewa University, Bauchi, Nigeria

Published November 2026

Abstract

Disaster management facilities must support continuous preparedness, coordinated emergency response, recovery operations, training, administration, logistics, and community services. Conventional single-purpose spaces may limit operational adaptability and reduce the usefulness of facilities outside emergency periods. This study explores architectural multifunctionality as a design approach for a disaster management centre in Yola, Adamawa State, Nigeria. The study adopted a qualitative case-study approach supported by a structured observational checklist and cross-case analysis. Four cases were examined: the National Emergency Management Agency (NEMA) facility in Abuja; the Innovative Community–Disaster Convertible Centre (iC-DCC) in Penang, Malaysia; the Disaster Prevention and Education Centre in Istanbul; and a modular multipurpose health, civic, and educational facility in Sub-Saharan Africa. Multifunctionality was assessed using four spatial variables—size, shape, quality, and linkage—each weighted equally at 25%. The cases achieved scores of 72%, 88%, 88%, and 80%, respectively, producing a mean score of 82%. The findings indicate that large adaptable spaces, modifiable spatial configurations, environmental quality, and effective circulation/linkage support multifunctional performance. The iC-DCC and Istanbul cases demonstrate how shared or flexible spaces and adaptable connections can support multiple operational and community functions. The study concludes that multifunctionality should be embedded in the architectural programming and spatial organization of disaster management centres, particularly through neutralized spaces capable of accommodating different activities with limited physical alteration. These principles provide a basis for developing a resilient and adaptable disaster management centre for Yola.

Keywords: adaptable space; Adamawa State; architectural design; disaster management centre; multifunctionality; neutralization; Nigeria; Yola

Disaster management involves the policies, administrative decisions, and operational activities required to prepare for, mitigate, respond to, and recover from natural and human-induced hazards. It is a multidisciplinary undertaking requiring coordination among government institutions, emergency services, health providers, security agencies, community organizations, humanitarian partners, and other stakeholders. Effective disaster management therefore depends not only on organizational capacity and equipment, but also on the physical environments in which information is received, decisions are made, personnel are trained, supplies are managed, and affected people are supported.

In Nigeria, disaster-management responsibilities operate through a coordinated framework involving the National Emergency Management Agency (NEMA), State Emergency Management Agencies (SEMAs), local emergency management authorities, and community-level stakeholders. The frame-

work requires vertical and horizontal coordination, resource mobilization, information exchange, and timely response. At state level, operational planning must accommodate detailed coordination of services such as police, fire and rescue, ambulance services, voluntary organizations, and local communities.

Adamawa State is exposed to flood-related and other emergency risks. Flooding events recorded in 2024, including the Kiri Dam-related incident and subsequent flooding in communities across the state, placed pressure on local response capacity and humanitarian resources. These events underscore the need for a purpose-designed emergency facility capable of supporting operations, logistics, medical assistance, temporary accommodation, coordination, and recovery activities. The state emergency-management agency also faces challenges linked to inadequate purpose-built facilities and limited provision for accommodation, storage, temporary shelter, and health-support services.

A disaster management centre is expected to support more than the immediate emergency period. Between events, the facility may be used for administration, training, community engagement, public education, meetings, maintenance, and preparedness activities. During emergencies, spaces may need to accommodate command and control, relief distribution, medical triage, temporary shelter, coordination, and operational support. This changing programme of activities makes adaptability and multifunctionality central architectural considerations.

Multifunctionality in architecture refers to the capacity of spaces or buildings to accommodate more than one function, either simultaneously or at different times, with spatial and operational arrangements that support the transition between uses. It differs from simple co-location, in which separate functions merely occupy the same building, because multifunctional design seeks meaningful integration, shared use, adaptability, and efficiency. Adaptable spaces may respond to changing social, economic, environmental, and operational needs over a building's life cycle.

This study therefore investigates multifunctionality as an architectural strategy for disaster management centre design in Yola, Adamawa State. It focuses on the spatial principle of neutralization and evaluates its application through four variables: size, shape, quality, and linkage. The study addresses three questions: (1) What principles of multifunctionality are relevant to disaster management centres and public buildings? (2) To what extent do selected case-study facilities demonstrate these principles? and (3) How can the principles be translated into the design of a disaster management centre in Yola?

The aim is to explore the principles of multifunctionality in the design of a disaster management centre in Yola, Adamawa State. The objectives are to identify multifunctionality principles relevant to disaster-management and public buildings; determine the level of compliance demonstrated by selected case studies; and establish how multifunctional design approaches can be applied to a proposed disaster management centre in Yola.

1 Literature review and conceptual framework

1.1 Disaster management and the facility's operational requirements

Disaster management is a continuous process that includes mitigation, preparedness, response, recovery, and related development activities. The cycle requires institutions to maintain readiness before an event, coordinate immediate response during an event, and support restoration and longer-

term recovery after an event. A disaster-management facility consequently needs to accommodate both routine functions and rapid operational change.

Nigeria's disaster-management framework emphasizes coordination among national, state, local, and community-level actors. NEMA provides national coordination, while state and local institutions facilitate implementation within their respective jurisdictions. This multi-sectoral system relies on information sharing, resource allocation, communication, and timely assistance. From an architectural perspective, these requirements translate into spaces for command functions, administration, training, logistics, medical services, relief distribution, and collaboration with partner organizations.

1.2 Functional spaces in a disaster management centre

The functional programme of a disaster management centre includes administration, control and communication, training, maintenance, aviation operations, land operations, finance and logistics, relief and rehabilitation, warehousing, and clinical services. Although these units have distinct requirements, they remain operationally interdependent. Administrative and finance functions support personnel and institutional management; control functions receive, process, analyse, and disseminate emergency information; training builds staff and community preparedness; maintenance and land operations sustain fleet and equipment readiness; aviation operations facilitate access to difficult terrain; relief and rehabilitation manage supplies and assistance; and clinic facilities provide initial medical support.

The architectural challenge is to provide appropriate dedicated spaces where specialized functions require them while allowing selected spaces to be shared, expanded, subdivided, or reconfigured. A multifunctional centre should not compromise safety, security, privacy, operational separation, or the readiness of critical response functions in pursuit of flexibility.

1.3 Multifunctionality and adaptable space

For this study, multifunctional space is conceptualized as the integration of different functions across time and space. Such spaces can accommodate diverse users and activities, facilitate interaction, and contribute to social, economic, environmental, and cultural objectives. Multifunctional buildings can host different activities throughout their life cycle and, where feasible, respond to changing demands without major structural modifications.

The reviewed literature differentiates multifunctionality from the simple co-location of multiple functions. The design challenge is to establish spatial arrangements and environmental conditions that enable functions to share spaces or transition between uses. This is especially pertinent to disaster management facilities, which alternate between routine operations and periods of intensive emergency activity.

1.4 Neutralization as the primary design principle

Neutralization is the central multifunctionality principle adopted for this research. A neutralized space is designed to accommodate several functions rather than being exclusively shaped for one use. Its dimensions, proportions, spatial quality, and connections are selected to support a range of activities with minimal alteration. The study operationalizes neutralization through four variables:

- **Size:** dimensions and capacity that allow more than one activity to be accommodated, including the possibility of partitioning or combining spaces.

- **Shape:** spatial proportions and geometry that are suitable for different functions and flexible configurations.
- **Quality:** environmental and user conditions including lighting, ventilation, daylight, temperature, safety, security, and views.
- **Linkage:** circulation, access, connections, and wayfinding that allow spaces and internal/external functions to be reached and reorganized effectively.

The study further considers homogenization, multi-linkage, and hierarchical levels as complementary measures of multifunctionality. Homogenization refers to spaces with similar characteristics that facilitate functional interchange; multi-linkage enables alternative connections between spaces; and hierarchical levels allow changes at one building level without unnecessarily affecting higher-order systems. Neutralization and its four variables, however, constitute the primary analytical framework for the case-study assessment presented in this article.

1.5 Architectural relevance to Yola

A multifunctional disaster management centre in Yola should accommodate routine institutional activities while being capable of transitioning into an emergency-support facility when required. The proposed programme encompasses administration, entrance and security, temporary shelter, health-care, conference and training facilities, storage, helicopter-related facilities, building services, parking, indoor recreation, and community or cultural spaces. Multifunctionality can sustain the use of these facilities throughout the year while preserving their emergency-response capacity. The design should balance adaptability with secure access, clearly defined operational zones, emergency circulation, and the needs of vulnerable occupants.

2 Research methodology

2.1 Research approach and design

The study adopted a qualitative research approach using explanatory case studies. Case-study inquiry was selected to examine architectural functionality, spatial organization, and adaptability in facilities whose design and operation involve multiple, interrelated functions. The research used observation-oriented evaluation and content analysis rather than survey or experimental methods.

2.2 Case selection

Four case studies were examined to illustrate multifunctionality in disaster-related, educational, community, and health-support facilities: (1) National Emergency Management Agency (NEMA), Abuja, Nigeria; (2) Innovative Community–Disaster Convertible Centre (iC-DCC), Penang, Malaysia; (3) Disaster Prevention and Education Centre, Istanbul; and (4) a multipurpose civic, health, and education facility in Sub-Saharan Africa, documented as a 2020 competition project. Selection was based on reported spatial characteristics and relevance to emergency response, education, community use, healthcare, or convertible functions.

2.3 Data collection

Data were gathered through case-study documentation, photographs, observations, sketches, and a structured checklist developed from the multifunctionality framework. Secondary information was

drawn from literature, journal and conference papers, books, documents, and available case-study materials. The checklist focused on the four neutralization variables: size, shape, quality, and linkage.

2.4 Evaluation framework and scoring

Each of the four variables was assigned an equal weight of 25 points, yielding a maximum score of 100 points for each case. The checklist assessed spatial size and capacity, flexibility of shape and configuration, environmental and safety conditions, and connectivity and wayfinding. The assessment scale comprised four categories: 0–24 (not adequate), 25–49 (fairly adequate), 50–74 (adequate), and 75–100 (very adequate).

The case-study scores presented in the tables informed the comparative analysis. Scores for the four variables were aggregated to obtain each facility's overall multifunctionality rating. The values are reported as documented in the study materials; they were not independently remeasured or validated for this article.

2.5 Data analysis

The study employed cross-case analysis. Each facility was described in relation to the four variables, and the scores were compared to identify common architectural characteristics and differences. The comparative analysis was used to derive design implications for a proposed disaster management centre in Yola.

2.6 Validity and reliability

The assessment checklist underwent review by supervisors and other experts, and content validity was considered in determining whether it adequately represented the intended design variables. Inter-rater consistency was also recognized as a relevant consideration for observational assessment. However, numerical inter-rater reliability statistics were not available. Accordingly, the findings are interpreted as qualitative case-study ratings rather than statistically validated measurements.

3 Results and findings

3.1 Case-study overview

Case 1: National Emergency Management Agency (NEMA), Abuja, Nigeria. The facility is described as a large rectangular building with geometric elements in its elevations, concrete structural components, block walls, and glazed fenestration. Large spaces are supported by columns and internal foldable partitions, allowing use for conferences, lectures, workshops, and training. Its shape is predominantly rectangular with chamfered edges. Large openings, daylight, ventilation, and blinds contribute to environmental quality. Corridors, stairs, and lifts connect functions and support movement between floors. The case received a total score of 72%, classified as adequate.

Case 2: Innovative Community–Disaster Convertible Centre (iC-DCC), Penang, Malaysia. The iC-DCC is intended to operate as a community centre during normal periods and convert into a disaster-relief facility following an emergency. Its programme includes a community centre, multipurpose hall, medical facilities, helipad, and disaster operation and distribution centre. The multipurpose hall is designed to accommodate normal community activities such as sports and ceremonies, while a foldable, container-like accommodation mechanism can be deployed to provide temporary family accommodation. The facility is organized into five main blocks: entrance/main building, medical

facilities, disaster operation and distribution, administration/operation centre, and central multipurpose hall. Walkways, lobbies, corridors, stairs, and sky bridges connect the functions. The case scored 88%, classified as very adequate.

Case 3: Disaster Prevention and Education Centre, Istanbul. This facility integrates disaster-prevention and educational functions. Its geometry and structural concept draw inspiration from elemental forms and geometric tiling. The three-storey building features a large entrance hall serving both centres, as well as an additional access point from the parking area. Its programme includes information and children's facilities, a bookstore, souvenir shop, exhibition area, and planetarium connected to the second level. Reinforced concrete and steel are used alongside a lightweight space-frame roof and triangular diaphragm elements. Large fenestrations provide daylight and ventilation. Lobbies, corridors, and stairs link the functional areas, while collapsible classroom partitions facilitate spatial adaptation. The case achieved a score of 88%, categorized as very adequate.

Case 4: Multipurpose civic, health, and education facility, Sub-Saharan Africa. This modular, self-built facility uses local materials and is intended to address health emergencies and facility shortages. The design envisages an initial outpatient and hospital function followed by conversion to a school. Its programme includes 12 beds across two wards, two operating rooms, a healthcare clinic, and a psychological-support clinic, with separate guarded entrances and an emergency entrance linked to the surgical area. A large hall and modular components facilitate multiple uses. The square building form is subdivided into modular rectangular spaces with angled sides. Passive lighting and ventilation, wide fenestrations, and a courtyard contribute to environmental quality. Lobbies connect internal spaces, while exits provide access to the exterior. The case achieved a score of 80%, categorized as very adequate.

3.2 Comparative scores

Table 1. Multifunctionality scores reported for the four case studies (each variable weighted 25 points).

Case	Size	Shape	Quality	Linkages	Total	Rating
NEMA, Abuja	18	18	18	18	72	Adequate
iC-DCC, Penang	22	22	22	22	88	Very adequate
Disaster Prevention and Education Centre, Istanbul	22	22	22	22	88	Very adequate
Multipurpose facility, Sub-Saharan Africa	22	18	22	20	80	Very adequate

Across the four cases, the reported multifunctionality scores were comparatively high. The mean score was 82%, calculated from the totals of 72, 88, 88, and 80 (sum = 328; 328/4 = 82). Three cases were categorized as very adequate, while NEMA Abuja was rated adequate according to the assessment scale applied in this study.

3.3 Findings by spatial variable

Size. All four cases employ large or adaptable spaces to accommodate different activities. The iC-DCC multipurpose hall is especially notable because it supports community activities under normal conditions and is designed to incorporate temporary accommodation during emergencies. The Istanbul facility includes large spaces and an entrance hall serving multiple functions. The modular Sub-Saharan facility uses a large hall and modular components to allow changes among health, education, and civic uses.

Shape. The cases demonstrate varied geometry, including rectangular, curved, square, and modular arrangements. NEMA is predominantly rectangular; iC-DCC combines rectangular, curved, and circular elements; Istanbul uses a geometry derived from its concept and structural arrangement; and the Sub-Saharan facility adopts a square form subdivided into modules. The case descriptions indicate that multifunctionality does not depend on one universal shape, but on the suitability of spatial proportions and configuration to the intended activities.

Quality. Daylighting and ventilation are recurring design features. Large fenestrations, roof lighting, courtyard arrangements, and the use of blinds or other daylight controls are described in the cases. These features contribute to the usability of spaces for different functions and support occupant comfort. The quality variable also encompasses security and safety, although the case descriptions provide more detail on lighting and ventilation than on quantified safety performance.

Linkages. All cases include circulation elements such as corridors, lobbies, stairs, walkways, and, in the iC-DCC, sky bridges. The reported arrangements support access between functional areas and connection to external spaces. The Istanbul and NEMA descriptions note that horizontal circulation and spatial arrangements can support changing functions, while the iC-DCC separates key operational blocks and provides direct movement into the multipurpose hall according to arrival mode.

4 Discussion

4.1 Multifunctionality as operational adaptability

The case-study findings indicate that multifunctionality in disaster-management architecture is related to the capacity to accommodate varied activities through spatial capacity, appropriate geometry, environmental quality, and effective connections. The mean score of 82% suggests generally strong performance among the selected cases against the study's assessment checklist. This result should be considered in light of the qualitative, observational research design and should not be interpreted as a universal benchmark for disaster-management facilities.

The iC-DCC case offers a particularly clear example of operational conversion. The multipurpose hall is intended to remain useful as a community facility during non-emergency periods and to become a relief and accommodation space during disaster conditions. Its conversion mechanism illustrates how a building may support everyday social activities while retaining an emergency function. This approach can reduce the problem of underused spaces in facilities that are primarily activated during disaster events.

The Istanbul facility demonstrates multifunctionality through the integration of prevention, education, exhibition, and public learning activities. Its programme supports community awareness and education while its spatial system accommodates different activities through large interior spaces and collapsible partitions. This case suggests that disaster-management facilities can serve as civic learning environments and preparedness centres, rather than operating only as restricted administrative institutions.

The Sub-Saharan modular facility illustrates the proposed conversion between service functions and phases. Its planned transition from a health facility to a school demonstrates a longer-term approach to reuse and adaptability. The modular arrangement and use of local materials also indicate potential for context-sensitive construction. As this case is presented as a competition project, however, its proposed adaptability should not be taken as evidence of verified post-occupancy performance.

4.2 Size and neutralized space

Large spaces appear across the cases as a recurring enabling condition for multifunctionality. In disaster-management architecture, the size of a hall or shared room may determine whether it can accommodate training, public meetings, relief sorting, temporary shelter, or other activities. Nevertheless, large spaces alone do not guarantee adaptability. Their effectiveness depends on supporting systems such as storage, movable partitions, access routes, services, furniture, and clear operational rules. The design of neutralized spaces should therefore consider the dimensional requirements of likely functions and the capacity to divide or combine spaces.

4.3 Shape and spatial configuration

The cases show that multifunctionality can be supported by different formal approaches. Rectangular, square, curved, and modular spaces can all accommodate more than one activity when their proportions, access, and internal organization are appropriate. This implies that the design of a multifunctional disaster management centre in Yola should avoid imposing a single formal solution. Instead, spatial geometry should be tested against the requirements of emergency operations, training, community use, temporary accommodation, and support functions.

4.4 Environmental quality and resilience

Daylighting and ventilation are identified as prominent qualities in the case descriptions. In a facility that may be occupied by staff, community members, displaced people, and vulnerable populations, environmental conditions are important for comfort and usability. Large fenestrations, courtyard arrangements, roof lighting, and controlled daylighting can support varied functions. The design should, however, ensure that environmental strategies remain compatible with security, privacy, weather protection, and emergency operations. The checklist's environmental-quality variable provides a useful starting point, but future evaluation could broaden it to include thermal comfort, acoustic performance, energy resilience, water, sanitation, and accessibility.

4.5 Linkages and functional integration

Multifunctionality depends on how spaces connect as much as on their individual characteristics. Corridors, lobbies, stairs, lifts, walkways, and external routes determine how users move between facilities and how activities can be reorganized. In a disaster-management centre, the circulation system should distinguish public, staff, emergency, logistics, and restricted movement while providing efficient access to critical operations. The case-study descriptions suggest that clear circulation and flexible connections can help support different spatial arrangements. For Yola, linkage planning should be integrated with functional zoning and emergency access, ensuring that conversion does not create conflicting circulation or compromise security.

4.6 Implications for a disaster management centre in Yola

The findings support a design approach that combines dedicated critical spaces with adaptable shared spaces. Command, communications, security, clinical functions, and sensitive operations may require dedicated environments. Training halls, conference rooms, community spaces, and selected support areas can be designed for transformation into emergency functions. The architectural programme should identify normal-use activities, emergency-use activities, transition requirements, equipment needs, and the spatial relationships between them.

The centre should also support all-year activity. Community education, training, meetings, recreation, and preparedness activities can sustain occupancy and public engagement during non-emergency periods. During an emergency, selected facilities may be reconfigured for temporary shelter, triage, relief distribution, coordination, or support. The design should provide flexible furniture, modular partitions, robust service infrastructure, accessible circulation, secure storage, and clear transition protocols. Multifunctionality must be supported by operational planning, not only by architectural form.

5 Architectural design implications and recommendations

Drawing on the case-study findings and the proposed design programme, the following architectural implications are recommended for the multifunctional disaster management centre in Yola:

1. **Adopt a flexible spatial programme.** Identify spaces that must remain dedicated and those that can be shared or converted. Establish a clear schedule of normal and emergency use for each adaptable space.
2. **Design neutralized halls.** Provide appropriately sized halls capable of supporting training, meetings, community activities, relief distribution, temporary shelter, or other planned emergency functions. Use movable or collapsible partitions where appropriate.
3. **Coordinate dimensions and geometry.** Test room size, proportions, and shapes against the activities expected to occur in normal and emergency conditions. Avoid flexibility that depends on extensive reconstruction.
4. **Integrate environmental quality.** Provide daylight, ventilation, shading, and adjustable environmental controls, while considering privacy, thermal comfort, security, and emergency operation.
5. **Strengthen circulation and linkage.** Organize clear connections among administration, control, medical, training, logistics, relief, maintenance, and outdoor operational areas. Separate public and restricted circulation and provide accessible routes.
6. **Support rapid conversion.** Provide storage for emergency furniture, partitions, supplies, equipment, and conversion components. Ensure that services, power, water, sanitation, and communications can support alternative uses.
7. **Design for community use.** Integrate training, public awareness, meeting, and community spaces that remain useful during non-disaster periods and contribute to preparedness.
8. **Protect critical operations.** Flexibility should not compromise command-and-control, secure communications, emergency access, medical support, or the safe handling of relief materials.
9. **Use context-responsive construction.** Consider modular systems, durable materials, maintainability, and local construction capacity to support long-term performance and recovery.

6 Conclusion

This study explored architectural multifunctionality in the design of a disaster management centre for Yola, Adamawa State, using four case studies and a structured checklist based on neutralization. The analysis evaluated size, shape, quality, and linkage, each assigned 25 points. The reported case scores were 72% for NEMA Abuja, 88% for iC-DCC Penang, 88% for the Disaster Prevention and Education Centre Istanbul, and 80% for the Sub-Saharan multipurpose facility. The average score was 82%, with three cases rated very adequate and one rated adequate.

The findings indicate that multifunctionality is supported by adaptable space dimensions, suitable spatial geometry, environmental quality, and effective circulation and connections. The iC-DCC case demonstrates emergency conversion of a community multipurpose hall, while the Istanbul case integrates disaster education and public learning. The modular Sub-Saharan case illustrates intended transformation between health and educational uses. Together, these cases provide architectural lessons for facilities that must remain useful under routine conditions while responding to changing emergency requirements.

For the proposed Yola disaster management centre, multifunctionality should be incorporated into the spatial programme, zoning, circulation, environmental design, and operational planning from the outset. The study recommends neutralized spaces that can accommodate multiple functions with limited alteration, alongside dedicated spaces for critical operations and safety-sensitive activities. Such an approach can improve spatial efficiency, support community preparedness, and strengthen the facility's capacity to respond to disaster-related demands.

7 Limitations of the study

The study is constrained by its qualitative case-study design, the limited number of selected facilities, and its reliance on documented descriptions, observations, photographs, sketches, and checklist ratings. Numerical inter-rater reliability statistics, user surveys, post-occupancy evaluations, and measured performance data for the case facilities were not available. One case is a competition project whose proposed functions may not have been operationally tested. Consequently, the scoring framework offers a comparative assessment structure but should not be regarded as a standardized or externally validated multifunctionality index. Future research should validate the checklist, examine a wider range of operational facilities, engage users and emergency personnel, and assess conversion time, capacity, accessibility, environmental performance, and operational effectiveness.

References

[1] Adio-Moses RO, Taiwo PA (2019). An analysis of state of emergency preparedness and response of government to disaster risk management in Nigeria. *IOSR Journal of Humanities and Social Science*.

[2] Carter WN (2008). Disaster management: A disaster manager's handbook. *Asian Development Bank*.

[3] Creswell JW, Poth CN (2023). Qualitative inquiry and research design: Choosing among five approaches. *5th ed*. SAGE Publications.

[4] Essoh GE, Owoicho P, Abutu PO (2018). Managing national emergency in Nigeria: Prospects and challenges. *Journal of Good Governance and Sustainable Development in Africa*.

[5] Federal Emergency Management Agency (FEMA) (2021). Emergency Operations Center toolkit: Resources and guidance for emergency operations centers [Internet]. *2021*. Available from: https://preptoolkit.fema.gov/web/nims-toolkit/eoc

[6] Intergovernmental Panel on Climate Change (IPCC) (2022). Climate change 2022: Impacts, adaptation and vulnerability [Internet]. *Cambridge University Press*; 2022. Available from: https://www.ipcc.ch/report/ar6/wg2/

[7] Internal Displacement Monitoring Centre (IDMC) (2025). Global report on internal displacement 2025 [Internet]. *2025*. Available from: https://www.internal-displacement.org/publications/2025-global-report-on-internal-displacement-grid/

[8] Internal Displacement Monitoring Centre (IDMC) (2026). Global report on internal displacement 2026 [Internet]. *2026*. Available from: https://www.internal-displacement.org/publications/2026-global-report-on-internal-displacement-grid/

[9] International Federation of Red Cross and Red Crescent Societies (IFRC) (2022). World disasters report 2022: Trust, equity and local action [Internet]. *2022*. Available from: https://www.ifrc.org/document/world-disasters-report-2022

[10] International Organization for Migration (IOM) (2024). Nigeria—Joint post-flood situation report—Adamawa State (10 December 2024) [Internet]. *2024*. Available from: https://dtm.iom.int/reports/nigeria-joint-post-flood-situation-report-adamawa-state-10-december-2024

[11] Manga PM, Vawa JY (2021). An architectural response to internally displaced persons' psycho-social and economic needs in Adamawa State, Nigeria (2015–2021). *Journal of Multidisciplinary Engineering Science and Technology*, 8(8). https://www.jmest.org/wp-content/uploads/JMESTN42353855.pdf

[12] Mlote DS, Budig M, Cheah L (2024). Adaptability of buildings: A systematic review of current research. *Frontiers in Built Environment*, 10, 1376759. https://doi.org/10.3389/fbuil.2024.1376759

[13] National Bureau of Statistics (2006). Federal Republic of Nigeria 2006 population census. *Official Gazette*.

[14] National Emergency Management Agency (NEMA) (2023). NEMA: Proactivity, preparedness and performance in 2023 [Internet]. *2023*. Available from: https://nema.gov.ng/nema-proactivity-preparedness-and-performance-in-2023/

[15] Oruonye ED (2012). The challenges of urban flood disaster management in Nigeria: A case study of Jalingo LGA, Taraba State, Nigeria. *International Journal of Recent Scientific Research*.

[16] Ratsou Staehr E, Stevik TK, Houck LD (2025). Adaptability in the building process: A multifaceted perspective across the life cycle of a building. *Buildings*, 15(7), 1119. https://doi.org/10.3390/buildings15071119

[17] State Emergency Services (2019). Australian Council of State Emergency Services [Agency webpage].

[18] Tsoumpri D (2023). Architectural space as an open, adaptable system: A design experiment. *International Journal of Architectural Computing*, 21(4). https://doi.org/10.1177/14780771231162382

[19] United Nations Children's Fund (UNICEF) (2024). Nigeria humanitarian situation report no. 2, 31 December 2024 [Internet]. 2024. Available from: https://www.unicef.org/documents/nigeria-humanitarian-situation-report-no-2-31-december-2024

[20] United Nations Development Programme (UNDP) (2023). Nigeria flood impact, recovery and mitigation assessment report 2022–2023 [Internet]. *2023*. Available from: https://www.undp.org/nigeria/publications/nigeria-flood-impact-recovery-and-mitigation-assessment-report-2022-2023

[21] United Nations Environment Programme (UNEP) & Global Alliance for Buildings and Construction (GlobalABC) (2025). Global status report for buildings and construction 2024/2025: Not just another brick in the wall [Internet]. *2025*. Available from: https://globalabc.org/resources/publications/global-status-report-buildings-and-construction-20242025-not-just-another

[22] United Nations Environment Programme (UNEP) (2022). 2022 global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector [Internet]. *2022*. Available from: https://wedocs.unep.org/items/c22095a1-fbcc-4378-8a42-b87ef3ec724c

[23] United Nations Environment Programme (UNEP) (2023). Adaptation gap report 2023: Underfinanced [Internet]. *Underprepared*; 2023. Available from: https://wedocs.unep.org/items/635ff4d3-010e-4a52-a75d-bb050e75d6ee

[24] United Nations Environment Programme (UNEP) (2024). Adaptation gap report 2024 [Internet]. *2024*. Available from: https://wedocs.unep.org/items/b8964bdc-a2f8-4153-96fd-a1e4141bff75

[25] United Nations High Commissioner for Refugees (UNHCR) (2025). Global trends: Forced displacement in 2024 [Internet]. *2025*. Available from: https://www.unhcr.org/global-trends-report-2024

[26] United Nations Human Settlements Programme (UN-Habitat) (2022). World cities report 2022: Envisaging the future of cities [Internet]. *2022*. Available from: https://unhabitat.org/knowledge/publications/world-cities-report-2022-envisaging-the-future-of-cities

[27] United Nations Office for Disaster Risk Reduction (UNDRR) (2022). Global assessment report on disaster risk reduction 2022: Our world at risk—Transforming governance for a resilient future [Internet]. *2022*. Available from: https://digitallibrary.un.org/record/3969846

[28] United Nations Office for Disaster Risk Reduction (UNDRR) (2024). Forensic insights for future resilience: Learning from past disasters (Global Assessment Report special report 2024) [Internet]. *2024*. Available from: https://www.undrr.org/gar/gar2024-special-report

[29] United Nations Office for Disaster Risk Reduction (UNDRR) (2025). Global assessment report on disaster risk reduction 2025 [Internet]. *2025*. Available from: https://www.undrr.org/gar/gar2025

[30] World Bank (2021). Climate risk country profile: Nigeria [Internet]. *2021*. Available from: https://climateknowledgeportal.worldbank.org/sites/default/files/2021-07/15918-WB_Nigeria%20Country%20Profile-WEB.pdf

[31] World Health Organization (WHO) (2021). WHO guidance on preparing for national response to health emergencies and disasters [Internet]. *2021*. Available from: https://www.who.int/publications/i/item/9789240037182

[32] World Health Organization (WHO) (2024). Emergency response framework (ERF), edition 2.1 [Internet]. *2024*. Available from: https://www.who.int/publications/i/item/9789240058064

[33] Özel. (2008). Original figure source as credited in the manuscript; full bibliographic details require confirmation.