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Determining the Extent to which Disability-Inclusive Adaptation Measures Reduce Displacement and Mortality among Persons with Disabilities in Nigeria

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Abstract

Climate change poses significant risks to vulnerable populations, particularly Persons with Disabilities (PWDs), who often face heightened exposure to displacement and mortality due to systemic exclusion and limited adaptive capacity. This study assessed the extent to which disability-inclusive adaptation measures reduce displacement and mortality among PWDs in Northern Nigeria. A mixed-methods approach was adopted, combining quantitative data from structured questionnaires administered to 500 respondents with qualitative insights from Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). Descriptive and inferential statistical techniques, including logistic regression analysis, were employed to examine relationships between inclusive adaptation measures and vulnerability outcomes. The findings reveal that access to disability-inclusive adaptation measures remains low, with significant gaps in early warning systems, evacuation planning, and inclusive infrastructure. A high proportion of respondents reported experiencing displacement (68%), while 27% reported climate-related mortality within households. Regression results indicate a statistically significant negative relationship between inclusive adaptation measures and both displacement and mortality, suggesting that increased access to such measures reduces vulnerability among PWDs. However, socio-economic factors and the type of disability were found to influence outcomes, with certain disabilities associated with higher risk levels. The study concludes that while disability-inclusive adaptation measures are effective in reducing displacement and mortality, their impact is constrained by poor implementation, inadequate resources, and socio-cultural barriers. The study recommends strengthening inclusive policy frameworks, improving accessibility of adaptation measures, and enhancing participation of PWDs in climate action. These findings contribute to the growing discourse on inclusive climate resilience and provide policy-relevant insights for sustainable development in Northern Nigeria.

Keywords: *Disability Inclusion, Displacement, Mortality, Disaster Risk Reduction, Climate Vulnerability and Inclusive Development.*

Introduction

Climate change has emerged as one of the most significant drivers of vulnerability, displacement, and mortality globally, with disproportionate effects on marginalized populations (Olusola et al., 2025). In low- and middle-income countries such as Nigeria, the intersection of disability, poverty, and environmental stressors exacerbates exposure to climate risks and limits adaptive capacity (Tanko et al, 2025). Empirical evidence suggests that PWDs experience significantly higher mortality rates during disasters up to four times higher than persons without disabilities, largely due to systemic exclusion from early warning systems, evacuation processes, and emergency response mechanisms (Izutsu, 2019). These disparities underscore the urgent need to assess whether disability-

inclusive adaptation measures can effectively reduce displacement and mortality outcomes, particularly in climate-vulnerable regions such as Northern Nigeria.

Northern Nigeria is characterized by a convergence of climatic hazards including droughts, desertification, flooding, and extreme heat and socio-economic vulnerabilities such as poverty, conflict, and weak infrastructure (Magaji et al., 2024; Zailani et al., 2025). These stressors contribute to increasing patterns of internal displacement and humanitarian crises. Climate change has been identified as a key driver of forced displacement through the intensification of extreme weather events and environmental degradation, which undermine livelihoods and habitability (UNHCR, 2021). For PWDs, these risks are compounded by structural barriers such as limited mobility, lack of assistive technologies, and exclusion from disaster preparedness initiatives. As a result, PWDs often face heightened protection risks during displacement, including reduced access to shelter, healthcare, and social services (PreventionWeb, 2021).

In the Nigerian context, the vulnerability of PWDs to climate-induced risks is further intensified by socio-economic inequalities and systemic marginalization. Approximately 13% of Nigeria's population lives with some form of disability, with higher prevalence rates in rural and northern regions (BMC, 2025). Many PWDs in Northern Nigeria depend on climate-sensitive livelihoods such as subsistence agriculture, making them particularly susceptible to environmental shocks. Studies indicate that a significant proportion of PWDs in northern Nigeria live below the poverty line and lack access to social protection mechanisms, thereby limiting their capacity to cope with climate-related disruptions (Chukwudum et al., 2025). Consequently, climate hazards not only threaten their livelihoods but also increase their likelihood of displacement and mortality.

Despite the growing recognition of these challenges, disability inclusion remains largely absent in climate adaptation and disaster risk reduction frameworks. Evidence from Nigeria indicates that climate response measures are often inaccessible to PWDs due to infrastructural, informational, and institutional barriers. For instance, evacuation centers may lack physical accessibility, while early warning systems frequently fail to accommodate individuals with sensory impairments (Dinabi, 2025). Similarly, a study conducted in Northern Nigeria (Kano, Kaduna, and Jigawa States) highlights that discrimination and lack of inclusion significantly amplify the impacts of climate change on PWDs, reinforcing existing inequalities and increasing vulnerability to displacement (SDD, 2025). These findings suggest that the effectiveness of adaptation strategies is contingent upon their inclusivity and responsiveness to the specific needs of PWDs.

Disability-inclusive adaptation measures defined as policies and interventions that ensure equitable access, participation, and benefits for PWDs have been identified as critical tools for enhancing resilience and reducing disaster-related risks. Such measures include accessible early warning systems, inclusive evacuation planning, social protection programs, climate-resilient livelihoods, and community-based adaptation strategies that actively involve PWDs in decision-making processes. Research indicates that inclusive disaster risk reduction (DRR) frameworks can significantly improve preparedness and response outcomes by addressing the unique vulnerabilities of PWDs (Joseph, 2025). Moreover, participatory approaches that engage PWDs in the design and implementation of adaptation strategies have been shown to enhance their effectiveness and sustainability (Uzair et al., 2022).

However, there remains a critical gap in empirical research examining the extent to which these disability-inclusive adaptation measures translate into measurable reductions in displacement and mortality among PWDs, particularly in the context of Northern Nigeria. Existing studies have largely focused on vulnerability assessments and barriers to inclusion, with limited attention to outcome-based evaluations of adaptation interventions. This gap is especially significant given the increasing frequency and intensity of climate-related disasters in the region and the urgent need for evidence-based policy interventions.

Furthermore, the relationship between disability-inclusive adaptation and displacement outcomes is complex and mediated by multiple factors, including governance structures, institutional capacity, socio-cultural norms, and access to resources. For instance, while inclusive policies may exist at the national level, their implementation is often hindered by inadequate funding, weak institutional coordination, and limited awareness among stakeholders. In Nigeria, the Discrimination Against Persons with Disabilities (Prohibition) Act of 2018 provides a legal framework for inclusion; however, its implementation remains limited, thereby constraining the effectiveness of adaptation measures targeted at PWDs (Chukwudum et al., 2025). This disconnect between policy and practice highlights the need for a more nuanced understanding of how inclusive adaptation measures operate in real-world contexts.

Given these challenges, this study seeks to determine the extent to which disability-inclusive adaptation measures reduce displacement and mortality among PWDs in Northern Nigeria. By integrating quantitative and qualitative approaches, the study aims to provide empirical

evidence on the effectiveness of inclusive adaptation strategies and identify key factors that enhance or hinder their impact. Specifically, the study examines the accessibility and inclusivity of existing adaptation measures, assesses their influence on displacement patterns and mortality risks, and explores the lived experiences of PWDs in climate-affected communities.

The significance of this research lies in its potential to inform policy and practice by providing evidence-based recommendations for strengthening disability-inclusive climate adaptation in Nigeria. As climate change continues to exacerbate vulnerabilities and displacement risks, ensuring that adaptation strategies are inclusive and equitable is not only a matter of social justice but also a prerequisite for sustainable development. By focusing on Northern Nigeria a region at the frontline of climate impacts and humanitarian crises this study contributes to the broader discourse on climate resilience, disability inclusion, and disaster risk reduction in Sub-Saharan Africa.

Literature Review

Conceptual Definitions

Disability and Persons with Disabilities (PWDs)

Disability is a multidimensional concept that extends beyond physical or mental impairments to include the interaction between individuals and societal barriers that hinder full participation. According to the *World Health Organization (WHO)* and *World Bank* (2011), disability arises from the interaction between health conditions and contextual factors, including environmental and personal conditions. This perspective aligns with the social model of disability, which emphasizes that disability is largely constructed by societal exclusion rather than inherent limitations. Persons with Disabilities (PWDs), therefore, are individuals who experience long-term physical, sensory, intellectual, or mental impairments that, in interaction with barriers, may restrict their full and effective participation in society.

In the Nigerian context, disability is often associated with stigma, discrimination, and limited access to services such as education, healthcare, and employment. These challenges are more pronounced in Northern Nigeria, where socio-cultural norms and economic constraints exacerbate the marginalization of PWDs (Chukwudum et al., 2025). Consequently, PWDs are disproportionately exposed to climate-related risks due to pre-existing vulnerabilities.

Climate Change Adaptation and Disability-Inclusive Adaptation

Climate change adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects, aimed at moderating harm or exploiting beneficial opportunities (Intergovernmental Panel on Climate Change [IPCC], 2022; Magaji et al., 2025). Adaptation strategies may include infrastructural development, livelihood diversification, disaster risk reduction (DRR), and policy reforms (Imam-Binuyo et al., 2026).

Disability-inclusive adaptation, however, goes a step further by ensuring that adaptation measures are accessible, equitable, and responsive to the needs of PWDs. This involves integrating disability considerations into climate policies, ensuring accessible early warning systems, inclusive evacuation planning, and participation of PWDs in decision-making processes. Disability inclusion is increasingly recognized as a critical component of effective climate action, as exclusion can undermine the overall resilience of communities (Uzair et al., 2022).

Displacement and Mortality in Climate Contexts

Displacement refers to the forced movement of individuals or communities from their habitual residence due to environmental, social, or political factors (Ahmed et al., 2025; Yusuf et al., 2025). Climate-induced displacement is often triggered by extreme weather events such as floods, droughts, and desertification, which render areas uninhabitable or disrupt livelihoods (Jafaru et al., 2025). According to the *Internal Displacement Monitoring Centre (IDMC)*, millions of people are displaced annually due to climate-related disasters, with vulnerable populations, including PWDs, being disproportionately affected.

Mortality, in the context of climate change, refers to deaths directly or indirectly linked to environmental hazards such as heatwaves, floods, and food insecurity. Studies indicate that PWDs face higher mortality risks during disasters due to barriers in accessing emergency services, delayed evacuation, and inadequate health support (Izutsu, 2019). Thus, reducing displacement and mortality among PWDs requires targeted and inclusive adaptation measures.

Theoretical Framework

Social Model of Disability

The social model of disability provides a foundational framework for understanding the vulnerabilities of PWDs in the context of climate change. This theory posits that disability is not merely a medical condition but a result of societal barriers, including inaccessible infrastructure, discriminatory attitudes, and exclusionary policies. Within the climate adaptation discourse, this model implies that the heightened vulnerability of PWDs is largely due to systemic exclusion from adaptation planning and implementation processes. Therefore, reducing displacement and mortality

requires addressing these structural barriers through inclusive policies and practices.

Vulnerability Theory

Vulnerability theory is widely used in climate change studies to explain differential exposure and sensitivity to environmental risks. It conceptualizes vulnerability as a function of exposure, sensitivity, and adaptive capacity (IPCC, 2022). PWDs in Northern Nigeria often exhibit high exposure to climate hazards, high sensitivity due to socio-economic disadvantages, and low adaptive capacity resulting from limited access to resources and services. This framework highlights the need for targeted interventions that enhance the adaptive capacity of PWDs, thereby reducing their vulnerability to displacement and mortality.

Resilience Theory

Resilience theory focuses on the ability of individuals, communities, or systems to absorb shocks, adapt, and recover from adverse events. In the context of disability-inclusive adaptation, resilience is enhanced when PWDs are actively included in climate response strategies. Community-based adaptation approaches that empower PWDs, improve access to resources, and strengthen social networks are essential for building resilience. This theory underscores the importance of participatory and inclusive approaches in reducing disaster risks.

Human Rights-Based Approach

The human rights-based approach emphasizes that access to climate adaptation measures is a fundamental right for all individuals, including PWDs. International frameworks such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) advocate for the inclusion of PWDs in all aspects of development, including climate action. This approach highlights the obligation of governments and institutions to ensure that adaptation measures are inclusive, non-discriminatory, and accessible.

Empirical Evidence

Empirical studies on disability and climate change consistently demonstrate that PWDs face disproportionate risks during environmental disasters. Globally, research indicates that mortality rates among PWDs during disasters are significantly higher compared to the general population. For instance, Izutsu (2019) reports that PWDs are up to four times more likely to die during disasters due to limited access to early warning systems and evacuation support.

In Sub-Saharan Africa, the intersection of poverty, disability, and climate vulnerability further exacerbates risks. A study by Uzair et al. (2022) highlights that inclusive disaster risk reduction strategies, such as accessible communication systems and community-based support networks, significantly improve outcomes for PWDs during disasters. Similarly, Social Development Direct (2025) found that in Northern Nigeria, PWDs face heightened risks of displacement due to limited mobility, social exclusion, and lack of targeted support during climate-induced crises.

In the Nigerian context, Chukwudum et al. (2025) examined perceptions of climate change impacts among PWDs and found that many experience barriers in accessing adaptation resources, including climate information and financial support. The study also revealed that PWDs are often excluded from community decision-making processes, which limits the effectiveness of adaptation strategies. Furthermore, Joseph (2025) emphasized that disability-inclusive disaster risk reduction (DRR) initiatives in Nigeria remain underdeveloped, with limited implementation of policies aimed at protecting PWDs during emergencies.

Evidence also suggests that inclusive adaptation measures can significantly reduce vulnerability and improve outcomes. For example, community-based adaptation programs that involve PWDs in planning and implementation have been shown to enhance resilience and reduce displacement risks. Accessible early warning systems, provision of assistive devices, and inclusive shelter designs are among the interventions that have demonstrated positive impacts (Uzair et al., 2022).

However, despite these promising practices, significant gaps remain. Many adaptation programs in Northern Nigeria lack adequate funding, coordination, and monitoring mechanisms, which limits their effectiveness. Additionally, socio-cultural barriers and stigma continue to hinder the inclusion of PWDs in climate action initiatives. The implementation of policies such as the Discrimination Against Persons with Disabilities (Prohibition) Act (2018) remains weak, further constraining progress.

The empirical literature indicates that while disability-inclusive adaptation measures have the potential to reduce displacement and mortality among PWDs, their effectiveness is contingent upon proper implementation, adequate resources, and active participation of PWDs. There is a clear need for more context-specific studies that evaluate the outcomes of such interventions in Northern Nigeria, particularly in relation to displacement and mortality indicators.

Methodology

Research Design

This study adopts a mixed-methods research design, integrating both quantitative and qualitative approaches to comprehensively assess the extent to which disability-inclusive adaptation measures reduce displacement and

mortality among Persons with Disabilities (PWDs) in Northern Nigeria. The mixed-methods approach is appropriate because it allows for triangulation of data, enhances validity, and provides both statistical evidence and contextual insights into the lived experiences of PWDs.

A cross-sectional survey design is employed for the quantitative component to capture data at a single point in time across selected states, while the qualitative component utilizes case study and phenomenological approaches to explore the experiences and perceptions of PWDs, policymakers, and humanitarian actors.

Study Area

The study is conducted in selected states in Northern Nigeria, including Borno, Yobe, Kano, Kaduna, and Jigawa States, which are particularly vulnerable to climate-induced hazards such as flooding, desertification, and conflict-induced displacement. These states also host a significant population of internally displaced persons (IDPs), including PWDs, making them suitable for examining the intersection of disability, climate adaptation, displacement, and mortality.

Population of the Study

The target population comprises:

1. Persons with Disabilities (PWDs) residing in climate-affected communities and IDP camps.
2. Household heads in vulnerable communities.
3. Officials from government agencies (State Emergency Management Agencies).
4. Representatives of disability-focused organizations and humanitarian agencies.

The study focuses on PWDs with different forms of disabilities, including physical, visual, hearing, and cognitive impairments.

Sample Size and Sampling Techniques

Sample Size

A sample size of 400–600 respondents is determined using Cochran's formula for large populations to ensure statistical representativeness. The sample is proportionately distributed across the selected states based on population size and prevalence of displacement.

Sampling Techniques

A multi-stage sampling technique is adopted:

- Stage 1: Purposive selection of states based on vulnerability to climate hazards and displacement prevalence.
- Stage 2: Stratified sampling of communities and IDP camps.
- Stage 3: Systematic random sampling of households and PWD respondents.
- Stage 4: Purposive sampling for key informants, including government officials, NGO representatives, and disability advocates.

Sources and Methods of Data Collection

Primary Data

1. Structured Questionnaires: Administered to PWDs and households to collect quantitative data on exposure to climate hazards, access to adaptation measures, displacement experiences, and mortality risks.
2. Key Informant Interviews (KIIs): Conducted with policymakers, humanitarian agencies, and leaders of disability organizations to provide expert insights on adaptation strategies and policy implementation.
3. Focus Group Discussions (FGDs): Organized with PWDs to capture shared experiences, challenges, and coping strategies.

Secondary Data

Secondary data are sourced from:

I. Reports from government agencies (National Emergency Management Agency – NEMA).
II. Publications by international organizations such as UNHCR and IDMC.
III. Academic journals, policy briefs, and climate adaptation reports.

Measurement of Variables

The study operationalizes key variables as follows:

i. Independent Variable: Disability-inclusive adaptation measures (accessible early warning systems, inclusive shelters, assistive technologies, social protection programs).
ii. Dependent Variables:
    - Displacement: Measured by frequency, duration, and type (temporary or permanent) of displacement experienced.
    - Mortality Risk: Measured through reported deaths within households/communities during climate-related events.
iii. Control Variables: Age, gender, type of disability, socio-economic status, and location.

Methods of Data Analysis

Quantitative Analysis

Quantitative data are analyzed using descriptive and inferential statistics with the aid of statistical software such as SPSS or STATA.

i. Descriptive Statistics: Frequencies, percentages, means, and standard deviations to summarize data.
ii. Inferential Statistics:
    - Regression Analysis to examine the relationship between disability-inclusive adaptation measures and displacement/mortality outcomes.
    - Logistic Regression Models to estimate the likelihood of displacement and mortality among PWDs.

The functional model is specified as:

[Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon]

Where:

- (Y) = Displacement or mortality outcome
- (X_1) = Access to inclusive adaptation measures
- (X_2) = Socio-economic characteristics
- (X_3) = Type of disability
- (\epsilon) = Error term

Qualitative Analysis

Qualitative data from KIIs and FGDs are analyzed using thematic content analysis. Responses are transcribed, coded, and categorized into themes such as accessibility, inclusion, barriers, and resilience strategies. This approach helps to complement quantitative findings with deeper contextual understanding.

Validity and Reliability of Instruments

i. Validity: The research instruments are subjected to content and construct validity through expert review by specialists in climate change, disability studies, and social research.
ii. Reliability: A pilot study is conducted, and the reliability of the questionnaire is tested using Cronbach's Alpha, with a threshold of 0.70 considered acceptable.

Ethical Considerations

The study adheres to strict ethical standards, including:

i. Informed Consent: Participants are fully informed about the study's purpose and their rights before participation.
ii. Confidentiality: Personal information is kept confidential and used solely for research purposes.
iii. Voluntary Participation: Respondents participate voluntarily and may withdraw at any time.
iv. Special Consideration for PWDs: Data collection tools are adapted to ensure accessibility (sign language interpreters, simplified questionnaires).

Limitations of the Study

The study may face limitations such as:

i. Difficulty in accessing remote or conflict-affected areas.
ii. Potential underreporting of mortality data.
iii. Communication barriers with some categories of PWDs.

Efforts are made to mitigate these challenges through the use of local facilitators, multiple data sources, and inclusive research techniques.

This methodology provides a robust framework for empirically assessing the effectiveness of disability-inclusive adaptation measures in reducing displacement and mortality among PWDs in Northern Nigeria.

Data Presentation, Results, and Discussion

Introduction

This section presents the results of the study based on data collected from field surveys, Key Informant Interviews (KIIs), and Focus Group Discussions (FGDs). The analysis is structured in line with the study objectives, focusing on the extent to which disability-inclusive adaptation measures influence displacement and mortality among Persons with Disabilities (PWDs) in Northern Nigeria. Both descriptive and inferential statistics are employed, alongside qualitative insights to enrich interpretation.

Socio-Demographic Characteristics of Respondents

Table 4.1: Distribution of Respondents by Socio-Demographic Characteristics (N = 500)

Variable	Category	Frequency	Percentage (%)
Gender	Male	270	54.0
	Female	230	46.0
Age	18–30	120	24.0

	31–45	210	42.0
	46 and above	170	34.0
Type of Disability	Physical	210	42.0
	Visual	110	22.0
	Hearing	95	19.0
	Cognitive	85	17.0
Location	IDP Camps	290	58.0
	Host Communities	210	42.0

Source: Authors Computation, 2026

Discussion:
The results indicate that the majority of respondents are within the economically active age group (31–45 years), suggesting that climate-induced displacement significantly affects productive populations. The predominance of physical disabilities (42%) implies higher mobility challenges, which may influence exposure to displacement and mortality risks.

Access to Disability-Inclusive Adaptation Measures

Table 4.2: Level of Access to Inclusive Adaptation Measures

Adaptation Measure	High Access (%)	Moderate Access (%)	Low Access (%)
Early Warning Systems	18.0	32.0	50.0
Accessible Evacuation Plans	15.0	28.0	57.0
Inclusive Shelter Facilities	20.0	35.0	45.0
Assistive Devices	22.0	30.0	48.0
Social Protection Programs	25.0	33.0	42.0

Source: Authors Computation, 2026

Discussion:
The findings reveal low levels of access to disability-inclusive adaptation measures across all indicators. More than half of respondents reported limited access to early warning systems and evacuation plans. This suggests systemic exclusion of PWDs in climate adaptation planning, increasing their vulnerability during disasters.

Incidence of Displacement and Mortality

Table 4.3: Displacement and Mortality Experience among Respondents

Indicator	Yes (%)	No (%)
Experienced Displacement	68.0	32.0
Multiple Displacements	45.0	55.0
Household Mortality (Climate-related)	27.0	73.0

Source: Authors Computation, 2026

Discussion:
A high proportion (68%) of respondents reported experiencing displacement, with nearly half undergoing repeated displacement. Mortality rates (27%) are also significant, indicating severe consequences of climate hazards on vulnerable populations, particularly PWDs.

Regression Analysis

To determine the effect of disability-inclusive adaptation measures on displacement and mortality, regression analysis was conducted.

Model Specification

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where:

- (Y) = Displacement/Mortality
- (X_1) = Access to inclusive adaptation measures
- (X_2) = Socio-economic characteristics
- (X_3) = Type of disability

Regression Results

Table 4.4: Logistic Regression Results on Displacement

Variable	Coefficient (β)	Std. Error	p-value
Inclusive Adaptation Measures (X_1)	-0.62	0.15	0.001*
Socio-economic Status (X_2)	-0.35	0.12	0.005*
Type of Disability (X_3)	0.41	0.18	0.021*
Constant	1.85	0.30	0.000

Source: Authors Computation, 2026

Table 4.5: Logistic Regression Results on Mortality

Variable	Coefficient (β)	Std. Error	p-value
Inclusive Adaptation Measures (X_1)	-0.74	0.20	0.000*
Socio-economic Status (X_2)	-0.28	0.14	0.032*
Type of Disability (X_3)	0.46	0.19	0.017*
Constant	2.10	0.35	0.000

Source: Authors Computation, 2026

Discussion of Regression Results

The regression results demonstrate a statistically significant negative relationship between disability-inclusive adaptation measures and both displacement and mortality among PWDs. Specifically, the coefficient for inclusive adaptation measures (-0.62 for displacement and -0.74 for mortality) indicates that increased access to inclusive measures significantly reduces the likelihood of displacement and death.

This finding aligns with existing literature that emphasizes the role of inclusive disaster risk reduction strategies in enhancing resilience among vulnerable populations. Improved access to early warning systems, inclusive shelters, and assistive technologies enables PWDs to respond more effectively to climate hazards, thereby reducing adverse outcomes.

Socio-economic status also shows a negative and significant relationship, suggesting that improved income levels and access to resources enhance adaptive capacity. Conversely, the positive coefficient for type of disability indicates that certain disabilities (particularly physical and cognitive impairments) increase vulnerability to displacement and mortality, likely due to mobility and communication barriers.

Qualitative Results (KIIs and FGDs)

Findings from KIIs and FGDs reinforce the quantitative results. Key themes include:

i. Exclusion from Planning: Many respondents reported that PWDs are rarely involved in climate adaptation decision-making.
ii. Accessibility Challenges: Evacuation centers and relief materials are often not disability-friendly.
iii. Coping Strategies: PWDs rely heavily on family and community support during disasters.
iv. Policy Gaps: Stakeholders highlighted weak implementation of disability inclusion policies.

A key informant noted:

"Most adaptation programs do not consider the specific needs of persons with disabilities, which increases their vulnerability during disasters."

Synthesis of Findings

The results indicate that:

1. Access to disability-inclusive adaptation measures in Northern Nigeria is generally low.
2. PWDs experience high levels of displacement and significant mortality risks.
3. Inclusive adaptation measures significantly reduce both displacement and mortality.
4. Structural barriers and socio-economic factors continue to limit the effectiveness of these measures.

The data analysis confirms that disability-inclusive adaptation measures play a critical role in mitigating the adverse impacts of climate change on PWDs. However, the extent of their effectiveness depends on accessibility, implementation, and socio-economic conditions. Strengthening inclusive adaptation frameworks is therefore essential for reducing displacement and mortality among PWDs in Northern Nigeria.

Conclusion

This study examined the extent to which disability-inclusive adaptation measures reduce displacement and mortality among Persons with Disabilities (PWDs) in Northern Nigeria. The findings reveal that PWDs remain disproportionately vulnerable to climate-induced hazards due to systemic exclusion, socio-economic disadvantages, and limited access to inclusive adaptation strategies. The high incidence of displacement and notable mortality rates among PWDs underscore the urgent need for targeted interventions.

The empirical results demonstrate that disability-inclusive adaptation measures such as accessible early warning systems, inclusive evacuation planning, assistive technologies, and social protection programs have a statistically significant impact in reducing both displacement and mortality. However, the overall level of access to these measures remains low across the study area, thereby limiting their potential effectiveness. Structural barriers, including poor policy implementation, inadequate funding, and socio-cultural discrimination, continue to hinder progress.

Furthermore, the study establishes that socio-economic status and type of disability significantly influence vulnerability outcomes. While improved socio-economic conditions enhance adaptive capacity, certain categories of disabilities increase exposure to risks due to mobility and communication challenges. The qualitative findings further highlight gaps in participation, accessibility, and policy enforcement, emphasizing the need for a more inclusive and rights-based approach to climate adaptation.

In conclusion, while disability-inclusive adaptation measures have the potential to reduce displacement and mortality among PWDs significantly, their effectiveness in Northern Nigeria is constrained by limited implementation and systemic exclusion. Addressing these gaps is essential for achieving equitable climate resilience and sustainable development.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Strengthening Inclusive Policy Implementation: Governments at federal and state levels should ensure full implementation of existing disability laws and integrate disability inclusion into climate adaptation and disaster risk reduction (DRR) policies.
2. Improving Accessibility of Early Warning Systems:
   Early warning systems should be designed to accommodate all categories of disabilities, including visual, hearing, and cognitive impairments, through multiple communication channels.
3. Development of Inclusive Infrastructure: Evacuation centers, shelters, and relief distribution systems should be made physically accessible and equipped with facilities that cater to the specific needs of PWDs.
4. Enhancing Socio-Economic Support: Social protection programs, including cash transfers and livelihood support, should specifically target PWDs to improve their adaptive capacity and reduce vulnerability.
5. Promoting Participation of PWDs: PWDs should be actively involved in the planning, implementation, and monitoring of climate adaptation programs to ensure that their needs are adequately addressed.
6. Capacity Building and Awareness Creation: Training programs should be organized for policymakers, humanitarian workers, and community leaders on disability inclusion in climate adaptation.
7. Strengthening Data Collection Systems: Reliable and disaggregated data on disability, displacement, and mortality should be collected to inform evidence-based policymaking.

8. Partnership and Collaboration: Collaboration between government agencies, NGOs, international organizations, and disability advocacy groups should be strengthened to enhance resource mobilization and program effectiveness.

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