

DOI Link: <https://doi.org/10.61586/Di7w9>
Vol.38, Issue.9, Part.1, September 2025, PP.2-27

A Systematic Review of Factors Influencing Climate-induced Migration in Pakistan: Risks, Vulnerabilities, and Policy Imperatives

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Received Feb 2025 Accepted Aug 2025 Published Sep 2025

Abstract

In recent years, climate change has displaced millions of people around the world. South Asia—particularly Pakistan—is among the most vulnerable regions, where re-current floods, droughts, and extreme heat events have forced large segments of the population to migrate in search of safety and livelihoods. Despite this growing crisis, no comprehensive study has systematically examined the key factors driving climate-induced migration in Pakistan. In this context, we conducted a systematic review of peer-reviewed literature published between 2010 and 2024, drawing from Google Scholar and Web of Science, to identify and synthesize the multidimensional drivers of climate-induced migration. Our analysis categorizes these drivers into three intersecting vulnerability domains: socioeconomic (income inequality, landlessness, limited access to healthcare and education, gender disparities), geographical (hazard exposure, terrain, water scarcity, slow-onset events like droughts and heatwaves), and historical-structural (colonial legacies, tribal norms, land conflicts, governance failures, and gendered social structures). Findings reveal that climate-induced migration is not solely a response to environmental hazards but is shaped by overlapping vulnerabilities that compound risk. Research to date has focused disproportionately on flood-induced displacement, with limited attention to slow-onset disasters. A critical insight emerging from the review is the heightened vulnerability of women, who face systemic barriers, increased exposure to violence, and restricted access to relief and recovery resources during displacement. This review highlights the urgent need for integrated, risk-informed migration policies that address deep-rooted socioeconomic inequalities, strengthen institutional capacities, and ensure gender-responsive planning. Tackling the structural drivers of vulnerability is essential for enabling safe, dignified, and adaptive forms of climate mobility in Pakistan.

Keywords: Climate-induced migration; climate risk; gender and displacement; socioeconomic vulnerability; adaptation policy; Pakistan

1. Introduction

Climate change represents a complex global challenge, influencing various aspects of human life and society (Kamal, 2023). Its manifestations include rising temperatures, erratic precipitation patterns, escalating sea levels, and an increased frequency of extreme weather events such as floods, droughts, heatwaves, and wildfires (Hussain et al., 2020; Otto et al., 2023). Over recent decades, the vulnerability of human populations to these climate-induced disasters has grown significantly, prompting adaptive strategies, including human migration, which is referred to as “climate-induced migration” (Gul et al., 2024; Jan et al., 2024a; Ullah et al., 2024a).

Migration has been a part of human history for millennia, shaped by a multitude of factors that vary by region and context. In developing nations, particularly, the drivers of migration often stem from natural phenomena related to climate change, as well as socio-economic pressures like armed conflicts and wars (Khan et al., 2023; Upadhyay et al., 2015). Vulnerable populations, therefore, find themselves forced to leave their homes—sometimes willingly, sometimes not—in search of safety and stability (Ferris and Habib, 2020; Shweta et al., 2017; Toscano, 2015). Beyond environmental triggers, various social factors motivate migration, including the pursuit of better economic opportunities, enhanced educational and healthcare access, socio-political stability, and improved infrastructure (Naser et al., 2019; Upadhyay et al., 2015).

This review focuses on Pakistan as a case study, a country with a population nearing 250 million and spanning an area of 796,000 square kilometers, characterized by a diverse climate and topography (Ullah et al., 2019). The climate ranges from tropical in the south to temperate in the north, encompassing semi-arid regions, humid high mountains, and extensive arid areas like the Balochistan Plateau and Thar Desert (Jan et al., 2024a). Pakistan is consistently identified as one of the countries most vulnerable to climate change, where the susceptibility of its population to climate-related disasters is increasingly acute (Shah et al., 2025; Ullah et al., 2018; Ullah and Nihei, 2016). A recent global report highlights Pakistan among the top 50 countries experiencing a surge in internal displacement due to climate events like floods and heavy monsoon rainfall, further exacerbated by non-climatic factors such as conflicts and earthquakes (Kamal, 2023).

The scale of climate-related disasters in Pakistan is alarming (Rana et al., 2023), with significant events like urban flooding in major cities—including Karachi, Lahore, Rawalpindi, and Hyderabad—glacial outbursts in the Upper Indus Basin, and flash floods in southern Punjab and Sindh (Magsi et al., 2023; Salik et al., 2023). The catastrophic floods beginning in June 2022 serve as a stark example of this crisis, resulting in the submergence of approximately one-third of the country's land, the destruction of 3.6 million acres of crops, and the loss of over 750,000 livestock (Manzoor et al., 2022). These disasters inflicted damage beyond agriculture, affecting around 24,000 educational institutions and decimating vital infrastructure like roads and bridges (Otto et al., 2023; Shah et al., 2024a).

It is widely acknowledged that climate change and its associated disasters have heightened socio-economic and ecological vulnerabilities in Pakistan (Ullah et al., 2025). Notably, the catastrophic floods of 2010, 2011, and 2022 exemplify the severe impact of climate change, with millions affected—20 million during the 2010 floods and a staggering 33 million during the 2022 floods (Otto et al., 2023; Shah et al., 2024b, 2020; Ullah et al., 2024b). The financial toll is equally shocking, with losses exceeding \$30 billion, contrasting sharply with the \$1.5 billion emergency relief package negotiated with the International Monetary Fund (IMF) in the preceding year (Nanditha et al., 2023). This situation is further complicated by Pakistan's existing sovereign debt, which exceeds \$250 billion (Islam et al.,

n.d.; Majeed, 2023). Many of those affected come from underprivileged backgrounds, residing in impoverished districts along rivers that are prone to flooding (Shah et al., 2022). Among the displaced were approximately 650,000 pregnant women and 16 million children, who required extensive medical care during and after the crises (Iqbal et al., 2024; Sadia et al., 2016). Moreover, prolonged droughts in southern Pakistan, exacerbated by climate change, have led to increased water scarcity, marginalization of livelihoods, and food insecurity (Hussain et al., 2020; Salik et al., 2023). The growing recognition of these climate-induced challenges highlights their role as primary drivers of migration in Pakistan. Climate-induced migration has extensive implications for both societal structures and environmental stability (Fry et al., 2024; Toscano, 2015). In dire situations, displaced individuals often leave their homes with minimal belongings, relocating to areas already strained by an influx of migrants (Shah et al., 2024b). This rapid increase in population can lead to numerous issues, including limited access to education, healthcare services, and inadequate sanitation facilities, creating a large-scale humanitarian crisis (Hamidi et al., 2025; Jan et al., 2024a; Rana et al., 2023). At the same time, the influx of displaced individuals creates competition for limited natural resources, leading to unplanned urbanization in major cities (Ali et al., 2018). In rural contexts, people, especially women often migrate as a survival strategy when male family members struggle to provide for the household post-disaster (Bhutta et al., 2022). Conversely, migration to urban areas, motivated by the pursuit of improved facilities and economic prospects, exacerbates the burden on already stretched urban infrastructure, resources, and local economies (Rana et al., 2023; Waseem and Rana, 2023). In this context, climate-induced migration is recognized as a multifaceted challenge that requires nuanced understanding and response strategies in Pakistan (Rasheed, 2022).

These migration trends are not without significant challenges (Ullah et al., 2025). Environmentally, migration can lead to the degradation of ecosystems, such as the loss of arable land due to salinization from rising sea levels and flooding, posing a serious threat to food security as agriculture becomes increasingly untenable in affected areas (Askland et al., 2022; Ferris and Habib, 2020; Hasnat et al., 2022). Socially, the breakdown of community structures due to displacement can lead to isolation and increased mental health issues among migrants (Salik et al., 2020; Shabbir et al., 2021). For instance, those forced into urban slums frequently face discrimination, exacerbating their vulnerabilities and limiting their access to essential services (Hamidi et al., 2025). Economically, displaced individuals often lack the financial means necessary to adapt to their new environments (Ullah et al., 2024b). Many are forced into informal employment, which tends to be low-paying and unstable (Nanditha et al., 2023; Salik et al., 2020). Salik et al. (2023) (Salik et al., 2023) have reported a significant rise in food insecurity rates in regions affected by climate disasters, intensifying existing poverty levels. Rural farmers, in particular, struggle with declines in agricultural productivity driven by unpredictable weather patterns (Ullah et al., 2019), further increasing their reliance on migration (Ullah et al., 2024a).

Culturally, migration disrupts established customs and traditions, especially in rural communities where kinship ties play a crucial role (Magsi et al., 2023; Salik et al., 2023). Displaced individuals often grapple with maintaining their cultural identity in urban settings, facing challenges related to social integration and, at times, hostility from host communities (Gul et al., 2024). Health challenges are also pronounced; overcrowding in temporary shelters raises the risk of waterborne diseases and health crises (Ali et al., 2022; Rasheed, 2022). As highlighted by Shah et al. (2020) (Shah et al., 2020), immediate efforts should center on enhancing the delivery of humanitarian aid and rescue operations, alongside relocating affected individuals to secure areas. The authors further reported that the provision of basic shelter, sustenance, and urgent medical care is of utmost importance.

Concurrently, reinstating primary healthcare services and implementing preventive health strategies—especially for the well-being of women and children—are critical (Raza et al., 2023; Shah et al., 2025). Given the disruptions to health outreach and immunization services, prioritizing these aspects is essential, particularly for pregnant women requiring secure childbirth facilities (Raza et al., 2023). Looking forward, addressing climate change and strengthening disaster preparedness will be crucial in mitigating the repercussions of potential climate-induced disasters in Pakistan.

Despite the extensive challenges posed by climate-induced migration, there is a notable gap in the literature regarding its specific effects within the context of Pakistan (Ullah et al., 2024a, 2024b). Most existing studies primarily focus on economic drivers, often framed within push-and-pull theories, or on international migration and its implications for remittance flows (Askland et al., 2022; Iqbal et al., 2022; Manzoor et al., 2022). This oversight neglects the real-life experiences of displaced communities; consequently, this review seeks to fill this critical gap by advancing the understanding of climate change as a key driver of migration in Pakistan. This comprehensive review of climate-induced migration specifically addresses a range of interconnected factors—socioeconomic, geographical (environmental), historical (cultural and psychological)—and their implications for affected communities. The study not only enhances the academic debates on climate migration but also provides valuable insights for relevant stakeholders aiming to address the complicated challenges faced by vulnerable populations in Pakistan.

2. Method

2.1. Protocol

The systematic review process for this study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2015). The PRISMA framework is widely recognized as a standard for conducting systematic reviews, ensuring a comprehensive, transparent, and replicable process. The main objective was to identify, synthesize, and critically appraise empirical and policy-related literature that assesses climate-induced migration in Pakistan. This process involved a multistage approach, starting with a systematic search of relevant databases, followed by careful screening, full-text review, and eventual study selection. This procedure helps understand the mechanisms, vulnerabilities, policy responses, and adaptation strategies related to climate-related displacement in Pakistan. The systematic process guarantees that the included literature collectively offers a credible and exhaustive view of the subject, which can aid policy formulation and further empirical investigations.

2.2. Eligibility Criteria

In this study, inclusion and exclusion criteria are established to make sure only the studies that directly contribute to understanding climate-induced migration in Pakistan are included. The primary goal of this review is to identify the main factors that contribute to climate-related displacement, the vulnerabilities people face, and the policy responses implemented to reduce or mitigate its impacts. Thus, contributory factors are defined as elements that, if they were absent or different at the time, climate-related displacement might not have happened, its severity might have been reduced, or related vulnerabilities might not have appeared. These factors are crucial for understanding the complex dynamics of climate-induced migration and for developing effective policy responses.

2.2.1. Inclusion Criteria

The following criteria were used to determine whether a study was eligible for inclusion:

- The study explicitly focuses on climate-induced migration in Pakistan, with an emphasis on climate-related stressors, policy responses, vulnerability, adaptation mechanisms, or related impacts.
- The study examines drivers or mechanisms of climate-related displacement or relocation.
- The publication is written in English, is peer-reviewed or from a credible policy institution, and its full text is available for exhaustive review.
- The study was published between 2010 and 2024 to account for the most up-to-date data, policy perspectives, and practices.
- The study includes analysis related to geographical, policy, vulnerability, or historical aspects of climate-induced migration in Pakistan.

2.2.2. Exclusion Criteria

The following criteria were applied to exclude studies from consideration:

- The study focused on climate change impacts in general without addressing climate-induced migration in Pakistan.
- The research primarily related to international migration from Pakistan (with no policy or vulnerability context related to climate).
- The non-peer-reviewed sources, opinion papers, blogs, or grey literature without credible or systematic data.
- The paper that does not directly contribute to understanding vulnerability, policy responses, or drivers of climate-induced migration in Pakistan.

2.3. Search Strategy

The primary data sources for this systematic review consisted of reputable academic databases and search engines, including Google Scholar and Web of Science. A comprehensive search strategy was implemented using a combination of keywords related to climate-induced migration in Pakistan (e.g., “climate-induced migration in Pakistan”, “flood migration in Pakistan”, “drought migration in Pakistan”) alongside related terms (such as “vulnerability”, “displacement”, “adaptive policy”, “governance”, and “environmental stressors”).

These keywords were used both as main search terms and free-text words to maximize coverage and identify all potentially relevant studies. To further broaden the search, grey literature, policy reports, and dissertations were also screened. This additional search was designed to uncover policy perspectives or empirical data not captured by the main search strategy. Furthermore, we manually reviewed the reference lists of the retrieved articles to identify additional relevant studies that might otherwise have been missed. This exhaustive process helps to provide a comprehensive view of the literature related to climate-induced migration in Pakistan.

3. Results

3.1. Articles Retrieved

A total of 3,236 records were initially retrieved from the databases and other sources (see Figure 1). After removing duplicates, 2,168 unique entries remained for further evaluation. The team then performed a title and abstract screening, which resulted in 274 articles that appeared to be relevant. Subsequently, 243 articles were excluded after full-text review due to their lack of pertinence, methodological weaknesses, or limited policy or vulnerability perspectives. The final pool consisted of 31 eligible articles for in-depth review. Furthermore, 3 additional studies were identified through manual search of the literature, yielding a total of 34 articles included in this systematic review.

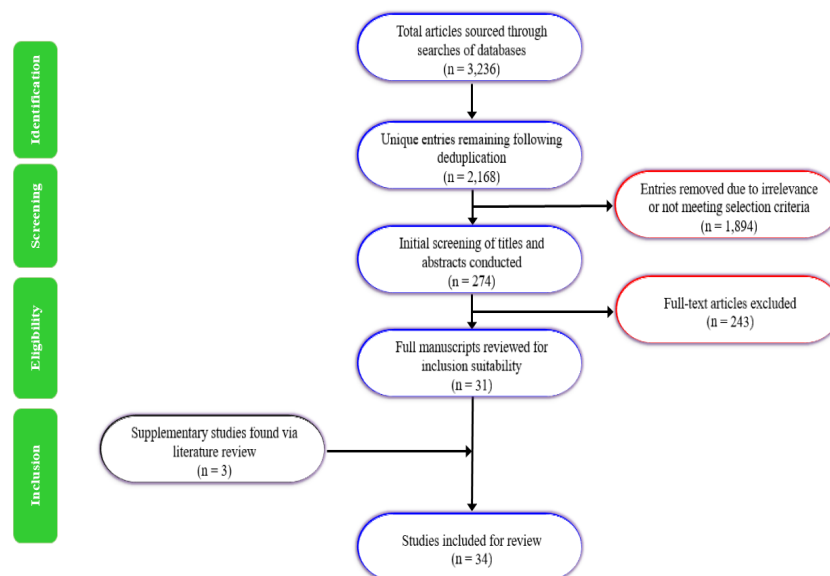


Figure 1. PRISMA Flow Diagram

3.2. Keyword Analysis

The keyword analysis illustrates the main terms related to your paper, reflecting its multidisciplinary focus on climate change, environmental impacts, and vulnerabilities, particularly in Pakistan (Figure 2). The clusters highlight “climate change”, “climate research”, and “flood” as central themes, suggesting that your study focuses on the effects of climate change — especially flooding — on vulnerable areas such as Khyber Pakhtunkhwa and Sindh.

Other terms, including “livelihood”, “migration”, “resilience”, and “development”, show that your study comprehensively considers how environmental stressors affect human well-being, economic stability, and adaptation strategies. Furthermore, keywords like “case

study”, “questionnaire”, and “area community” indicate that your research involves empirical data collection and context-specific analysis, adding depth to your policy-relevant findings.

The strong presence of “women”, “people”, and “property damage” emphasizes a particular focus on social and economic vulnerabilities, especially for the most vulnerable groups. Overall, this shows a holistic study that brings together environmental science, social impacts, and policy implications in the context of climate resilience in Pakistan.

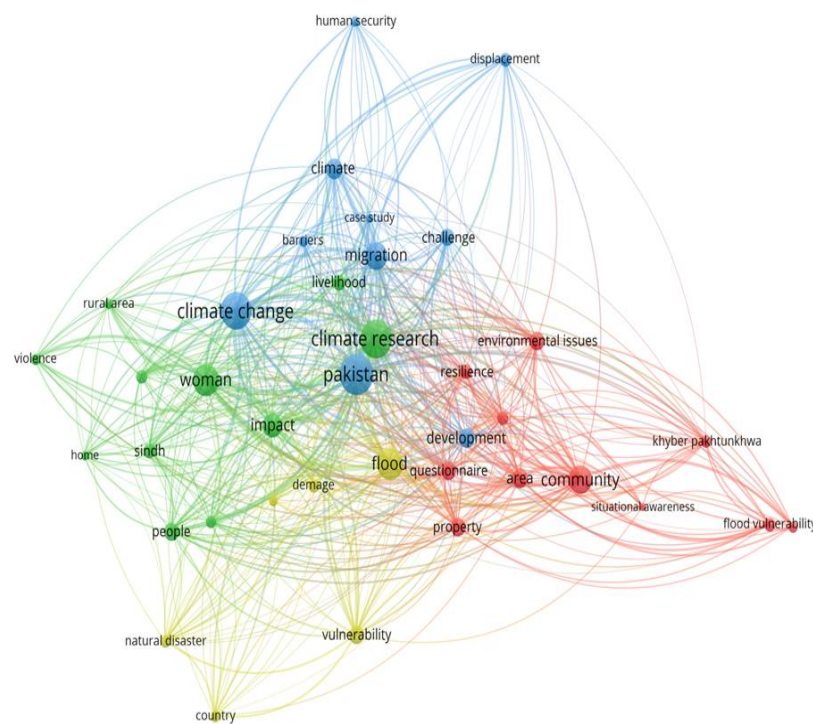


Figure 2. Keyword Co-occurrence Network of the Reviewed Papers

3.3. Article Distribution across Journals

The frequency list shows a range of journals that reflect the multidisciplinary nature of your study, encompassing climate change, environmental impacts, policy, social sciences, and economics, health, and gender perspectives (Figure 3). Some journals, such as *Climate Risk Management*, *International Journal of Disaster Risk Reduction*, *Pakistan Journal of Humanities and Social Sciences*, and *Water*, appear more frequently (with two mentions each), indicating their strong relevance to your topic and their role as key publication outlets for related research. This pattern emphasizes a growing interest in understanding

climate-related vulnerabilities, policy responses, and the social dimensions of climate impacts.

Other journals, with single mentions, further highlight the broad spectrum of perspectives that contribute to this dialogue — ranging from *Earth's Future* and *Environmental Research (Climate)* to *Russian Law Journal* and *Sociological Research and Innovation*. This variety underscores the necessity for a multidisciplinary approach to climate change and policy, integrating knowledge from environmental sciences, economics, health, gender studies, and policy institutions to enable a more comprehensive understanding and effective intervention strategies.



Figure 3. Compilation of Journals Featuring the Reviewed Papers

3.4. Regional Distribution of Publications

The chart in Figure 4 illustrates the frequency of the reviewed paper related to different regions of Pakistan, with Pakistan (multi-regional) leading at 8, reflecting a broad, cross-regional perspective. This is closely followed by Pakistan (national) with 7, indicating a significant emphasis on country-wide data or policy perspectives. Among the provinces, Khyber Pakhtunkhwa stands out with 6 mentions, Punjab with 5, Sindh with 4, Balochistan with 3, and Gilgit-Baltistan with 1, demonstrating varying degrees of geographical emphasis.

This distribution suggests that the most of the existing research focuses predominantly on multi-regional and national perspectives while also addressing the unique vulnerabilities and impacts at the provincial level — particularly in Khyber Pakhtunkhwa and Punjab, which are frequently affected by climate-related hazards. The lower representation for Gilgit-Baltistan may reflect limited data or less documented impacts in that region, while the higher frequencies for Sindh and Balochistan align with their well-established vulnerability to floods and other climate stressors. Overall, this pattern underscores a comprehensive approach, integrating both broad policy perspectives and region-specific vulnerabilities to provide a holistic view of climate impacts across Pakistan.

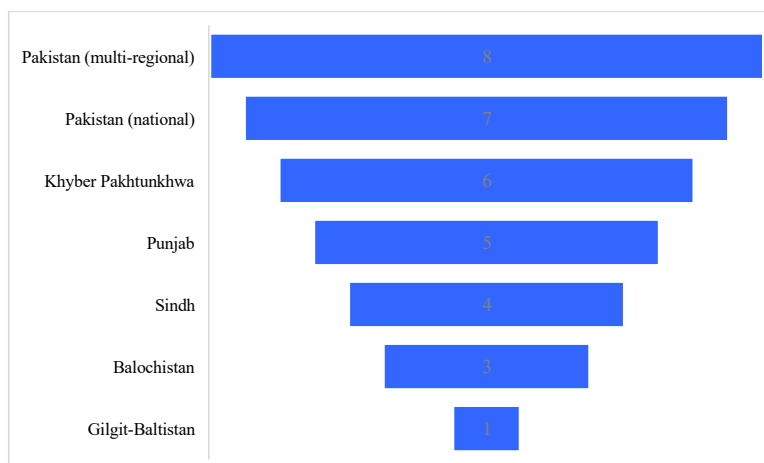


Figure 4. Regional Distribution of the Reviewed Papers

3.5. Factors Influencing Climate-induced Migration

The summaries of 34 research articles in Pakistan (Table 1) show the emergence of climate-induced migration as a critical adaptation response and consequence. A particularly robust finding across the literature is the disproportionate burden borne by women, with 18 studies specifically analyzing how gender disparities and sociocultural norms amplify women's risks during disasters and displacement, including heightened exposure to violence and reduced access to resources. Vulnerability consistently manifests through intersecting socioeconomic, geographical, and historical factors. Socioeconomic drivers are paramount, with income disparities (examined in 26 studies) and gender disparities (26 studies) representing the most frequently identified stressors. Geographical context proves

fundamental, as location/terrain (25 studies) shapes hazard exposure, while specific hazard zones (18 studies) and droughts/heatwaves (12 studies) compound risks. Historical legacies are equally critical, dominated by development gaps – examined in 25 studies – reflecting systemic underinvestment and institutional weaknesses that cripple resilience. Gender norms (17 studies), land conflicts (11 studies), and traditional practices (11 studies) further embed vulnerability. Strikingly, the influence of colonial systems (5 studies) and tribal norms (5 studies) remains relatively underexplored despite their contextual significance.

Three interconnected vulnerability nexuses dominate the findings: First, a poverty-exposure nexus links income disparities with high-risk locations/terrain and entrenched development gaps. Second, a gender injustice nexus demonstrates how gender disparities, reinforced by restrictive gender norms, intersect with limited healthcare/education access (11 studies) and exclusion from land ownership (13 studies) to create unique female vulnerabilities, particularly during displacement. Third, a migration driver nexus shows how water scarcity (10 studies) and droughts interact with income disparities and development gaps to force movement, while land attachment (10 studies) and traditional practices influence adaptation choices.

The analysis highlights that Pakistan's climate crisis is not merely environmental but a product of deep-seated inequalities, spatial precarity, and historical governance failures, where disasters act as threat multipliers for marginalized groups – especially women and rural populations. This vulnerability manifests most visibly in devastating floods, drives significant displacement, and disproportionately burdens women. While the research provides a robust understanding of flood impacts, socioeconomic factors, gender dynamics, and migration, it suggests potential gaps in fully exploring the historical depth of colonial/tribal systems and perhaps a relative under-focus on slow-onset disasters like drought compared to floods. The overwhelming emphasis on Development Gaps points squarely to governance and institutional capacity as critical areas for intervention.

Table 2. Factors Influencing Climate-induced Migration

S · N o .	Referen ces	Article Title	Socioeconomic Factors			Geographical Factors			Historical Factors								
			Income Disparities	Healthcare/Education	Gender Disparities	Location/Terrain	Water Scarcity	Hazard Zones	Droughts/Heatwaves	Colonial Systems	Land Conflicts	Migrant Populations	Development Gaps	Traditional Practices	Gender Norms	Land Attachment	Tribal Norms
1	(Hussain et al., 2023)	The Intersection of Patriarchal Chains and The Natural Disasters: Exploring the Impact of Flood on Women in The Rural Areas of Dera Ghazi Khan, Pakistan	✓	✓			✓	✓	✓		✓	✓	✓			✓	
2	(Ullah and Nihei, 2016)	Climate Change Vulnerability of Pakistan Towards Natural Disasters: A Review	✓		✓	✓	✓		✓			✓	✓	✓	✓		
3	(Ullah et al., 2024b)	Behind the floodwaters: Violence against women, and disaster management capacities in flood-affected areas of Pakistan	✓		✓	✓	✓		✓			✓	✓	✓	✓		
4	(Ullah et al., 2024a)	Unseen suffering: Social injustice among women during climate-induced migration in Pakistan	✓		✓	✓						✓	✓	✓	✓		
5	(Ullah et al., 2025)	Unveiling the Multi-Dimensional Vulnerabilities of Flood-Affected Communities in Khyber Pakhtunkhwa, Pakistan	✓	✓	✓	✓	✓		✓			✓	✓	✓		✓	✓
6	(Rasheed, 2022)	Assessing Climate Change Induced Migration: A Communities' Perspective of District Chaghi and Kila Abdullah, Balochistan	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓
7	(Ajani and van der Geest, 2021)	Climate change in rural Pakistan: evidence and experiences from a people-centered perspective	✓			✓	✓	✓	✓	✓			✓		✓	✓	✓
8	(Magsi et al., 2023)	Climate Change and Climate Justice in Rural Sindh: Evidences and Experiences from the Rural-Based Population of Khairpur District	✓	✓	✓				✓		✓	✓	✓	✓			
9	(Otto et al., 2023)	Climate change increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan					✓		✓	✓			✓				
10	(Shabbir et al., 2021)	Climate Induced Migration Among Women Stories from Muzaffargarh and Tharparkar districts Pakistan	✓			✓			✓				✓			✓	
11	(Farah et al., 2023)	Climate-induced Migration and Associated Risks in Pakistan: A systematic Review	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
12	(Iqbal et al., 2022)	The floods of 2022: Economic and health crisis hits Pakistan			✓			✓	✓				✓				
13	(Iqbal et al., 2024)	Exploring the effects of floods in Pakistan: Pre/post flood analysis 2022	✓		✓		✓		✓				✓	✓			
14	(Memon, 2020)	Climate change and violence against women: study of a flood-affected population in the rural area of Sindh, Pakistan						✓					✓				
15	(Scheffran et al., 2014)	Gender and Environmentally-induced Migration in Gilgit-Baltistan, Pakistan				✓	✓	✓							✓	✓	
16	(Majeed, 2023)	Good Governance, Institutional Capacity and Challenges: Case Study of Floods in Pakistan	✓							✓			✓		✓		✓
17	(Jan et al., 2024a)	Impact of Situational Awareness on Flood Vulnerability Reduction in Nowshera, Pakistan			✓		✓		✓								
18	(Gul et al., 2024)	Impact of Climate Change-Induced Flood on Women's Life: A Case Study of 2022 Flood in District Nowshera, Khyber Pakhtunkhwa, Pakistan	✓										✓	✓			

1	(Nanditha et al., 2023)	The Pakistan Flood of August 2022: Causes and Implications				✓		✓			✓						
2	(Nazeer and Bork, 2021)	A local scale flood vulnerability assessment in the flood-prone area of Khyber Pakhtunkhwa, Pakistan	✓			✓		✓									
2	(Hamidi et al., 2025)	Household flood resilience in the Nowshera district, Pakistan: A multidimensional analysis	✓			✓		✓		✓	✓		✓				✓
2	(Saif and Raza, 2022)	Women and climate change	✓			✓										✓	
2	(Kamal, 2023)	Climate, floods, and migration in Pakistan	✓			✓		✓			✓						
2	(Saeed, 2023)	Climate Change and Climate Induced Migration in Pakistan: A Threat to Human Security (The Study of RajanPur and Taunsa Sharif after Flood 2022)	✓								✓	✓					
2	(Ali et al., 2018)	Climate Change-Induced Conflicts in Pakistan: From National to Individual Level	✓			✓					✓						
2	(Vighio, 2024)	A Comprehensive Assessment of Migration Associated with Climate and Related Risks: A Literature Based Research in Pakistan	✓								✓						
2	(Hamza et al., 2024)	Migration as an Adaptation Measure to Achieve Resilient Lifestyle in the Face of Climate-Induced Drought: Insight from the Thar Desert in Pakistan				✓	✓				✓						
2	(Bibi and Muhamad, 2024)	Pakistan's Climate Conundrum: Revealing the Nexus Between Climate Change and Internal Migration	✓								✓	✓					
2	(Rauf and Zaidi, 2024)	The Effects of Climate Change on Migration and Challenges for Local Government: Case Study of District Umerkot Sindh	✓	✓			✓		✓		✓	✓		✓		✓	
3	(Khalid et al., 2024)	Navigating climate change, disasters and displacement in Pakistan: a case study of Rahim Yar Khan	✓	✓			✓		✓		✓			✓		✓	
3	(Abdul et al., 2024)	Climate Change Impacts on Migration, Poverty, and Health Issues in Pakistan: A Comprehensive Analysis.								✓		✓					
3	(Ghamze Ali et al., 2019)	Internal Migration and Urbanisation: A Case Study from Semi-arid Regions of Pakistan	✓								✓	✓					
3	(Saima et al., 2024)	Climate Displacement in Pakistan: (under) reported Frame in Media Discourse on Climate Change in Pakistan	✓								✓	✓					
3	(Muneeb and Aadersh, 2024)	Climate Change: Impacts on Balochistan and Suggested Contemplative Responses	✓		✓			✓		✓		✓			✓		

4. Discussion

4.1. Socio-Economic Factors

The discussion on socioeconomic vulnerability reveals a complex interplay of factors that fundamentally shape communities' capacity to withstand climate impacts. Central to this is income disparity. Evidence consistently shows that marginalized communities face severe limitations in accessing resources and income opportunities, directly undermining their ability to adapt to climatic changes or invest in resilience measures (Fahad and Wang, 2018). This economic vulnerability is often compounded by geographic isolation, confining these populations to environmentally sensitive areas with scarce formal employment, thereby perpetuating socioeconomic discrimination and unequal resource distribution (Iqbal et al., 2022). Even when employment exists, it frequently relegates vulnerable groups to low-paying, insecure jobs lacking essential social benefits, leaving them economically exposed (Scheffran et al., 2014). Crucially, the financial constraints stemming from income disparities severely restrict investment in critical adaptive infrastructure – flood-resistant homes, drought-resistant seeds, soil conservation, water harvesting, or irrigation systems remain out of reach, trapping communities in livelihoods increasingly precarious under unpredictable climates (Jan et al., 2024b; Manzoor et al., 2022; Ullah and Nihei, 2016).

Land ownership emerges as another critical axis of inequality and vulnerability. Access to fertile land is paramount for rural livelihoods in Pakistan. However, historical inequities have concentrated significant holdings among a few, leaving many landless or with insecure tenure (Majeed, 2023; Rehmat et al., 2023). This lack of secure access hinders income generation from agriculture and land-based activities (Abid, 2016; Khalida, 2017; Shah et al., 2018). Crucially, as climate change disrupts agriculture through shifting weather patterns and extreme events (Abid, 2016), landowners possess the means to invest in adaptive practices like water-efficient irrigation or resilient crops (Khurshid et al., 2022). In contrast, landless individuals and communities lack these resources, heightening their vulnerability to declining yields, food insecurity, and economic hardship (A. A. Shah et al., 2023; Ullah et al., 2018). Secure land tenure also acts as a critical buffer against displacement during disasters like floods; landowners are more likely to retain assets and rebuild, while the landless face heightened risks of losing everything and struggling to re-establish themselves elsewhere (Khalida, 2017; Wasif Ali et al., 2022). Furthermore, landownership often convenes social and political influence, potentially skewing access to government resources and disaster relief away from the most marginalized (Khalida, 2017; Shabbir et al., 2021).

Access to healthcare and education forms a vital third pillar of socioeconomic vulnerability (Shah et al., 2025, 2024a; Ullah et al., 2024b). These authors reported that, uneven distribution of healthcare services, particularly in remote rural areas, leaves marginalized communities without adequate facilities, professionals, or medicines. This gap becomes critically dangerous as climate change exacerbates health risks – heat stress, vector-borne diseases, and waterborne illnesses from floods or contamination (Raza et al., 2023). Without access, vulnerable populations face higher morbidity and mortality. Financial barriers further prevent seeking timely care or affording treatment, worsening outcomes (ThomAs and Rendón, 2010). Preventive healthcare, essential for managing climate-related health threats, is also less accessible to these groups. Similarly, limited educational access hinders climate resilience (Raza, 2017). Education is fundamental for raising awareness and understanding climate change impacts and solutions (Shaw, 2015a). Shah et al. (2024) (Shah et al., 2024a) mentioned in their study that without education,

communities lack the knowledge for informed adaptation and mitigation decisions. Education also provides vital skills for implementing sustainable practices, which vulnerable communities often lack. The author further emphasized that, understanding complex climate information and early warnings is hampered by limited education, leaving communities unaware of impending risks.

Gender disparities profoundly intensify vulnerability, particularly during climate-forced migration, where environmental, social, economic, cultural, and political drivers converge. Research indicates that women in Pakistan face layered discrimination that restricts their decision-making power and resource access, significantly impairing household resilience (Rasheed, 2022; Shah et al., 2022; Ullah et al., 2018). Environmental shocks directly impact women's livelihoods. Events like the devastating 2022 floods, which displaced millions and ravaged agricultural lands (Nanditha et al., 2023), disproportionately affected women reliant on these resources (e.g., loss of land/livestock in Sindh) and forced them into challenging conditions in temporary shelters (Magsi et al., 2023). Socially and culturally, patriarchal norms often marginalize women's voices in critical adaptation and disaster planning (Ullah et al., 2025), leading to inadequate attention to their specific needs like sanitation and health services (Muzamil, 2021; Poudel and Belgrave, 2015; Tadgell et al., 2018). Cultural and religious practices, especially in conservative regions, can severely restrict women's mobility, preventing them from seeking aid or participating in community responses (Nanditha et al., 2023; Shah et al., 2025). Economically, women face barriers to financial resources, land ownership, and formal recognition of their labor (e.g., informal agricultural work in Punjab), making them highly vulnerable to climate-induced economic shocks and increasing poverty and dependence (Salik et al., 2023). Politically, the lack of gender-sensitive policies, exemplified by the insufficient focus on women's vulnerabilities in Pakistan's National Climate Change Policy and the absence of comprehensive gender-disaggregated data, hampers effective intervention design (Kamal, 2023). However, it is essential to recognize that women are not merely victims but active agents in disaster response. Studies highlight their crucial resilience and supporting roles: managing relief efforts and aid (Maheen, 2011; Nizami and Ali, 2017); securing food and shelter for families and leveraging community networks (Habiba, 2023; Hasnat et al., 2022); advocating for the rights and needs of the displaced, particularly women and children; maintaining community cohesion through cultural resilience (Nizami and Ali, 2017); and initiating small businesses for economic recovery (Scheffran et al., 2014). These contributions underscore the vital importance of integrating gender perspectives into recovery and adaptation efforts, acknowledging both the unique challenges women face during climate-forced migration and their indispensable role in community resilience.

4.2. Geographic Factors

The geographic determinants of climate vulnerability in Pakistan form a critical foundation for understanding differential risk exposure. This vulnerability is profoundly shaped by location and terrain, acting as primary filters for hazard impact. Communities situated in low-lying coastal zones, particularly in Sindh, face a dual threat from sea-level rise and intensified storm surges (Magsi et al., 2023). Melting glaciers and ice caps contribute to encroaching seawater, leading to soil salinization and contamination of freshwater sources, thereby crippling agriculture and potable water access (Hussain et al., 2020). The devastating impacts of this exposure were clearly evident during the catastrophic floods in the country, which caused massive infrastructure loss, home destruction, and livelihood collapse, disproportionately affecting agrarian communities and frequently triggering forced displacement and profound social upheaval (Ali et al., 2018; Ullah et al., 2019).

Conversely, communities living in mountainous regions, such as the Himalayas and Karakoram, confront distinct geophysical hazards (Ferris and Habib, 2020). Landslides and Glacial Lake Outburst Floods (GLOFs) pose severe and often sudden threats, exemplified by the destructive 2010 Attabad landslide in Gilgit-Baltistan (Hussain et al., 2023). The rough terrain, coupled with often-limited infrastructure and remoteness, severely hampers disaster response and recovery efforts, magnifying economic losses and community disruption following such events (Nizami and Ali, 2017). The specific topography dictates the nature of the hazard but consistently amplifies vulnerability through isolation and resource constraints (Shah et al., 2018; Shaw, 2015b).

Water scarcity constitutes a second, pervasive geographic stressor, intrinsically linked to Pakistan's predominantly arid to semi-arid climate (Iqbal et al., 2023; Khalid and Khan, 2016; Vinke et al., 2017). Erratic precipitation patterns and rising temperatures are diminishing already strained water resources (Nawaz et al., 2016), with regions like Balochistan experiencing acute shortages (Rasheed, 2022). This scarcity directly imperils agricultural viability and household water security, forming a core component of vulnerability. Farmers struggle with inadequate irrigation, leading to plummeting crop yields, food insecurity, and the economic strain of shifting to less productive but drought-resistant crops (Ullah et al., 2018). Livestock health and productivity, vital for livelihoods in Balochistan and Sindh and other parts of the country, are also critically compromised by insufficient water. Furthermore, the lack of clean drinking water elevates risks of waterborne diseases (Kreutzmann and Schütte, 2010), while the burden of water collection – falling heavily on women – involves arduous journeys that consume time otherwise available for education or income generation, significantly impacting their well-being and opportunity (Shah et al., 2024a).

A third critical dimension is the proximity to hazard-prone areas. Marginalized communities are often trapped in a cycle of vulnerability precisely because they reside in locations frequently exposed to floods, droughts, and extreme weather events (Ullah et al., 2018). This proximity elevates the immediate risk to life and safety during disasters, as tragically demonstrated during the 2010 and 2022 floods where limited access to emergency services compounded mortality and health impacts (Magsi et al., 2023; Manzoor et al., 2022; Nazeer and Bork, 2021). Beyond the human cost, disasters impose disproportionate damage on property and essential infrastructure within these communities (Nazeer and Bork, 2021). The destruction of homes, roads, and irrigation systems disrupts daily existence, deepens economic hardship, and erodes overall well-being, with agricultural livelihoods being particularly devastated (Rehmat et al., 2023). Critically, these communities typically lack the financial reserves and institutional support necessary for effective coping and recovery, perpetuating their vulnerability cycle (Iqbal et al., 2024, 2022; Rana et al., 2023).

Breaking this geographic cycle requires integrated strategies. Robust, community-centric disaster preparedness and response mechanisms are vital. This includes reliable early warning systems tailored for remote areas and empowering local populations through participatory disaster management planning as suggested by Shah et al. (2023) (Ashfaq Ahmad Shah et al., 2023); Bhutta et al. (2022) (Bhutta et al., 2022); Manzoor et al. (2022) (Manzoor et al., 2022). Simultaneously, addressing the underlying socio-economic drivers of vulnerability is essential. Investments in education, skills development, and accessible financial resources can empower marginalized groups, especially women, to diversify livelihoods and enhance adaptive capacity ((Memon, 2020; Nazeer and Bork, 2021; Shah et al., 2024b; Ullah et al., 2025, 2024b). Furthermore, spatially targeted infrastructure improvements are crucial. Enhancing resilience in environmentally sensitive areas – such as flood defenses in riverine communities or slope stabilization in mountains – can directly

protect lives, homes, and agricultural assets, thereby safeguarding livelihoods and food security (Vinke et al., 2017). Comprehensive water management strategies are equally vital. Promoting rainwater harvesting, constructing check dams, restoring traditional water conservation systems (karez, ponds), and integrating local knowledge into modern practices are essential steps towards mitigating scarcity and improving water security for both agriculture and domestic needs (Iqbal et al., 2023; Nawaz et al., 2016). Policymakers must clearly identify and address this complex geographic architecture of risk; ensuring frameworks are inclusive and responsive to the unique place-based challenges faced by vulnerable communities. The geography dictates the hazard; socio-economic conditions determine the capacity to respond; effective policy must bridge this divide.

4.3. Historical Factors:

The historical context profoundly shapes contemporary vulnerability to climate impacts and migration in Pakistan, embedding layers of disadvantage that compound environmental stress. Cultural adaptation and identity conflicts present significant hurdles for climate-displaced populations. Migrants often experience profound cultural shock when relocating to areas with divergent languages, customs, and social norms, leading to isolation and disorientation that exacerbates the trauma of displacement (Magsi et al., 2023; Memon, 2020; Nazeer and Bork, 2021). These studies have reported about migrants experiences from across Pakistan where language barriers impede access to essential services and foster marginalization. Minority ethnic or religious groups frequently face discrimination, restricting their participation in community life and resource access, while simultaneously altering family and gender dynamics (Mueller et al., 2014). Despite these challenges, migrants demonstrate resilience through cultural blending and adaptation, a process often supported by local organizations fostering exchange and understanding (Baig et al., 2024; Waseem and Rana, 2023).

Land tenure insecurity and conflict, deeply rooted in historical inequities, critically undermine resettlement prospects for climate migrants. Displaced populations face immense difficulty securing stable land or housing, often becoming landless (Ullah et al., 2025). Competition for scarce resources, such as in Balochistan, fuels tensions between host communities and internally displaced persons (IDPs), eroding social cohesion and heightening economic vulnerability, including food insecurity (Khan et al., 2024; Magsi et al., 2023; Saeed, 2023; Salik et al., 2023). Weak legal recognition of migrant rights further compounds their precarious situation, limiting access to services and protection (Iqbal et al., 2022; Raza et al., 2023; Shah et al., 2025). Historical patterns of internal migration, driven by urbanization and past conflicts (e.g., Mohajir and Baloch populations in Karachi), have concentrated marginalized communities in resource-stressed urban areas, creating intergenerational vulnerabilities linked to limited access to education, healthcare, and economic opportunity (Ali et al., 2022; Gul et al., 2024; Kamal, 2023). These pre-existing fault lines are exposed during climate crises, as seen in the disproportionate impact of Karachi's 2015 heatwave on low-income migrants in informal settlements lacking cooling infrastructure and healthcare.

Persistent development gaps, reflecting historical underinvestment and neglect, cripple adaptive capacity, particularly in regions like South Punjab, Rural Sindh, Balochistan, and the mountainous areas of Khyber Pakhtunkhwa (Jan et al., 2024a). The absence of critical infrastructure—robust flood defenses, reliable irrigation, or resilient housing—leaves communities highly exposed. Crucially, the lack of effective, trusted early warning systems prevents timely evacuation and preparedness, as tragically demonstrated in District Charsadda during the 2010 floods, where community distrust in official warnings led to

catastrophic loss of life and property (Ullah et al., 2019). Furthermore, historically marginalized areas suffer from limited economic diversification and safety nets, hindering recovery from climate-induced economic shocks (Vinke et al., 2017).

Language barriers act as a significant, though often overlooked, historical factor perpetuating exclusion as reported by Ullah et al. (2024) (Ullah et al., 2024b). Communities speaking minority or distinct languages face severe limitations in accessing vital climate information (forecasts, warnings, adaptation resources) and participating meaningfully in policy dialogues (Fahad and Wang, 2018). This impedes preparedness and response and creates a disconnect between policy formulation and the lived realities of affected communities, leaving their needs unaddressed (Baig et al., 2024; Rana et al., 2023). Critically, language barriers also threaten the transmission of valuable Indigenous and local knowledge about climate and ecosystems to younger generations, eroding a vital resource for adaptation (Shah et al., 2019).

The psychosocial toll of climate-induced migration is severe and historically patterned, disproportionately affecting marginalized groups (Sadia et al., 2016; Shah et al., 2025). Displacement inflicts high levels of stress, anxiety, and trauma (Baig et al., 2024). Disturbing evidence, such as from Muzaffargarh post-2010 and 2022 floods, reveals the extreme vulnerabilities faced by women and children: desperate measures like feeding children sugar water due to food scarcity, attempts to filter floodwater through clothing (risking waterborne diseases), and horrific incidents of sexual assault and child abduction (Kayani, 2017; Magsi et al., 2023; Memon, 2020), particularly where security was absent in relief camps ((Ajani and van der Geest, 2021; Baig et al., 2024; Rana et al., 2021). The lack of safe, gender-segregated sanitation facilities further compounds mental distress and violates privacy (Salik et al., 2023). A pervasive sense of government neglect and incompetence in disaster response exacerbates this trauma (Iqbal et al., 2022; Kamal, 2023; Mueller et al., 2014; Raza et al., 2023). Addressing this requires not only immediate mental health support but fundamentally, gender-sensitive disaster management that prioritizes safety, reduces discrimination, and actively involves affected communities in planning and response. These historical burdens – cultural dislocation, land insecurity, institutional neglect, linguistic exclusion, and profound psychosocial harm – are not merely background; they are active ingredients in the compound vulnerability of Pakistan's climate-affected population.

5. Conclusion, Policy Implications, and Future Research Directions

5.1. Conclusion

Considering the changing climate and the frequent occurrence of its induced natural disasters, forced migration has emerged as an urgent and multifaceted challenge with extensive consequences. This study has shown the multifaceted nexus between climate change and forced migration by encompassing socioeconomic, geographical, and historical aspects of vulnerability factors among vulnerable communities in Pakistan. This review reveals that climate-induced migration stems not merely from environmental hazards but from deep-rooted socioeconomic inequalities (pervasive income/gender disparities, landlessness, inadequate healthcare/education), geographical precarity (location in floodplains like Sindh and Punjab, drought-prone regions like Thar/Cholisthan, or vulnerable northern mountains in the KP and Gilgit Baltistan), and historical legacies (systemic development gaps, entrenched gender norms, unresolved land conflicts, and institutional weaknesses). These factors act as threat multipliers, disproportionately impacting marginalized communities – particularly women. The disproportionate burden

on women, amplified by sociocultural norms leading to heightened risks of gender-based violence and restricted agency during displacement, emerges as a critical and consistent finding across Pakistan's diverse contexts. While floods dominate research, slow-onset disasters like drought and desertification in Balochistan and Sindh remain critically understudied, as do the enduring impacts of colonial land systems and tribal governance structures on vulnerability.

5.2. Policy Implications

The implications of this review are profound, necessitating a concerted effort from policymakers at all governance levels. This necessitates targeted poverty reduction through climate-responsive social protection (e.g., scaled-up Benazir Income Support Program integration with climate risk) and diversified livelihood programs promoting drought-resistant agriculture in arid zones and non-farm skills in high-migration areas like South Punjab. Land tenure security must be prioritized, requiring formalization of customary rights, resolution of historical conflicts and transparent land allocation in planned relocations to prevent exploitation. Gender-transformative approaches are non-negotiable: Mainstream gender equity across all climate/disaster policies, ensure women's participation in local disaster management committees, invest in women-specific healthcare (including psychosocial support in relief camps), and enforce legal protections against gender-based violence in displacement settings. Moreover, enhancing adaptive capacity demands location-specific investments. Riverine communities in Sindh and KP require robust, nature-based flood defenses (embankments, wetland restoration) and trusted, multilingual Early Warning Systems using community radio. Arid regions like Balochistan and Tharparkar need revitalized traditional water systems, large-scale rainwater harvesting, and integrated drought management. Crucially, Pakistan urgently needs a federally-led, provincially-coordinated National Policy on Climate-Induced Displacement and Planned Relocation, integrated with climate action and development plans. This requires decentralizing resources and capacity to district administrations for locally-led solutions, bridging long-lasting development gaps in neglected regions to ensure continuity in climate financing and implementation.

5.3. Future Research Directions

To address critical knowledge gaps and inform effective policy, future research on climate-induced migration in Pakistan must prioritize several understudied areas. First, shifting focus beyond floods is essential to understand how slower, escalating disasters drive displacement. This includes analyzing migration triggers and adaptation strategies linked to intensifying droughts (e.g., Thar Desert), sea-level rise (e.g., coastal Sindh), and urban heat stress (e.g., Karachi)—phenomena currently overshadowed by flood-centric studies. Second, mapping internal migration pathways is urgently needed to track flows from climate-affected regions to urban hubs like Karachi, Hyderabad, or Quetta. Research should document how this movement strains urban infrastructure (water, housing), public services (healthcare, schools), and social cohesion in receiving communities. Third, investigating gendered dimensions across contexts requires comparing how cultural norms in distinct regions (e.g., Punjab vs. Khyber Pakhtunkhwa vs. Sindh) shape women's agency in migration decisions, access to resources during displacement, and resilience strategies before, during, and after relocation.

Funding: China Ocean Development Foundation and Academy of Ocean of China (grant number CODF-AOC202406) funded this research.

Acknowledgments: The authors extend their appreciation to the China Ocean Development Foundation and Academy of Ocean of China (grant number CODF-AOC202406) for supporting this research.

Conflict of Interest: The authors declare that there is no conflict of interest.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) used editGPT to improve the English Grammar and readability of the content. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

Availability of Data/Materials: Data availability does not apply to this article as no datasets were generated or analyzed during the current study.

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