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Unveiling the Multi-Dimensional Vulnerabilities of Flood-Affected Communities in Khyber Pakhtunkhwa, Pakistan

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Abstract: Climate-induced migration is increasingly affecting communities, disrupting livelihoods, and intensifying socio-economic inequalities, particularly in disaster-prone regions. Despite the prevalence of recurring flood hazards, there remains limited research on the multi-dimensional impacts of migration particularly in socio-culturally sensitive and resource-constrained settings like Khyber Pakhtunkhwa (KPK), Pakistan. This study seeks to bridge this gap by exploring the post-migration challenges of flood-affected communities in District Nowshera. Using a qualitative methodology, we conducted in-depth interviews with 25 diverse key informants. The study results revealed profound socio-economic instability, inadequate access to essential services, and cultural disruptions. Key findings include significant challenges such as inadequate housing, the loss of traditional livelihoods, persistent financial hardships, health issues, and the breakdown of social support networks. Moreover, displaced families face marginalization and language barriers, which hinder integration into host communities, amplifying feelings of isolation and identity loss. Environmental degradation in resettlement areas further intensifies these challenges, prolonging poor living conditions and heightened vulnerability. To address these issues, the study recommends community-based interventions such as developing resilient, culturally appropriate housing, implementing targeted skills training programs to restore livelihoods, promoting climate-smart agricultural practices, and enacting inclusive social policies to promote integration and cohesion to address climate-induced migration in disaster-prone regions.

Keywords: climate-induced migration; flood hazard; vulnerability; resilience; Pakistan



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1. Introduction

The accelerating global climate crisis is one of the most pressing challenges of the 21st century, causing unprecedented disruptions to economies and human societies [1,2]. Extreme weather events, such as floods, droughts, heatwaves, and wildfires, are increasing in frequency and intensity, disproportionately influencing vulnerable populations [3–5]. This is particularly evident in rural, low-income, and marginalized communities, where reliance on agriculture, livestock, and natural resources for livelihoods heightens their

exposure to climate-induced shocks [6–9]. Variability in rainfall patterns, rising temperatures, and prolonged droughts have already eroded agricultural productivity in these areas, exacerbating food insecurity and deepening poverty [10]. Faced with escalating climate risks, rural families often turn to migration as a coping mechanism when local adaptation strategies fail [6]. However, migration, particularly among rural communities, is fraught with sociocultural challenges, including disruptions to social networks, cultural heritage, and identity [11–13]. These complexities highlight the need for a deeper exploration of the lived experiences of those affected.

The socioeconomic, health, interpersonal, and well-being effects of floods in areas vulnerable to climate-induced migration have been the subject of several research [11,14,15]. For instance, studies conducted in Bangladesh have shown how severely livelihoods are disrupted, with flood-affected populations experiencing long-term economic instability and the loss of agricultural income [16,17]. Similarly, frequent floods in Vietnam have been connected to the decline of traditional means of subsistence, and displaced populations find it difficult to reconstruct their lives since they have little access to resources and assistance [18]. Research from Afghanistan and India highlights the difficulties of migration, with flood-displaced communities experiencing social and cultural disintegration in addition to income loss, which makes integration into host communities especially challenging [3,19]. Social fragmentation in Sub-Saharan Africa increases vulnerability due to resource scarcity and host-displaced population tensions [20,21]. Flood-prone areas also frequently experience health crises, such as the development of waterborne illnesses and mental health issues [22]. Environmental deterioration in Indonesia exacerbates poverty and vulnerability by making living conditions worse for displaced populations [23]. Therefore, research on the multidimensional vulnerability of climate-induced migration offers a comparative context that improves our comprehension of the difficulties experienced by populations affected.

Pakistan consistently ranks high on the Global Climate Risk Index [24,25]. This vulnerability stems from a combination of natural and human factors, including rapid population growth, deforestation, urbanization, and unsustainable agricultural practices [17,18,26]. These elements exacerbate climate-related challenges, resulting in frequent and severe natural disasters such as floods, prolonged droughts, and erratic weather patterns [20,27]. Catastrophic events like the floods of 2010 and 2022 starkly illustrate Pakistan's susceptibility to climate extremes [28,29]. The 2010 flood, one of the most devastating natural disasters in the country's history, lasted six months and impacted 45 of Pakistan's 135 districts [30]. It caused an estimated 9.7 billion USD in damages, displaced approximately 20 million people, destroyed 1.1 million homes, and severely damaged 432 healthcare facilities [31]. The scale of destruction highlighted the acute vulnerability of flood-prone communities, where inadequate infrastructure and limited disaster preparedness worsened the impact. The 2022 flood further emphasized the growing threat of climate change in Pakistan as it hit one-third of the country [32]. According to the National Disaster Management Authority (NDMA), over 2.3 million homes were damaged or destroyed, 1.7 million hectares of crops were lost, and 800,000 livestock perished. Additionally, over 30,000 schools, 2000 health facilities, and 6700 km of roads have been damaged or destroyed [33].

The province of KPK was among the hardest hit, with nearly 3 million people directly affected by floods [34]. Around 1 million individuals were displaced due to floods, of which approximately one hundred thousand were displaced in Nowshera as vast areas of agricultural land, infrastructure, and homes were destroyed [35]. The scale of migration and displacement was also significant, forcing many individuals to migrate to urban centers or temporary shelters [32]. Displaced individuals faced severe challenges, including limited access to adequate housing, healthcare, education, and stable employment [24].

Overcrowded living conditions and poor access to clean water further compounded their struggles in temporary shelters, placing immense pressure on urban infrastructure and social services [36]. These recurring flood hazards result in significant economic losses and drive widespread migration placement, forcing millions to migrate in search of safety and better opportunities [37]. While migration can serve as an adaptive response to climate-related challenges, it introduces a new set of difficulties for displaced individuals, who often struggle to rebuild their lives under harsh circumstances.

Moreover, numerous studies have explored the socioeconomic, community dynamics, interpersonal relationships, health, education, and gender aspects of climate-induced migration, revealing the complex nature of community vulnerability through various methods [11,17,22,38–41]. For instance, ref. [41] emphasized the disproportionate impact of floods on marginalized groups, highlighting the connection between coping mechanisms and socioeconomic status. Salik et al. [13] found that affected communities experienced higher rates of illness, lost livelihoods, and disrupted education due to the socioeconomic and health effects of floods. Ahmad and Afzal [42] conducted focus groups and household surveys on livelihood loss and healthcare access, discovering that lower-income households took longer to recover. Sadia et al. [43] highlighted the gendered aspects of flood impacts, showing that women face additional challenges such as limited access to relief resources, increased health risks, and heightened caregiving responsibilities during migration. Gul et al. [36] and Ullah et al. [24] examined the psychological effects of migration, emphasizing the loss of social networks and cultural heritage. Majeed [37] focused on the importance of social cohesion and adaptive capacity in building resilience from a community and interpersonal perspective. Other research revealed that schools are often used as shelters during floods, significantly impacting education and disrupting children's learning [38,44].

Despite the growing body of literature on climate-induced migration, much of the existing research primarily focuses on the environmental triggers and socioeconomic drivers behind migration, often overlooking the multifaceted challenges that migrants face after resettlement [45–47]. In particular, there is a noticeable gap in understanding the specific struggles encountered by rural migrants in regions like District Nowshera and Khyber Pakhtunkhwa, where the effects of climate-induced migration intersect with deep-rooted socio-cultural dynamics [32]. This study aims to fill this gap by exploring the complex range of post-migration challenges faced by these rural communities, with specific emphasis on issues such as socioeconomic, community and interpersonal, and health and well-being challenges within new environments.

2. Methodology and Context

2.1. Study Area

This study focuses on Nowshera, a district in Khyber Pakhtunkhwa (KPK), Pakistan (Figure 1), that is highly susceptible to climate-induced natural disasters, particularly floods [48]. The district's flat topography, extensive riverine areas, and proximity to the Kabul and Swat Rivers make it highly vulnerable to flooding [35]. Additionally, Nowshera has experienced significant flood events, including the catastrophic 2010 floods and the monsoon floods of 2022, which caused widespread damage to infrastructure, livelihoods, and other properties [48]. Given its history of severe flood events, such as the devastating floods of 2010 and the more recent monsoon floods of 2022 [24]. Nowshera is a relevant study area for exploring climate-induced migration and the challenges these communities face.

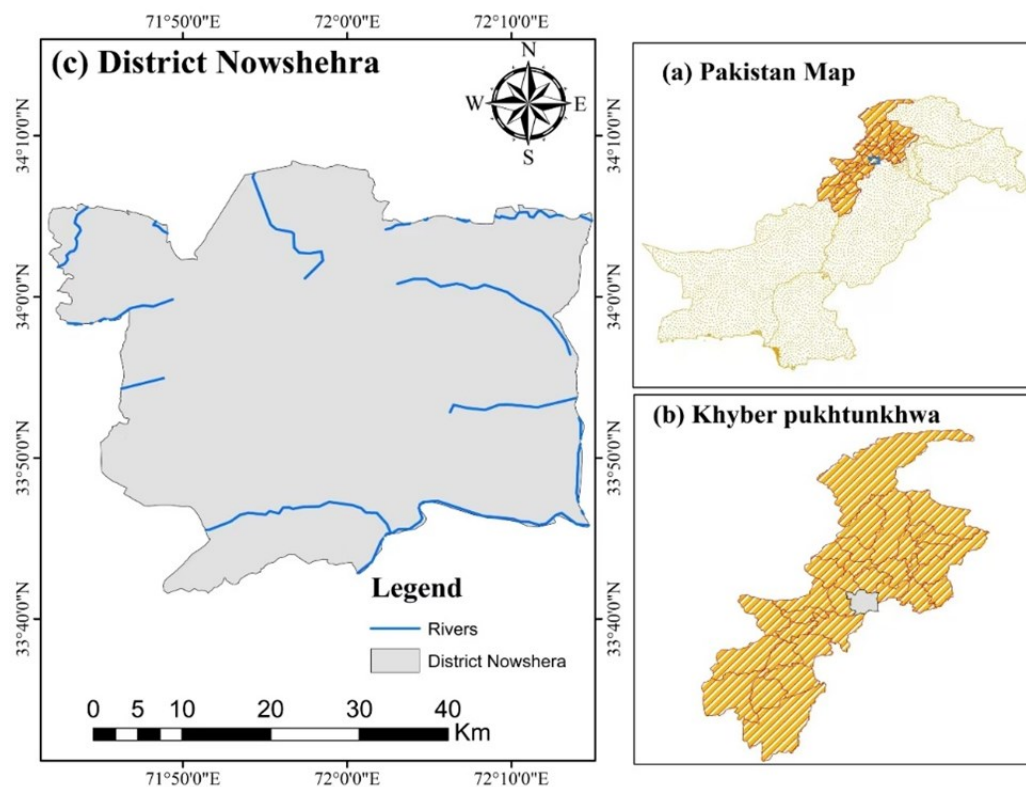


Figure 1. Map of the study area.

According to the latest census of 2023, the total area of the Nowshera district is area sq. kilometers 1748. Its total population is 1.7 million, comprising 51.5% male and 48.5% female [35]. The district is predominantly rural, with 1.4 million individuals residing in rural areas, which aligns with its reliance on agriculture and natural resources for livelihoods [49]. The average household size is 7.7 persons, the literacy rate is 58%, and 91% of households have access to electricity. About 17% of the population is in wage employment and 21% rely on agriculture. Other livelihoods include private, government, and business endeavors [49]. The district consists of 53.3% built-up area, and 38% agricultural land, and the yearly average temperature is 24.4 °C although temperature often exceeds 40 °C in the summer [35]. The socioeconomic conditions of its residents reflect typical rural KPK challenges, including limited access to healthcare, education, and formal employment opportunities. Additionally, the district is home to a large population of ethnic Pashtuns, whose cultural practices and community ties significantly influence their coping mechanisms during disasters [27].

2.2. Study Design

The research utilized a qualitative study design that focused on ethnographic fieldwork, supplemented by in-depth, semi-structured interviews (Figure 2). This qualitative approach was selected to explore the socioeconomic, community interpersonal, health and well-being challenges that displaced individuals encounter, providing a comprehensive understanding of the complex post-migration issues they face. Ethnography, which involves immersive observation and participation in a community's daily life, proved particularly effective in this context, allowing for direct engagement with participants in their natural environment. To guide this exploration, Environmental Migration Theory (EMT) was utilized, which emphasizes the intersection of environmental stressors and socioeconomic vulnerabilities in shaping migration patterns and adaptation strategies. This theoretical framework informed the development of interview questions and fieldwork, focusing

on both the environmental drivers of migration and the adaptive strategies employed by displaced individuals in response to these challenges. Hence, the study aimed to highlight the subjective experiences of individuals displaced by flooding and the challenges they face in integrating into new resettlement areas.

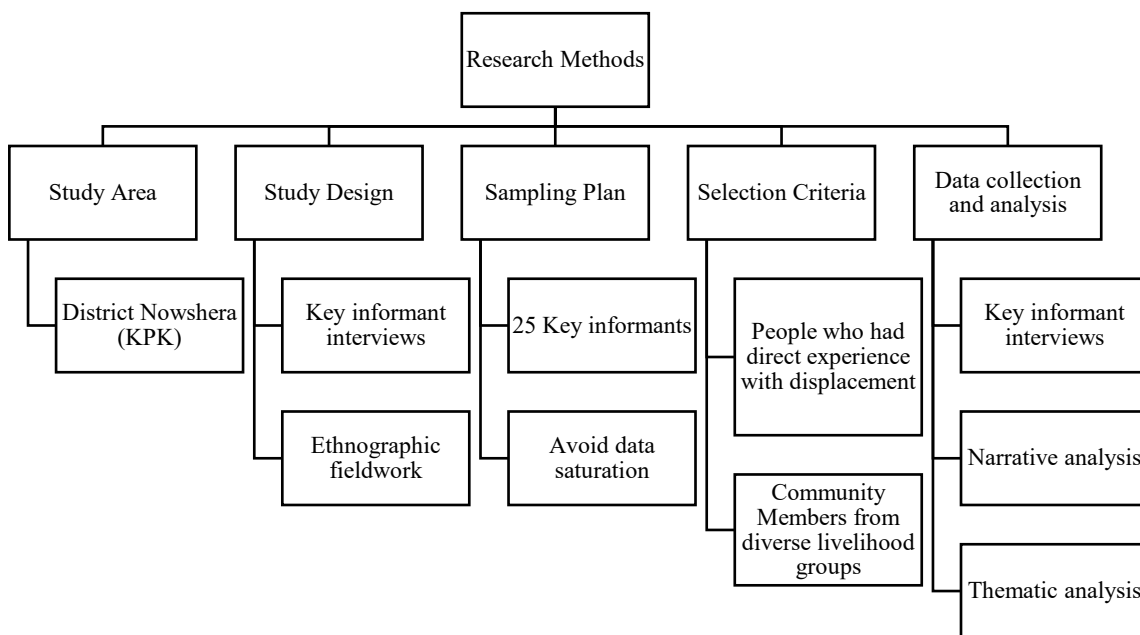


Figure 2. Schematic diagram of research methods.

2.3. Sampling Plan

A purposive sampling strategy was used to select 25 key informants from flood-affected communities in Nowshera, Khyber Pakhtunkhwa. This method was chosen for its effectiveness in identifying participants with specific experiences relevant to the study’s objectives, allowing for the collection of rich, detailed data. The sample size was determined based on the principle of data saturation, indicating that further interviews were unlikely to yield new insights [50]. Displaced individuals were central to this sampling strategy, representing various segments of the local population who had directly experienced the impacts of the floods and were forced to migrate. Their insights provided a detailed understanding of individual and family-level challenges, such as livelihood loss, health issues, housing instability, unemployment, and difficulties in social integration. To explore collective experiences and decision-making processes, community leaders, such as local elders and tribal heads, were also included. These individuals offered perspectives on how traditional leadership structures were utilized during the disaster response and how they guided their communities through the migration and resettlement phases.

Additionally, the study included local political representatives, such as elected members from village and union councils, who played crucial roles in advocating for their constituents’ needs. These informants illuminated governance challenges, resource allocation, and the political dynamics involved in managing disaster relief and recovery efforts. The inclusion of religious leaders, particularly mosque imams, provided valuable insights into the sociocultural dimensions of migration. They shared how religious gatherings became sources of emotional support and how religious teachings influenced community resilience during the crisis. The perspectives of teachers and educators were also integral to the study, emphasizing the impact of migration and displacement on education. These informants discussed the challenges of continuing schooling in temporary settlements, the disruption of educational activities, and the effects on students’ learning and well-being.

Village secretaries were included to understand the administrative and logistical aspects of managing displaced populations, offering insights into the bureaucratic challenges of documentation, relief distribution, and communication coordination between affected families and government agencies.

The ethnographic fieldwork, conducted over a month (March–April 2023), involved the study team and two trained enumerators who made themselves familiar with the daily lives of the affected communities. They actively participated in community activities, observed social interactions, and conducted semi-structured interviews in temporary settlements and areas where displaced individuals had resettled. This approach ensured an inclusive understanding of the lived experiences of the displaced population, capturing the multifaceted challenges of post-disaster migration in the study area.

2.4. Selection Criteria for Informants

The selection of informants was guided by predetermined criteria aimed at ensuring both relevance and diversity in the perspectives gathered [51]. First, participants were required to have direct experience of migration due to climate-induced disasters, specifically floods, within the past decade. This ensured that informants had recent and pertinent experiences relating to migration and resettlement processes. Second, the sampling sought to include a balanced mix of men and women across various age groups, from young adults (18–30 years) to older individuals (60+ years), to capture generational differences in experiences and perceptions. Socioeconomic diversity was also a key consideration, with informants drawn from different livelihood groups: 2 farmers, 3 homemakers, 2 shop owners, 1 small business owner, 2 laborers, 3 teachers, 3 students, 2 community leaders, 3 elders, 2 local politicians, 2 religious leaders, and 1 housewife. These groups were selected to ensure a diverse representation of perspectives on the challenges displaced communities face. The selection process was adaptive: if an informant declined to participate, another individual meeting the same criteria was chosen to maintain the integrity and diversity of the sample.

2.5. Data Collection and Analysis

Data collection involved semi-structured interviews with 25 key informants, complemented by participant observation during ethnographic fieldwork. Each interview was designed to last between 40 and 60 min, allowing for an in-depth exploration of participants' experiences and perspectives. The semi-structured format allowed the interviewer to adapt questions based on the informants' responses while ensuring that key topics were consistently covered across all interviews. The interview guide was focused on challenges faced during integration into new environments. A pilot phase allowed for pre-testing of the questions with a small group, resulting in refinements to enhance clarity and cultural sensitivity.

The interviews were conducted in the local Pashto language, with assistance from two trained enumerators who were native speakers, ensuring effective communication and comfort for the informants. Each interview was audio-recorded with the participant's consent and transcribed verbatim. The study employed a narrative analysis approach to understand the lived experiences and perspectives of climate migrants, focusing on their socioeconomic, interpersonal, and health and well-being challenges after relocation. The interview data were analyzed through a systematic review of direct narrations from key informant interviews, capturing the richness of the respondents' accounts while preserving their original voices for an authentic representation of their experiences.

The analysis process began with thoroughly reading all interview transcripts to familiarize the study team with the data. Key phrases, ideas, and significant points raised

by the informants were highlighted directly in the text. This initial review facilitated the identification of recurring themes, patterns, and unique insights shared by the respondents. To effectively organize and manage the data, Microsoft Excel was used to document and summarize these key narratives.

The direct narrations were categorized into broader thematic areas reflecting common issues and challenges discussed by the informants (Figure 2). Notable recurring topics included “financial constraints, land ownership, institutional support, alternative livelihood options, integration barriers, community conflicts, psychological and emotional stress, etc.” This thematic grouping allowed for a systematic exploration of various aspects of the respondents’ experiences while maintaining the integrity of their original narratives. This approach provided a comprehensive view of the respondents’ realities, enabling the identification of key issues and needs specific to the context of climate-induced migration.

3. Results and Discussion

The results of this study regarding challenges faced by displaced communities are divided into three categories, namely, (1) socio-economic challenges; (2) community and interpersonal challenges; and (3) health and well-being (Figure 3). Each of these categories is explained in detail below. Moreover, the key informants were categorized into various groups based on their roles and livelihoods within the community. These categories and their respective counts are as follows (see, Appendix A). This categorization highlights the diversity of participants, ensuring that the study captures a wide range of perspectives from individuals with distinct experiences and roles in the community.

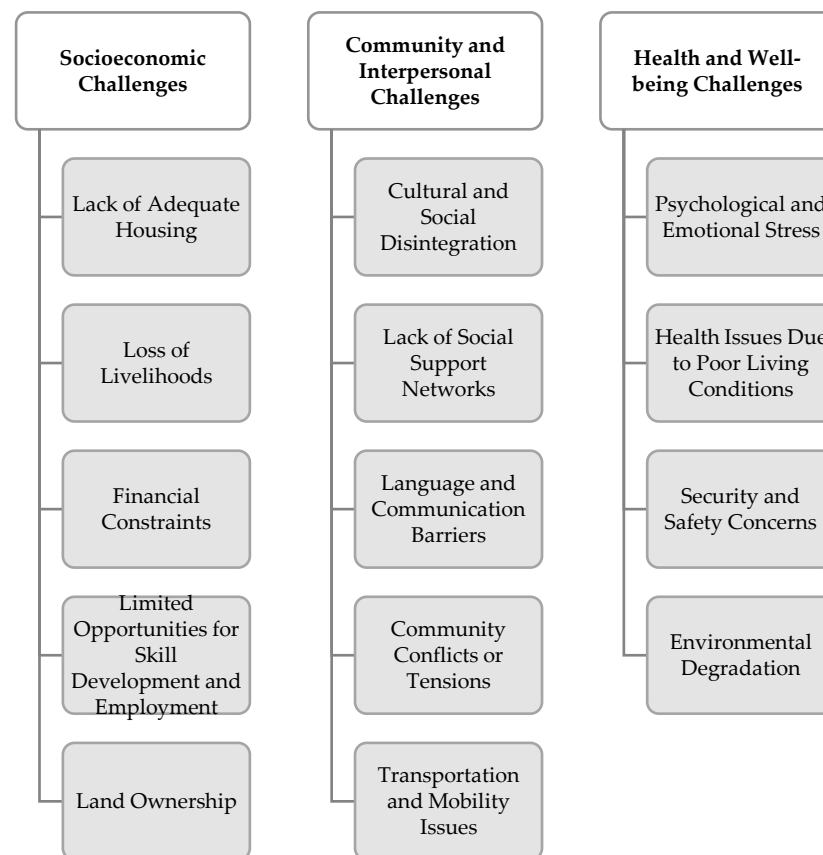


Figure 3. List of challenges associated with post-climate migration identified during key informant interviews.

3.1. Socio-Economic Challenges

The sociodemographic characteristics of key informants who participated in this study reflect a diverse range of backgrounds, roles, and experiences that are central to understanding the challenges faced by these communities in District Nowshera (see Appendix A). The sample comprises both male and female respondents, with ages ranging from 19 to 63. From those with little formal schooling to those with undergraduate degrees, the informant's educational backgrounds are diverse. Farming, housekeeping, teaching, student, small business ownership, labor, and community leadership are among the occupations of the lay informants. A thorough analysis of the socioeconomic issues surrounding migration and displacement is made possible by this diversity since each informant offers distinct perspectives depending on their age, gender, role in the community, and educational attainment.

The socioeconomic challenges climate migrants face in District Nowshera arise from their abrupt migration and loss of stability. One major socioeconomic concern for migrated families is housing; many have been forced to seek refuge in temporary shelters. The absence of safe housing has exposed these families to harsh weather conditions and increased physical insecurity. As Informants C, G, and described, "The shelters provided here are just tin sheets. They offer no protection from extreme heat or cold, and there is no privacy at all. We have gone from having a proper home to living in a crowded, unsafe place. We fear for our children's health and safety every day." This inadequate housing not only impacts physical well-being but also has psychological effects, creating a sense of instability and loss of dignity among the affected families.

The socioeconomic challenges described by key informants show the intense impact of migration on communities' living conditions, further increasing their vulnerability [12,13,52]. The urgent need for adequate housing among displaced families is a critical concern, as illustrated by the evidence of Informants C, G, and P. The transition from stable, permanent homes to makeshift shelters intensifies the physical and psychological vulnerability of those affected. This issue is not restricted to Nowshera: similar patterns have emerged in flood-hit areas of Sindh and Punjab [52,53], where forced migrants had to live in shelters in deteriorated situations. Moreover, globally, this situation mirrors the experiences of climate refugees in countries like Bangladesh and India, where informal settlements along riverbanks are particularly prone to flooding [17,54,55]. For example, displaced families from coastal areas in Bangladesh often find themselves in urban slums, facing comparable housing insecurity and limited access to sanitation facilities [12,22]. The implications of these conditions are severe: inadequate shelter compromises physical health, leading to increased susceptibility to respiratory infections, heat stress, and waterborne diseases [56]. Furthermore, the psychological toll of losing one's home and living in insecure, cramped conditions can result in chronic stress, anxiety, and a diminished sense of dignity [32]. The lack of privacy and safety, especially for women and children, further exacerbates their vulnerability [48,51]. Addressing this issue necessitates a confined approach, combining immediate humanitarian relief with long-term investment in climate-resilient housing infrastructure capable of withstanding future environmental shocks.

The destruction of agricultural land, livestock, and local businesses due to recurrent floods has devastated the primary income sources for many households in the study area, profoundly impacting their economic well-being. Most of the informants reported that they had lost land due to flood hazards alongside other valuable assets. For instance, Informant D emphasized the severity of this situation, stating, "Our entire farmland was submerged, and now it's unusable. Farming was our only source of income, and without it, we have nothing left." The loss of farmland has left families unable to produce food for subsistence or generate income, forcing them to depend on expensive market purchases

or external assistance for survival. This has led to increased food insecurity and financial strain, particularly for households with larger families to support.

Similarly, Informant L shared, “I owned a small shop that was washed away. I lost my inventory and everything I had built over the years. Now, finding even temporary work has become a daily struggle.” The destruction of local businesses not only wiped out years of savings but also created long-term economic instability for individuals who relied on these enterprises as their primary livelihood. Without adequate financial support or recovery mechanisms, many displaced families now struggle to afford necessities, such as food, healthcare, and education for their children.

The economic well-being of these families has further deteriorated due to the absence of stable income alternatives. Informants explained that jobs in the resettlement areas are often limited, and available opportunities are predominantly low-wage and labor-intensive. Several key informants, for instance, C and Q, described the mental and physical toll, stating, “We used to have stable incomes primarily from farming, but now we have to do odd jobs that barely pay enough to survive.” Informant N noted, “Before, we could provide for our families with dignity, but now every day is a fight just to get by, struggling to afford even the basics like food and medicine.” The cumulative economic losses thus make living difficult and have left families in a risky situation, with little hope of rebuilding their financial stability.

The loss of income-generating assets, such as agricultural land and small businesses, has severely impacted the economic well-being of affected families. This disruption is particularly distinct in rural areas like Nowshera, where agriculture is the backbone of livelihoods [57]. Informants D and L illustrated the collapse of traditional income sources, forcing families to seek alternative livelihoods in unfamiliar sectors. The broader implications of such economic disruption are evident in other climate-affected areas across Pakistan, where recurring floods have led to similar losses in livelihoods [30,46,47]. Internationally, regions like the Mekong Delta in Vietnam [58] and parts of Sub-Saharan Africa [56,59] face similar challenges, as climate-induced disasters have destroyed farmlands and fisheries, pushing communities into poverty [21]. The sudden loss of livelihoods leaves affected families without financial buffers, complicating their recovery efforts. This situation creates a cycle of poverty and vulnerability, compelling families to sell remaining assets, take on high-interest loans, or migrate to urban areas for low-wage, unstable employment [60,61]. Limited access to financial support, such as microloans or government assistance, exacerbates these challenges, underscoring the need for targeted livelihood restoration programs that focus on skill development, income diversification, and access to credit facilities [24,62].

The unexpected and forced migration has left many families in financial distress. The cost of rebuilding their homes, combined with rising prices for essential goods, has depleted their savings and pushed them into debt. As Informants P, S, and T explained, “We have used up all our savings trying to rebuild our home. Now we are borrowing money just to buy food and essentials, and the debt keeps piling up.” Informant B echoed these sentiments, stating, “Everything has become so expensive. We cannot afford enough food, let alone medicines or clothes for our children. Without financial assistance or a stable income, we are barely getting by.” These financial constraints hinder their ability to recover and rebuild their lives, trapping them in a cycle of poverty.

The financial strain faced by displaced families in Nowshera directly stems from the economic losses caused by climate-induced disasters. Informants P, T, and B reported depleting their savings and accumulating debt to cover basic needs. This situation reflects a broader trend in disaster-affected regions worldwide, where the immediate costs of migration—such as rebuilding homes, purchasing essentials, and accessing healthcare—can quickly drain household finances [22,43,61]. Communities in developing countries like

Afghanistan, Sri Lanka, India, Bangladesh, and others often experience similar financial burdens, resulting in high levels of indebtedness [3,55,63,64]. The rising cost of living further intensifies this strain, as inflation surges post-disaster, increasing prices for essential goods [60,65]. Communities find it hard to bear the economic costs of these hazards, hindering their ability to rebuild and recover sustainably [66]. The provision of low-interest loans, debt relief programs, and cash assistance, might help families manage their resources effectively during crises [48].

Another significant impact of forced migration is the reduced access to opportunities for stable employment and skill development, leaving many individuals in low-wage, unskilled jobs. Informant S explained, “I used to work on our farm, but now that the land is gone, I need to find new work. I don’t have any other skills, so I end up doing labor jobs that pay very little.” Informant M echoed these frustrations: “I used to run a small business in our village, but after the floods, I lost everything. Now, I am doing odd jobs in the city, but it is barely enough to survive. Without proper training or opportunities to learn new skills, I feel stuck in this cycle of low-paying, unstable work.” Informants F, K, and Y emphasized, “There are no training programs here to help us learn new skills. We need opportunities to work in different fields, but without training or support, it’s almost impossible to get a decent job.” This absence of skill development initiatives has limited economic mobility and confined many individuals to precarious, informal labor markets, further exacerbating their financial struggles. Previous literature also shows similar results where migration has significantly reduced opportunities for stable employment, worsening existing socioeconomic vulnerabilities [21,36,37,62,64].

Key Informants S, F, K, and Y pointed out the lack of skill development programs, which forces many displaced individuals into low-paying, unskilled jobs. This observation reflects global trends, where displaced populations frequently face challenges in integrating into formal labor markets due to skill mismatches and the absence of targeted vocational training [12,53,67]. For example, in post-disaster contexts in countries like Bangladesh and India, affected communities encounter similar employment barriers, leading to increased participation in precarious, informal labor markets [16,17,55]. The absence of skill development initiatives limits displaced individuals’ ability to acquire new competencies necessary for transitioning into alternative sectors and perpetuating a cycle of low-wage employment [53,60].

In District Nowshera, land ownership disputes have created significant challenges for displaced families seeking to resettle. Many flood victims lack official documentation for their land, complicating their claims to property and eligibility for resettlement. One respondent (Informant W) explained the dilemma: “My family has lived here for decades, but we never had papers. Now they are saying we don’t own the land. It’s impossible to prove it was ours.” Another shared their frustration with the resettlement process: “We tried moving to a vacant area, but officials warned us it was state land. They said we could be evicted anytime” (Informant A). Corruption and favoritism further complicate the situation, as noted by Informant G, who remarked, “Influential people are getting land parcels while we are left in uncertainty. We were promised land, but there’s no transparency in the allocation.”

The legal challenges surrounding land ownership pose a significant obstacle to the recovery process for flood-affected communities in Nowshera and in Pakistan overall [68]. Similar issues have been observed in other flood-prone areas of Khyber Pakhtunkhwa, such as Charsadda, where informal land tenure is prevalent [27]. In many cases, unclear land titles and ownership disputes delay access to government assistance and reconstruction initiatives. For instance, families without formal ownership documents often struggle to claim compensation or qualify for resettlement programs [48]. Rural areas of Nowshera,

where land is frequently inherited informally, lead to fragmented and undocumented ownership structures [69]. The lack of a unified and transparent land registry system in Pakistan exacerbates these issues, leaving displaced individuals vulnerable to exploitation or prolonged migration and displacement [70]. This situation is aligned with other neighboring countries, like India and Afghanistan, India, Sri Lanka, and parts of Africa, where land disputes following disasters have hindered recovery efforts [3,17,19,63,64,71]. Therefore, legal reforms addressing land tenure issues and improving transparency in land allocation are essential for enhancing the resilience of affected communities.

3.2. Community and Interpersonal Challenges

Results from key informant interviews showed that many displaced individuals were compelled to abandon their traditional lifestyles, including agricultural practices and community-centered social structures. Informant J highlighted this transformation, stating: “We used to work together as a community, helping each other with the harvest and during hard times. Now, we are scattered, and no one knows how to rely on each other anymore.” This breakdown of the community has left families isolated and unable to provide the support systems that once existed. Informant M elaborated further: “Our traditions are being lost. We no longer have the space or opportunity to gather for celebrations or cultural practices. Life has become more about survival than about living.” These feelings underscore the emotional toll of losing cultural connections and the collapse of communal bonds that once fostered resilience in these communities.

The disintegration of cultural and social structures is a significant consequence of migration, particularly for rural communities like those in Nowshera, where social bonds are crucial for survival [72]. Historically, these social ties have been formed through agricultural work, community events, and family gatherings, providing essential emotional, financial, and logistical support [48,73]. However, with the destruction of homes and farmland, many families in Nowshera are losing these vital support systems. Informant J and others have highlighted that this loss has left families disoriented, forcing survival to become a lonely struggle [36]. It not only creates an emotional burden but also has long-term effects on the community’s ability to recover from migration. Ullah et al. [32] mentioned that the lack of community cohesion makes it more challenging for families to adapt to new environments and rebuild their livelihoods. Similarly, communities in flood-prone areas of KPK, such as Charsadda or Dera Ismail Khan, have faced comparable challenges [74]. The erosion of social structures in these regions has led to increased reliance on external aid, often without the strong local support networks that could facilitate rebuilding efforts [66]. In contrast to more urbanized areas of Pakistan, where individuals may not heavily depend on communal ties, the loss of social frameworks in rural regions heightens vulnerability [75,76]. Thus, in Nowshera and similar districts, interventions should prioritize re-establishing social bonds and creating environments for communities to rebuild their networks. This can be achieved by establishing specific places for socializing, such as community centers or cultural events, which can help bridge the social gaps caused by migration.

Furthermore, the absence of established social support systems presents a significant challenge for migrated individuals. Informants M and others reflected on the emotional toll of displacement, stating, “Back home, we had neighbors who looked out for us, shared what little we had, and provided help during difficult times. Now, we are on our own with no one to assist us when things get tough.” This stresses the loss of a crucial safety net that was deeply woven into the social fabric of their previous lives. Migration has not only severed familial and community ties but has also created an atmosphere of uncertainty, making it difficult to rebuild trust and mutual assistance. Informants N, T, and Y emphasized the

emotional isolation resulting from this lack of support, saying, “It’s hard to keep going when you have no one to talk to, no one to rely on. You feel like you’re invisible.” The emotional strain of being without these familiar support structures is often compounded by the challenges of navigating a new environment, where forming new connections requires time.

When we compare this situation to other regions in KPK and beyond, particularly in conflict-affected areas, we observe similar patterns of community breakdown [2,3,77,78]. In these regions, families displaced by conflict also suffer the loss of informal networks [79]. For example, displaced families in KPK have reported struggles with accessing mental health services and coping with isolation, challenges that are equally relevant to those in Nowshera [22,61,80]. Before their forced migration, families in Nowshera relied on extended family members and neighbors for assistance during difficult times [66]. However, the key informant’s expression of feeling alone in a new environment with no immediate support emphasizes a broader issue of loneliness and mental health challenges related to migration, especially for women and elderly individuals who often face exclusion [81]. Given these dynamics, policies, and interventions in Nowshera must prioritize the reconstruction of these support networks, such as community-based groups where families can share resources and provide emotional support [82]. Furthermore, access to mental health services, which are often limited in rural areas, should be prioritized to address the psychological impacts of forced migration.

Language and communication barriers present significant challenges for displaced families, particularly when they settle in areas where different dialects or languages are spoken. In Nowshera, many displaced individuals come from regions where Pashto is spoken. However, in certain resettlement areas, local dialects or even other regional languages dominate, leading to confusion and alienation. Informants A and E shared their frustrating experiences: “We went to the government office to register for aid, but we couldn’t explain ourselves properly. The staff didn’t speak our language, and they didn’t seem interested in helping us.” This sentiment of feeling unheard and misunderstood is common among displaced individuals, who are often already grappling with the overwhelming stress of their situation. Informant H further illustrated this challenge with the remark, “At the local market, I try to buy things, but the sellers speak a different dialect. I don’t always get what I need, and I often feel like they’re taking advantage of me.”

These language and communication issues not only create daily obstacles for displaced families but also highlight a systemic problem of inadequate cultural and linguistic accommodation in service delivery [12]. Difficulty in seeking medical assistance, as previously noted, exemplifies how language barriers hinder access to critical care [32]. This issue is not confined to Nowshera. In other parts of KPK, where migration due to floods or conflict often forces movement from rural areas to urban centers, language differences similarly contribute to misunderstandings and challenges in accessing services [24,51]. In places like Peshawar, where both Pashto and Urdu are widely spoken, displaced families from more remote areas often struggle to navigate bureaucratic processes or seek healthcare in government-run hospitals due to these language gaps [66].

The influx of displaced families into already resource-scarce areas has strained relationships between these individuals and host communities, occasionally leading to conflicts. Informant D noted, “The locals are worried we will take all the resources and leave them with nothing. We’re constantly arguing over water, and it is getting worse.” This statement highlights the rising tensions when the local population views displaced families as a burden on limited resources. Informants C, L, and I, among others, elaborated, “People have started looking at us with suspicion, thinking that we’re here to take what little they have. It is creating a lot of conflict.” Such tensions manifest not only in disputes over material

resources but also reflect broader societal anxieties about identity and fairness. Conflicts often escalate in the absence of effective community mediation or equitable resource-sharing mechanisms, undermining social cohesion and prospects for peaceful coexistence between displaced families and host communities [70].

The rapid influx of displaced families into resettlement areas can strain local resources [83], leading to increased competition and, at times, violent conflicts [3]. In Nowshera, Informant P explained that disputes over water access are common as local communities and newcomers compete for these limited resources. Tensions often escalate, with local communities feeling their resources are stretched thin while displaced families view their access to necessities as precarious [24]. This issue is particularly important in flood-prone areas of Pakistan, other South Asian countries, and Africa, where competition for land and water between host communities and displaced populations has previously led to violent clashes [3,19,56,84]. Similarly, in the northern parts of KPK, where the population often relies on agricultural resources, conflicts over water distribution have erupted following the migration of communities [85]. The implications of this situation are two-fold: first, there is a clear need for improved resource distribution management in areas affected by migration. Second, local leaders and authorities must take a proactive role in mediating tensions and ensuring that all community members—both displaced and host—are included in decision-making processes.

The lack of reliable transportation has become a significant barrier for displaced families, hindering their access to essential services such as healthcare, education, and employment. Informant Q expressed this frustration, stating, “The roads are terrible, and we have no way to get to the city for medical treatment. It feels like we’re stuck here with no options.” Many families share this sentiment; despite their efforts to rebuild their lives, they often feel trapped by inadequate infrastructure. Informant E added, “The bus service is too expensive for us, and there’s no other way to get around. My children miss school because we can’t afford the transport to get there every day.” These transportation challenges are intensified by the geographical isolation of many resettlement areas, where roads are poorly maintained or nonexistent, deepening the sense of abandonment experienced by displaced individuals [32].

Transportation challenges are a significant barrier to displaced families’ access to essential services such as healthcare, education, and markets [86]. For instance, the recurring flooding of infrastructure facilities like roads and bridges along the Kabul River in the study area disrupts connectivity, leaving many communities isolated [35]. Children from displaced families often face difficulties attending schools, particularly when educational institutions are located far from temporary shelters or in areas inaccessible due to damaged infrastructure [51]. Similarly, limited transportation options prevent timely access to healthcare facilities, forcing families to rely on limited local services or sacrifice treatment altogether [22,24]. Moreover, due to infrastructure damage in disastrous situations, markets, which are vital for purchasing daily necessities and selling agricultural produce, become inaccessible [30,57]. This potentially leads to food insecurity and worsens economic hardships [52]. In Nowshera, inadequate road infrastructure and a lack of affordable transport options make it difficult for families to travel to urban centers or even nearby towns [32]. As Informant T noted, the absence of reliable transportation exacerbates the difficulties they already face, hindering their efforts to rebuild their lives. Similar issues have been observed in other rural areas of KPK, like Dera Ismail Khan, where transport infrastructure limits displaced populations’ access to basic services [34,67]. Such limitations on mobility not only restrict access to vital services but also hinder the search for employment and economic opportunities, perpetuating cycles of poverty and dependence on external aid [37].

Therefore, local governments and aid organizations must reconsider their strategies and work collaboratively with displaced communities to develop locally relevant solutions.

3.3. Health and Well-Being Challenges

This section explores various health-related challenges, including psychological distress, health issues stemming from inadequate living conditions, and security concerns in resettlement areas. Our key informants reported that forced migration has resulted in profound psychological distress, as many individuals struggle with the trauma of losing their homes, livelihoods, and familiar surroundings. In this context, Informant X shared, “I constantly think about our old house. I feel trapped here, with no way out. It’s like living in a bad dream that never ends.” The psychological impact of migration is exacerbated by instability and the stress of adapting to new, often harsh conditions. Informant O expressed, “I used to be a strong person, but now I find myself crying for no reason. The uncertainty and fear of what will happen next have broken my spirit.” For many, the trauma encompasses not only their experiences but also the overwhelming stress of their current and future circumstances. Informant V noted, “We live in fear every day—fear of not having enough food, fear of getting sick without access to a doctor. It’s an endless cycle of worry.” These accounts illustrate the severe psychological toll that forced migration has taken, leaving many feeling hopeless and unable to envision a stable future [87].

Previous studies also show that the psychological effects of migration on communities in the study area are intense, reflecting deep-seated trauma resulting from the abrupt loss of homes, livelihoods, and social connections [36]. The sense of hopelessness and isolation expressed by respondents is consistent with global findings in other post-disaster and conflict-displaced settings, such as the Rohingya camps in Bangladesh [88] and among internally displaced persons (IDPs) in Colombia [88]. However, the impact in Khyber Pakhtunkhwa (KPK) is intensified by sociocultural factors related to Pashtunwali, the traditional code of the Pashtun people [89]. The erosion of these traditional support structures leads to a loss of cultural anchors, further intensifying psychological distress. In contrast to other regions with active mental health programs, KPK’s healthcare system remains ill-equipped to address mental health needs, particularly in rural areas [90]. The stigma surrounding mental health prevents individuals from seeking help, as, culturally, acknowledging emotional distress may be perceived as a sign of weakness [91]. This situation parallels the experiences of Afghan refugees in Pakistan, who also face high levels of PTSD but lack access to culturally sensitive mental health services [92]. To effectively tackle these mental health challenges, localized interventions are essential [14]. Establishing community-based mental health support involving local leaders, religious figures, and trained community health workers can prove more effective than conventional clinical approaches [20]. Mobile mental health units offering psychosocial support and trauma counseling could help bridge the access gap. Additionally, promoting community gatherings or traditional jirgas (councils) could create culturally relevant spaces for collective healing, reducing feelings of isolation.

Another significant challenge is the poor living conditions in the resettlement areas, which have directly contributed to the declining physical health of displaced families. Informant U emphasized the dire situation: “We live in makeshift shelters that flood every time it rains. The dampness makes us sick, but there is nowhere else to go.” Overcrowded shelters, inadequate sanitation, and limited access to clean water have led to a rampant spread of communicable diseases. Informant G explained, “My mother’s asthma has worsened since we moved here. The dust and lack of clean air make it hard for her to breathe.” Inadequate access to healthcare further exacerbates these health issues. Informant Y stated, “There is no doctor here. When someone gets sick, we have to wait days for

transportation or try home remedies. It's very risky, especially for the children and the elderly." These narratives reflect the struggles families face in accessing basic healthcare services, compounding their vulnerability and increasing the risk of preventable illnesses.

The adverse health outcomes in the study area can be directly attributed to substandard living conditions, a finding consistent with observations from post-flood camps in Sindh and Baluchistan [45,52]. The authors highlighted the poor living conditions of migrants in post-flood scenarios. Substandard living conditions, including overcrowded shelters, inadequate housing, poor sanitation, and limited access to clean water, are common in temporary camps [93]. Such observations align with broader evidence of systemic inequities and the disproportionate burden borne by marginalized rural populations in the country and beyond [11,22,62,88]. In KPK, the situation is further aggravated by harsh climatic conditions, where extreme temperatures heighten the vulnerability of makeshift shelters [73]. In contrast, refugee camps in Jordan for Syrian refugees have implemented structured health interventions with adequate sanitation and access to medical services, resulting in better health outcomes despite similar living conditions [94]. This discrepancy stresses the need for stronger health infrastructure in the study area [80]. Local health authorities struggle to cope with scarce resources and an overburdened healthcare system, particularly in rural areas where access to health facilities is difficult due to poor roads and transportation issues [36]. Addressing these health issues requires both immediate and long-term strategies [80]. Short-term measures should focus on establishing mobile clinics capable of providing basic medical care, conducting vaccination drives, and distributing clean water filters. Collaborating with local NGOs for emergency relief and health education can help mitigate immediate health risks. Long-term solutions should include the establishment of permanent health posts in resettlement areas, investments in safe water infrastructure, and training for local health volunteers to monitor and respond to common health issues, thereby building community resilience.

Insecurity in resettlement areas poses a significant challenge, especially for women, children, and other vulnerable groups. Informant H expressed their concerns: "There is no proper protection here. At night, we hear people moving around our tents, and it is terrifying. We don't feel safe." The lack of adequate housing and security measures has led to increased incidents of theft and violence. Informant Y recounted, "One night, someone broke into our shelter and stole our food supplies. We couldn't do anything because we were outnumbered and had no one to call for help." Safety concerns create a ripple effect, cultivating an environment of fear that limits mobility and restricts daily activities, particularly for women. Informant D added, "We used to be able to go out freely in our village, but here, we don't go far from the tents. The fear of harassment and violence is constant." These narratives highlight the absence of security infrastructure, which further exacerbates psychological stress and restricts the ability of displaced individuals to feel safe in their new environment.

Safety and security concerns are critical in migration and displacement settings, and, in KPK, these challenges are increased by the region's pre-existing socio-political instability [78]. District Nowshera, like other parts of KPK, has long grappled with issues such as the presence of militant groups, sectarian tensions, and weak governance structures [48,78]. These factors have historically strained local administrative and law enforcement capacities, creating an environment where displaced populations face heightened vulnerabilities [66]. This instability has not only increased the risks of theft, gender-based violence, and lawlessness but has also undermined efforts to establish secure living conditions for affected communities [95]. In other regions with similar conflicts like KPK, such as Yemen and South Sudan, international aid organizations have made efforts to implement protection measures for vulnerable groups [26]. However, displaced communities in these areas

still face significant challenges, including security concerns. Similarly, relief camps in Bangladesh for Rohingya refugees highlight comparable struggles [7]. While some measures such as community-led watch groups and segregated shelters for opposite genders have been introduced, these initiatives remain insufficient to address the widespread issues of insecurity, gender-based violence, and exploitation [12,22]. Researchers argued that relief camps in flood-hit Khyber Pakhtunkhwa and other parts of Pakistan are generally overcrowded, poorly resourced, and fraught with safety concerns, particularly for women and children [32,36,66]. Therefore, these challenges underline the systemic issues faced by displaced populations in the study area and beyond, highlighting the need for comprehensive, localized, and sustainable solutions to improve safety and living conditions in relief settings [96]. Furthermore, advocating for the legal recognition of IDPs and their rights in KPK could help frame policies that protect them and ensure their access to justice [97].

Adapting to new climatic and environmental conditions has posed a significant challenge for displaced families in District Nowshera. Many of these migrants, who originally came from agricultural backgrounds, have struggled to cope with the unfamiliar weather patterns and soil types in their new settlements. As Informant E stated, “Back in our village, we knew when to sow and harvest. Here, the seasons feel different, and we do not understand the land. Our old methods don’t work anymore.” Another respondent, Informant Q, expressed frustration: “We are left guessing when to plant. The weather has become so uncertain; it feels like we have no control over our livelihoods anymore.” The issue is further worsened by environmental degradation in the resettlement areas, partly due to poor waste management and inadequate drainage systems. The improper disposal of waste has led to waterlogging, contamination of nearby water sources, and poor soil quality. Informants J and Q noted, “Waste around the field smells bad, making it hard to bear it. Although there are waste collection points, its collection frequency is weakly managed.”

The difficulties faced by displaced families in Nowshera exemplify broader challenges experienced by climate migrants throughout Khyber Pakhtunkhwa (KPK) and beyond. Displaced farmers in the other parts of the province encounter similar issues with altered weather patterns, soil quality, and limited knowledge of new agricultural practices [48]. These challenges are exacerbated by a lack of extension services or agricultural support programs that could assist communities in adapting. Internationally, similar trends can be observed in countries such as Bangladesh [98] and Myanmar [58], where displaced farmers often lack access to the training and resources necessary to acclimate to different climatic zones. The failure to adapt can result in reduced agricultural yields, increased food insecurity, and health consequences due to poor sanitation and waste management. This stresses crucial training efforts for introducing climate-resilient agricultural practices like crop diversification and access to climate-resistant seeds, etc. [85]. Additionally, implementing effective sanitation and waste disposal systems, such as establishing community-led waste collection programs and constructing designated landfill sites with proper drainage systems could play a central role in minimizing environmental risks in the study area [22].

4. Conclusions and Policy Recommendations

4.1. Conclusions

This study explores complex difficulties faced by climate migrants, emphasizing socioeconomic community and interpersonal health and well-being challenges in District Nowshera, Khyber Pakhtunkhwa (KPK), Pakistan, because of flood hazards. These challenges are essential for understanding the lived experiences of displaced populations and provide valuable insights into the broader implications of climate-induced migration.

The socioeconomic challenges faced by migrants in Nowshera are substantial. The transition from stable, permanent residences to makeshift shelters exacerbates both physical and psychological vulnerabilities. Inadequate housing is associated with a heightened risk of diseases, including respiratory infections and waterborne illnesses. The loss of agricultural land, livestock, and local businesses, which serve as primary sources of income, has intensified poverty and disrupted families' ability to fulfill basic needs. Migrants frequently encounter difficulties in securing stable employment and accessing financial support, further increasing their vulnerability. Additionally, land ownership disputes arising from informal inheritance practices and the lack of a transparent land registry system have complicated efforts to resettle and achieve long-term stability for these communities.

The study also explored the disintegration of social and cultural structures as a significant consequence of migration. Historically, rural communities in the study area have been dependent on strong social bonds for support during challenging times; however, the destruction of homes and farmland has disrupted these connections, resulting in feelings of isolation, particularly among women and the elderly. Additionally, language and communication barriers have hindered displaced families from accessing already scarce resources, such as healthcare, clean water, and education, often resulting in conflicts and impeding efforts to foster social cohesion. Furthermore, the damage to transportation networks forced families to rely on limited local options or forgo necessary care altogether, undermining the ability of migrants to rebuild their lives and livelihoods.

The loss of social connections has resulted in profound trauma and a pervasive sense of hopelessness, making it more challenging for individuals to adapt to their new circumstances. Substandard living conditions in resettlement areas, such as overcrowded shelters and inadequate sanitation, have led to poor physical health outcomes. These challenges, combined with insufficient institutional support, the region's pre-existing socio-political instability, and a lack of long-term planning, have hindered the sustainable recovery of displaced families' undermined efforts to create secure living conditions for these communities. Hence, there is a need for comprehensive support systems addressing the immediate physical needs of climate migrants and the long-term socioeconomic, interpersonal, and health challenges they encounter aiming to rebuild their lives and adapt to the new realities imposed by climate change.

4.2. Policy Recommendations

The study's conclusions highlight the urgent need for targeted, actionable solutions to address the complex vulnerabilities faced by flood-affected communities in Khyber Pakhtunkhwa's District Nowshera.

To mitigate the effects of recurrent floods, prioritizing flood-resistant housing is essential. For instance, training local masons in flood-resilient construction techniques will enhance the durability of these homes and ensure the long-term safety of communities.

Developing climate-resilient crops, such as sugarcane and wheat, which are widely cultivated in the region and have been adversely affected by flooding, is crucial. These crops should be adapted to withstand the changing climate to maintain consistent agricultural output and support local livelihoods. Implementing small-scale irrigation methods, like raised tube wells, can help reduce flood damage and stabilize agricultural production, thereby bolstering the local economy.

Another vital strategy is to diversify livelihoods through skills training programs focused on district-specific crafts, such as pottery, which is a significant part of Nowshera's cultural heritage. By fostering alternative income sources, households can enhance their economic resilience.

Setting up temporary learning centers can help minimize disruptions to children’s education caused by migration, ensuring continuity in their schooling during such times.

To strengthen social ties, forming neighborhood committees with members from both host and displaced communities can be beneficial. These committees would provide a vital platform for collective decision-making and problem-solving, fostering relationships among diverse community groups. Involving local youth in these committees will promote inclusivity and ensure that everyone’s voice is heard during the reconstruction process.

Addressing the health and welfare of displaced communities is equally critical. Mobile health units should be established to provide emergency medical assistance to flood victims. These units must be equipped with flood-resilient medical supplies, including kits for preventing waterborne diseases, to effectively address the urgent health needs of migrants. By doing so, these mobile units can help prevent disease outbreaks, deliver timely interventions, and ensure that the most vulnerable populations receive the care they need.

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Appendix A

List of key informants and their demographic characteristics.

Table A1. Characteristics of the interviewees of this study.

Code	Age	Gender	Education Level	Livelihood	Count	Brief Characteristics
A	30	Male	High School	Farmer	2	Second-generation Young farmer currently doing farming
Q	40	Male	High School	Farmer		Seasoned farmer utilizing traditional methods
B	45	Female	Primary	Homemaker	3	Middle-aged homemaker with deep community ties
H	31	Male	Primary	Homemaker		Experienced homemaker managing household migration
N	35	Female	No Formal Education	Homemaker		Middle-aged woman active in community support
D	24	Female	Undergraduate	Shop Owner	2	Female shop owner adapting business after floods
K	38	Male	Primary	Small Business Owner		Small business owner impacted by displacement

Table A1. Cont.

Code	Age	Gender	Education Level	Livelihood	Count	Brief Characteristics
E	37	Male	Primary	Laborer	2	Skilled laborer facing job instability post-disaster
S	25	Male	Undergraduate	Laborer		Manual laborer struggling to find stable work
F	42	Female	High School	Teacher	3	Local school teacher focusing on displaced students
J	25	Female	High School	Teacher		Female teacher advocating for educational continuity
U	35	Male	High School	Teacher		Teacher involved in rehabilitating educational activities
G	21	Male	Undergraduate	Student	3	Young male student from a farming family
O	24	Male	Undergraduate	Student		Young male student providing local volunteer support
W	19	Male	Undergraduate	Student		Young student engaged in awareness programs
I	56	Male	Primary	Community Leader	2	Influential leader in local disaster response efforts
R	59	Male	Middle School	Community Leader		Community elder leading local recovery initiatives
C	62	Male	No Formal Education	Elder	3	Respected elder with traditional knowledge
L	63	Female	Undergraduate	Elder		Elder with a strong cultural preservation role
T	55	Female	Primary	Elder		Elderly figurehead in cultural ceremonies
M	45	Male	High School	Local Politician	2	Elected village council member during crisis
V	48	Male	Primary	Local Politician		Local political representative voicing community concerns
P	50	Female	Primary	Religious Leader	2	Mosque imam offering spiritual and emotional guidance
Y	57	Male	Primary School	Imam (Religious leader)		Religious leader involved in cultural preservation
X	42	Female	No Formal Education	Housewife	1	Stitch clothes, and does housework

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