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Climate Migration: Evidence Synthesis on Drivers, Adaptation, and Governance

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ABSTRACT

Climate change is increasingly recognized as a significant driver of human mobility, shaping migration patterns through complex interactions between environmental stressors, socioeconomic vulnerabilities, and governance structures. This study synthesizes existing evidence on the drivers, adaptation pathways, and governance responses associated with climate migration. Drawing on interdisciplinary research and systematic reviews, the analysis examines how environmental hazards such as sea-level rise, droughts, floods, and extreme weather events interact with social, economic, political, and institutional factors to influence migration decisions. The study further explores adaptation strategies, including autonomous and planned adaptation, highlighting how mobility can function both as a coping mechanism and as a long-term resilience strategy. At the same time, it identifies limitations and trade-offs in adaptation efforts, including resource constraints, inequality, and the risk of maladaptive outcomes. The governance dimension of climate migration is examined through national, regional, and international policy frameworks that shape migration opportunities, protection mechanisms, and institutional coordination. The evidence also reveals persistent data gaps, measurement challenges, and biases within the climate-migration literature, underscoring the need for improved methodologies and more comprehensive datasets. Case study evidence from regions such as Africa, the Middle East, and Asia demonstrates that climate-related mobility is rarely driven by environmental factors alone, but rather emerges from the interaction between climate stressors and broader development challenges. The findings emphasize that effective climate-migration governance requires integrated approaches that combine adaptation planning, migration management, and climate justice considerations. Strengthening policy frameworks, improving data systems, and promoting international cooperation will be essential to address the growing scale and complexity of climate-induced human mobility.

Keywords: Climate Migration, Climate Adaptation, Environmental Stressors, Migration Governance, and Climate Justice.

INTRODUCTION

In 2005, UN Secretary-General Kofi Annan stated that “climate change is more than just an environmental issue, it is a matter of human dignity and social justice” [1]. Climate change can affect human frequencies in four major ways: health, economy, collectivism, and migration [2]. People often identify climate migration with climate refugees; in many parts of the world, people with social vulnerabilities and/or land-tied livelihoods suffer from climate change and consequently decide to leave their place of origin [3]. Even when a common agreement has not been reached on the definition of climate migrations, it is widely accepted that migration in response to

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environmental factors at least influences climate change. People generally migrate long distances in a region with a lack of capacity for climate adaptation, or for improving their environmental footprints [3]. Therefore, in scientific support for the development of adaptive capacities for both environment and economy, it evidently supports the mitigation of climate change and provides for social, economic, and human development policies [4].

Conceptual Framework and Definitions

Climate migration is defined as all types of planned and spontaneous movement engendered by environmental change and perceived as a necessary adaptation to it [3]. It encompasses voluntary, forced, within-country, and cross-border aspects, which makes it suitable for capturing both slow and sudden-onset climate mobility as well as longer-term trends and abrupt relocations, efforts to evade or escape environmental stress, and variables associated with determinism or resilience [4]. Such a comprehensive definition highlights the synergy between climate migration, development, and the Sustainable Development Goals, all too often framed as mutually exclusive objectives in the post-2020 global agenda [5]. Following this conceptual framework, invisible and near-latent forms of climate migration (e.g., a climate migrant returning home) are included in the scope without necessarily triggering an administrative label of 'climate mobility' [7]. For this reason, climate migration is preferred over climate-associated, climate-induced, and even more, climate-driven migration. Correspondingly, climate mobility labels more frequent and minor efforts to adapt to environmental and associated shocks without changing residence location completely [8].

Drivers of Climate-Induced Migration

Environmental and social factors influencing climate-induced movements exhibit a complex interaction, and the impact of physical stressors on mobility outcomes varies widely across regions [3]. The availability of global climate data enables the analysis of these climate impacts through theoretical frameworks. In many cases, mobility decisions are predicated on pre-existing socio-economic, political, and institutional vulnerabilities that either restrict movement or dictate the specific direction and mode of migration [4]. Environmental factors, while important in shaping the demand for movement, function predominantly in conjunction with these broader, contingent drivers [9].

Environmental Stressors and Disasters

Environmental stressors such as sea-level rise, droughts, and floods, and disaster events ranging from cyclones and tsunamis to wildfires, landslides, and hazardous waste are primary drivers that influence the timing, modality, and direction of movement [5]. The exposure of populations to such hazards depends on geographical location, patterns of settlement, and levels of vulnerability. Sensitivity to climate stressors is shaped by multiple factors, including economic development, poverty, education, ownership of physical and financial assets, and livelihood strategies [6]. At the same time, institutional settings focus on social, economic, and political interactions, and the combination of human and political capabilities influences the adequacy of policies encouraging either migration or adaptation [4].

Socioeconomic Vulnerabilities

Climate migration is driven by multiple drivers, including environmental stressors, socioeconomic vulnerabilities, and political and institutional factors that coalesce and interact in climate-exposed territories [12]. Environmental stressors can be broadly classified as gradual climate changes (e.g., rising average temperatures, sea-level rise) or disruptive extreme events (e.g., floods, droughts) [14]. Longitudinal analyses show that environmental changes amplify pre-existing socio-economic vulnerabilities such as poverty, education, asset ownership, and income sources, which in turn shape migration decisions [7]. Political, institutional, and security factors, including the quality of governance, conflict situations, and existing displacement regimes, add an additional layer of complexity, heavily influencing whether migration is actively pursued or effectively enabled [4].

Political, Institutional, and Security Factors

Political, institutional, and security factors can inhibit or drive migration decisions and they operate across different scales: [9] the quality of governance at national-level influences the capacity of states to establish and implement climate policies that reduce vulnerabilities to climate change and facilitate migration as an adaptation strategy; [8] armed conflict and insecurity reduce the desirability and feasibility of migration; and [13] the existence of national public policies and international treaties regulating displacement due to climate change-related disasters can facilitate climate migration [1]. Governance quality, the existence of armed conflict, and the existence of displacement regimes constitute three political and institutional factors that modulate migration decisions. Various studies have identified governance quality as a key driver of climate change vulnerability and a variable influencing climate migration decisions [15]. The existence of armed conflict has also been associated with reduced levels of climate migration. Refugee and other displacement regimes that specifically address climate

change and that are well integrated into the broader frameworks of social security, labour, and disaster risk reduction can support adaptation to climate-induced displacement more generally [13].

Adaptation Pathways and Outcomes

Climate change impacts can induce movement of people across spaces, but permanent resettlement does not always occur, nor does it happen in the same way everywhere. While some people relocate out of climate-sensitive locations, others choose to remain and adopt alternative ways of living [8]. The concept of climate mobility encompasses such observations, which have been largely overlooked in the discussions surrounding climate change impacts and human movement [9]. Adaptation to climate risks and exposure to climate-related threats can take many forms, including time-limited mobility, seasonal mobility, and movement across local or national borders based on protective or productive motives. Such alternative mobility patterns can also affect relocation decisions out of high-risk areas [3]. Adaptation actions and decision-making processes extend over long periods, often involving more constrained choices altogether; they are equally important in assessing climate-migration dynamics. Research suggests that climate adaptation efforts can lead to climate-mobility outcomes: investments in protective or productive measures motivate temporary or seasonal movement and migration; benefit sharing is more targeted at specific locations; and retained assets at the origin remain more viable [9]. Adaptation strategies can be more effective with support from local or national governments; locations at risk depend on successful resilience-building strategies before and after global climate thresholds are passed [2].

Autonomous and Planned Adaptation

When faced with the immediate consequences of climate change, individuals may engage in different typologies of adaptation. They may first rely on autonomous adaptation (also known as spontaneous or bottom-up adaptation), such as changing livelihood strategies in situ or moving towards other places in search of better opportunities. It can be initiated at the individual or household level and is often based on market price signals [8]. On the other hand, planned adaptation refers to prospective, proactive, and integrated initiatives that are part of a climate-change development strategy. The distinction between autonomous and planned adaptation is important because they influence the extent, scale, form, or speed of migration [6]. The autonomous adaptation has been used to cope with climate change, but has unintentionally increased the exposure and vulnerability of the people involved. For instance, the decision of some farmers to leave agricultural land and seek employment in urban areas is a form of autonomous adaptation. However, they are still exposed to extreme-weather events and have little access to socio-economic services. Nevertheless, the relevance of planned adaptation for addressing climate change has been discussed little [9]. When climate-related hazards threaten settlements, both avoidance-oriented and accommodation-oriented adaptations can take place. Avoidance-oriented adaptation entails proactively relocating people, structures, and land uses to better locations, such as abandoning a floodplain for safer areas. The relocation of people and activities away from those vulnerable landscapes is a form of planned adaptation [9]. A number of protective measures and resilience-building interventions have been proven to reduce mobility choices, such as the establishment of early-warning systems that allow communities to prepare for a forthcoming hazard, and social safety nets that ensure the safety of livelihoods while people are not able to keep working. Integrated with participatory planning, climate-smart livelihood programs that help local populations diversify livelihood options have also been found effective in decreasing mobility [2]. Nonetheless, adaptation measures aimed at reducing mobility, such as those built on the assumption that climate risks will remain limited and only the capacity to manage them will improve, entail significant limitations [7].

Protective Measures and Resilience Building

The central premise of the climate-migration debate frames migration as a means for adaptation to the consequences of climate change, with wide-ranging implications for people's mobility [8]. While some relocation must remain a last resort [2], avenues for adaptation, indirect or even the distribution of climate change, will continue to shape decisions on whether and how to move [7]. Three broad policy domains govern the discussion of mobility decisions and opportunities: [1] protective measures that directly reduce threats to lives and livelihoods and thus influence the need to move, [2] resilience-building interventions, notably access to basic livelihood support, social protection, and risk-mitigation mechanisms incentives to remain in place even under adverse circumstances and [3] formal arrangements for temporally or spatially severing residence to seek safer alternatives without permanently abandoning one's location. Policymakers need to recognize these interconnections to shape coherent and comprehensive frameworks [7]. The study of adaptation is increasingly focused not only on the physical manifestations of change and related protection against them but also on measures more broadly aimed at cushioning the impact of hazardous events on direct, environmentally induced mobility [4]. Such adaptation is thus both crucial in itself and also an integral part of the broader,

multidimensional, and socioeconomically determined vulnerability context essential to fully grasp the drivers of (remaining) mobility, migration dynamics, and the climate-social-structures nexus [3].

Limitations and Trade-offs in Adaptation

The effectiveness of adaptation measures can be constrained by several limitations and trade-offs. First, adaptation efforts often command significant resources that could otherwise address existing development challenges or entirely different climate issues [4]. Planned adaptation to multiple climate hazards simultaneously is generally unfeasible. Second, certain adaptation choices can aggravate pre-existing inequalities or contribute to maladaptive outcomes. Finally, more pervasive contextual constraints limit the scope for adaptation on migration pathways or overall mobility [8]. Opportunity costs arise whenever resources are diverted from established priorities, and climate change presents myriad long-standing development challenges. Climate-resilient crops, for example, represent an adaptation option for agricultural systems, yet any significant diversion of already scarce agricultural research resources is likely to have detrimental effects [2]. Equity concerns accompany adaptation measures as well. The potential interaction between climate hazards and pre-existing vulnerabilities complicates adaptive behavior, as adaptation can worsen inequity if it neither alleviates nor attends to the very problems that define such vulnerabilities [1]. Prioritizing remedies for existing inequalities, therefore, not only addresses local justice demands but also expands the adaptive space by making it more probable that adaptation measures directed at changing climate variables are equitable [3].

Governance Contexts and Policy Responses

Governance shapes climate migration outcomes through decisions on mitigation and adaptation, the framing of mobility as an option, the establishment of institutional arrangements, and the provision of rights and services. Within this context, policy responses have emerged at national, regional, and international scales [9]. National and subnational governance structures, capacities, and policies influence migration paths, timing, and destinations [2]. High governance capacity allows for anticipating climate migration and establishing plans that include the possibility of migration [10]. Conversely, low governance capacity tends to delay planning, increase vulnerability, and reduce the extent to which climate migration can be anticipated and supported. The absence of a national climate-migration policy can result in institutional fragmentation, which complicates coordination when people are forced to leave [5]. The relevance of climate migration plans also varies according to prior mobility patterns: while they are crucial in nations where such patterns are limited, they serve an additional purpose in countries associated with extensive pre-existing migrations [2]. At the regional scale, cooperation addresses coordination challenges across international borders, yet the establishment of operational mechanisms remains limited. Climate migration that crosses international boundaries sparks questions about protection, assistance, resilience-building, and future return: a humanitarian-development-peace nexus matures at the international level and must enhance operational fit with climate-movement considerations [1]. Coordination dilemmas stem from the formulation of region-wide strategies that cannot address heterogeneous local conditions. Indeed, vulnerable countries that receive substantial climate-migration inflows experience heightened internal displacements yet find it challenging to attract the international attention necessary to formulate humanitarian-development-peace packages. Regional declarations on cross-border climate-migration responses are yet to emerge, although preparatory processes and dialogues to deliberate such instruments are ongoing [6]. Human rights, protection, and justice aspects warrant further exploration, especially concerning the intersection between climate-induced migration and the provisions of the Global Compact on Migration [3]. Risk elements include the potential redirection of climate-migration discourse towards states at risk of losing fertile land or assets through large-scale, climate-driven outmigration while diverting attention from high-emissions states generating climatic risks [4].

National and Subnational Governance Structures

Governance is crucial for climate migration because it influences the ability and willingness to migrate, the protection available when migrating, and the delivery of support to settle in destination areas. Governance structures, capacities, and policy instruments at national and subnational levels shape migration decisions along multiple dimensions, such as whether to migrate, when, and where [11]. Climate migration and associated policies are governed through a variety of structures and strategies across multiple governance levels [10]. International institutions play an important role, but existing frameworks do not guarantee coordinated or predictable responses. National and subnational governments contribute significantly, yet most countries still lack migration policies that specifically integrate climate considerations [10]. Adapting to climate change continues to receive more attention in governance agendas than in-depth analyses of specific policies that facilitate internal or cross-border migration as a response [11].

Regional and International Cooperation

Regional and international cooperation on climate migration is currently fragmented and often weak despite the potential emergence of a range of formal and informal cooperative initiatives [16]. Climate change has the potential to intensify regional and international tensions through the exacerbation of extreme weather and disasters, and the widening of climate hazards in regions already prone to these threats. Issues of water security and scarcity arise from climate change, including aggravating the tensions over the rights of shared water sources, and increasing the migration of peasants from the countryside to urban areas [15]. Environmental hazards are also predicted to affect cross-boundary pollution patterns that increase competition for shared water resources. Regional climate change monitoring systems should be established to improve awareness of evolving climate trends and disasters. The regional forecasts and mapping of climate events should also accompany regional monitoring systems [2]. International coordination on climate change agreements and the provision of technology, information, and financial resources to countries impacted by climate change have also increased in importance as a consequence of climate change [12]. However, the lack of political processes for regional cooperation and the growing focus on transboundary environmental issues tend to create obstacles. Further investments are therefore necessary to promote the collaboration of existing activities that address climate change and transboundary pollution issues [14]. More financing for cross-country collaboration on transboundary pollution, waste management, and disaster management is also required [11].

Human Rights, Protection, and Justice

Vulnerable populations currently living in ecologically precarious areas remain at risk of climate-induced displacement when effective protective or adaptive measures are lacking [12]. Policy discussions regarding climate-related human mobility consistently highlight climate migrants' entitlement to protection and assistance. The anticipated scale of future movements underscores the need for comprehensive migration management solutions, including recognition of climate-displaced individuals' rights to stay in other countries or return when situations improve [13]. Considerations about climate-displaced individuals' rights engage states' obligations under international law and humanitarian principles. Concerns about the harmful global consequences of climate change further tighten moral responsibilities toward vulnerable groups exposed to the first effects of climate-related hazards [12]. In the absence of systematic protection, climate-induced individuals face a triple vulnerability related to illegal status, exclusion from the provision of humanitarian services, and associated danger [15]. Materialistic paradigms adopt a utilitarian and economic framing of the assistance issue and focus on migrants rather than inhabitants in the context of internationally-displaced people [13]. Human dignities, environmental security, and inequities based on high-impact actors retain precedence over climate migrants. Discussion moreover emphasizes mobility as an opportunity for select individuals, not as an inherent right for support, allowing elision of obligations to institutions and maintaining an exclusive conception [13].

Evidence Synthesis: Methods and Data Sources

Climate migration is a topic of increasing importance in academic and policy circles. Global temperatures have risen inexorably since the 1980s, with the past five years being the hottest on record [13], and many projections suggest that further increases can be expected. Changes to the planet's climate and physical environment can exert considerable influence on human behaviour and, particularly, the fundamental decision to migrate from one location to another [14]. The complexity of the dynamic relationship between environmental change and human mobility is, therefore, a central consideration in any discussion of climate migration [15]. While the climate migration debate has intensified, the accompanying analysis of the empirical evidence has not reached similar levels of rigour. A systematic mapping of the knowledge landscape reveals that, although more studies have been produced in recent years, vast areas remain unexplored. International scientific and development communities are currently wrestling with the phenomenon of climate migration, specifically, how climate change interacts with drivers of migration and whether climate-migration trends unfairly disadvantage the most vulnerable people. Accordingly, climate migration forms the principal focus, although environmental change, related phenomena, and broader sustainable-development concepts are also examined [15]. The desired synthesis is designed to inform academia and the international climate-development-migration-community nexus by focusing on climate-migration drivers, adaptation, and governance. Three specific questions guide investigations: What climate-related factors trigger consideration of relocation or movement? In what ways do people enhance resilience and adapt to climate-related changes, and what influence, if any, does this have on the decision to migrate? What formal and informal measures do governments and typically non-governmental organisations adopt to manage climate-related displacement or support climate-related migration? [12] The emphasis on climate migration stems from the topic's perceived underexplored nature relative to migration in general, heightened by a growing body of literature examining drivers of environmental change at broad systemic levels [13].

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Systematic Reviews and Meta-Analyses

Systematic reviews, meta-analyses, and related synthesis approaches represent a powerful means for assessing and aggregating existing empirical climate-migration findings [16]. Several systematic reviews have sought to compile evidence on climate-related mobility factors and adaptation or climate-change impacts on human migration more broadly. A systematic review covering drivers, adaptation, and governance was conducted via a structured search of peer-reviewed publications exploring climate-related human mobility across fields such as demography and environmental politics [15]. The unique theoretical lens allows a comprehensive synthesis of pathways, adaptation outcomes, and governance implications, while the breadth of disciplines provides access to a broader range of empirical analyses [14]. Furthermore, climate-change impacts on migration were made visible already in the title of climate-migration literature with the highest exposure, facilitating the identification of relevant studies [10].

Data Gaps, Measurement Challenges, and Biases

Climate-migration research faces substantial data gaps, measurement challenges, and biases that raise questions about the robustness of findings [13]. First, climate-migration studies often draw on various sources of empirical evidence. There is wide variation across the competing studies in the various ways that climate changes are measured, the definitions of migration used, and the steps taken to account for other drivers of migration or the selectivity of migrants [14]. Such differences complicate efforts to evaluate the sensitivity of results or to aggregate findings. A systematic mapping of the evidence landscape would enhance understanding of knowledge about what is known and not known regarding the connections between climate and migration and, more importantly, the roles of different climate stressors across regions and development contexts [15]. Second, an understanding arises from the literature examined that there are several significant data gaps and measurement challenges. Moreover, a consistent recognition emerges from the exploration undertaken that there are also important biases in the research. Specific studies frequently acknowledge limitations in their datasets that could lead to under- or over-estimation of climate influences on migration [16].

Case Study Illustrations across Regions

Climate change poses grave and far-reaching threats that have increasingly spurred structuring of analysis around climate-induced migration and, more broadly, human mobility [12]. Surveying relevant research on climate mobility, public institutions, and migration patterns in Africa and the Middle East, the relevant literature indicates migration in these regions is strongly driven by environmental change, with climate factors often playing a key role in the decision to move [13]. Climate mobility should therefore be situated within a broader context of socio-economic concerns, such as employment opportunity, remaining highly decisive motivators of movement 1. Two subsets of the evidence also endorse the salience of climate variables and their interaction with socio-demographic factors in shaping domestic migration flows across Asia [14]. One analysis of climate and migration using data from eight major global regions finds significant climate endowments to operate as migration pull factors, with different drivers influencing international and internal migration [13].

Implications for Policy and Practice

Effective adaptation to climate risks diminishes the loss of assets and livelihoods, preventing forced migration 2. Climate change forces initial migration and advances onward movement with successive stressors [13]. “Climate-Change-Related Displacement” requires measures ensuring continued access to basic human rights (e.g., housing, education, food) due to climate hazards prompting new locations; transitional arrangements support planning for potential long-term moves at origin [14].

Adaptation Planning and Migration-Responsive Policies

Adaptation planning and migration-responsive policies can enhance resilience by managing mobility as a complementary climate action. Climate adaptation and risk reduction generally aim to enhance human well-being. In this light, human mobility may be viewed primarily as an adaptation response [8]. However, plans, policies, and risk reduction strategies exist to direct climate migration, whether within countries or across borders. Migration routes and internal destinations, whether anticipated or prompt, are therefore core considerations when developing human mobility strategies in response to environmental changes [11]. Migration management frameworks and temporary solutions can address climate-related displacement, accompanying livelihoods, and prospects for return [2]. Many people permanently relocated by climate-related events encounter persistent difficulties; planning can mitigate the challenges of pre- and post-migration. Moreover, the climate transition disproportionately affects marginalised and vulnerable communities, whose well-being warrants particular attention in mobility responses. Climate justice is therefore a crucial consideration in planning frameworks and actions [15].

Migration Management and Temporary Solutions

Theoretical frameworks can assist in interpreting science-technology-society (STS) dynamics concerning migration decision-making [12]. This chapter summarizes STS findings and highlights a typology linking migration, climate change, the permanent emergence of technology, politics, and climate justice [10]. People use frameworks to analyze data; the typology clarifies the added value of applying a technology lens to migration studies. A geographical-science-technology framing emphasizes the need for heterogeneous but simultaneously applicable frameworks for understanding issues in contemporary society [11]. Technologies manifest as enablers and disruptors, with meaningful disambiguation between heterogeneous forms of technology essential for appreciating emergent procedures [10].

Climate Justice and Equity Considerations

As climate change progresses, the potential for mass human movement looms greater. Evidence shows that migratory movements due to climate change are happening now and are expected to increase, especially but not exclusively in developing countries [14]. Some affected individuals mobilize within their own countries, while others cross an international border to find opportunities elsewhere. Both types of movement occur in response to changing environmental stresses, a growing population, and a broader local context. Climate mobility encompasses both voluntary and forced migration, but the majority of relevant scholarship has focused on the latter, much of which describes climate refugees, a term that, despite its ubiquity, has been widely critiqued for its normative, analytical, and legal shortcomings [16]. It remains vital to examine the implications of climate migration, including the way climate justice and equity considerations intersect with adaptation pathways, governance contexts, and other climate-mobility dimensions [13]. The ideal of climate justice aims to repair harms wrought by a historical concentration of emissions in a few countries and to enhance equity for marginalised groups everywhere, but the paradigm still struggles to articulate clear policy interventions and priorities 4. Within the climate-migration literature, the justice framework appears most saliently in relation to impacts on vulnerable groups, particularly low-income households unable to pursue movement options, and political or institutional challenges to planned relocation and cross-border efforts [12].

Future Research Directions

Significant knowledge gaps persist within various aspects of climate migration research. To better inform stakeholders, scholars are urged to prioritize the following questions and to enhance methodological rigour, analytical depth, and accessibility in ongoing investigations [14]. Across many more advanced territories, further discernment is needed regarding regional, temporal, and socioeconomic discrepancies in climate-migration linkages, the influence of non-environmental migration determinants, and the ongoing significance of historical climatic events [13]. Conversely, particular attention remains warranted in the study of climate-mobility nexuses alongside a broadened interest in cooperative climate-migration interactions within diverse nations. Similar emphasis should also be granted to the examination of the interplay between climate considerations and non-climatic migrants, alongside the incorporation of climate considerations into non-environmental migration frameworks [15]. Moreover, the relationship between elevated climate-mobility flows and alterations triggered by various economic stimuli, alongside the capacity of alternative or emerging climate-stress systems to amplify mobility in settings presently perceived as relatively secure, merits increased focus. Greater priority remains necessary in investigating migration as a complementary adjustment strategy, constituting a critical element of climate-adaptation assistance [16]. Pending assessment concerns the intricacies of migration for labour or climate reasons and the resultant side effects. Additionally, an extensive understanding of migration's adaptive adjacency encompasses interrogating specific geographical transfer points, scrutinising potential constraints within receiving communities, evaluating the interdependence of origin and destination areas, and upholding thorough and methodical diligence within respective studies. Advancing inter-regional climate-link queries, public health considerations, and peacekeeping sustainability constitutes further topical advancement, whilst the articulation of in-depth traces alongside research findings may contribute toward broader accessibility [8].

CONCLUSION

Climate migration represents one of the most significant human consequences of climate change, reflecting the complex interactions between environmental hazards, socioeconomic vulnerabilities, and governance systems. As global temperatures continue to rise and extreme weather events become more frequent and intense, human mobility is increasingly shaped by climate-related pressures. However, the evidence demonstrates that climate migration cannot be understood as a purely environmental phenomenon; instead, it emerges from the combined influence of climate stressors, economic opportunities, institutional conditions, and social inequalities. This evidence synthesis highlights that environmental stressors such as droughts, floods, sea-level rise, and extreme weather events can act as catalysts for migration decisions. Yet these factors rarely operate in isolation.

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Socioeconomic conditions, including poverty levels, access to education, livelihood strategies, and asset ownership, significantly influence whether individuals and communities are able to migrate, remain in place, or pursue alternative adaptation strategies. Political and institutional conditions, such as governance capacity, conflict dynamics, and displacement policies, further shape migration outcomes by enabling or constraining mobility options. Adaptation pathways play a critical role in mediating the relationship between climate change and migration. Individuals and communities may adopt various forms of adaptation, ranging from autonomous responses such as livelihood diversification or temporary mobility to planned adaptation initiatives implemented by governments and institutions. In many contexts, mobility itself can serve as an adaptive strategy, allowing households to diversify income sources and reduce vulnerability to environmental shocks. At the same time, adaptation strategies must be carefully designed to avoid maladaptive outcomes that may increase inequality, exacerbate vulnerability, or limit future mobility options. The governance context is equally crucial in shaping climate migration dynamics. National and subnational governments influence migration through policy frameworks, institutional capacities, and development planning processes. While some countries have begun integrating climate mobility considerations into adaptation strategies, many still lack comprehensive policies that address climate-induced migration directly. At the regional and international levels, cooperation remains fragmented, and existing migration frameworks provide limited protection for individuals displaced by climate-related factors. Strengthening governance systems, therefore, requires improved policy coordination, enhanced institutional capacity, and stronger international collaboration. The synthesis also identifies significant gaps in current research. Inconsistent definitions of climate migration, limited data availability, and methodological differences across studies complicate efforts to compare findings and assess the scale of climate-induced mobility. Addressing these challenges requires more systematic data collection, interdisciplinary collaboration, and improved measurement approaches that capture both environmental and non-environmental drivers of migration. Ultimately, climate migration presents both challenges and opportunities for policymakers and societies. While large-scale displacement may create humanitarian and governance pressures, mobility can also function as a legitimate and proactive adaptation strategy that enhances resilience and livelihood security. Effective policy responses must therefore recognize migration not only as a problem to be managed but also as a potential pathway for adaptation. Moving forward, comprehensive climate-migration strategies should integrate adaptation planning, migration governance, and climate justice principles. Policies should prioritize the protection of vulnerable populations, support safe and orderly mobility pathways, and ensure equitable access to resources and opportunities for affected communities. Strengthening international cooperation, improving research and data systems, and incorporating climate justice perspectives will be essential in addressing the growing challenges of climate-induced human mobility in a changing global environment.

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