



# Migration Theory in Climate Mobility Research

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The purpose of this article is to explore how migration theory is invoked in empirical studies of climate-related migration, and to provide suggestions for engagement with theory in the emerging field of climate mobility. Theory is critical for understanding processes we observe in social-ecological systems because it points to a specific locus of attention for research, shapes research questions, guides quantitative model development, influences what researchers find, and ultimately informs policies and programs. Research into climate mobility has grown out of early studies on environmental migration, and has often developed in isolation from broader theoretical developments in the migration research community. As such, there is a risk that the work may be inadequately informed by the rich corpus of theory that has contributed to our understanding of who migrates; why they migrate; the types of mobility they employ; what sustains migration streams; and why they choose certain destinations over others. On the other hand, there are ways in which climate and broader environment migration research is enriching the conceptual frameworks being employed to understand migration, particularly forced migration. This paper draws on a review of 75 empirical studies and modeling efforts conducted by researchers from a diversity of disciplines, covering various regions, and using a variety of data sources and methods to assess how they used theory in their research. The goal is to suggest ways forward for engagement with migration theory in this large and growing research domain.

**Keywords:** migration theory, climate migration, climate mobility, migration research, climate adaptation, human mobility, climate change, aspirations and capabilities

## INTRODUCTION

The literature on climate migration, or what is now increasingly termed “climate mobilities” (Boas et al., 2019; Cundill et al., 2021), has grown considerably since the 2000s (Piguet, 2021; Šedová et al., 2021) and owes its origins to work on environmental migration (Warner et al., 2010; Morrissey, 2012)—a corpus that arose in isolation from the broader migration literature (Hunter, 2005; Piguet, 2018). There have been several recent reviews of the evidence for climate impacts on migration (Borderon et al., 2019; Hoffmann et al., 2020; Šedová et al., 2021; Selby and Daoust, 2021), and much has been written on the legal and conceptual ambiguities of terminology around climate migrants and “refugees” (McAdam, 2012; de Sherbinin, 2020; Mayer, 2020),

the terminological difficulties associated with different types of mobility from voluntary to forced (Avis, 2017; Piguet, 2018), and the apolitical and ahistorical nature of the climate migration literature (Morrissey, 2012; Ribot et al., 2020). Yet, with the exception of a few authors who give the subject limited or case-specific treatment (Hunter, 2005; Hugo, 2011; Hochleithner and Exner, 2018; Piguet, 2018; Kaczan and Orgill-Meyer, 2020; Zickgraf, 2021), there has been insufficient focus on how researchers studying climate migration engage with theory. On the other hand, consensus is growing that there is a need to embed climate mobility research in migration theory (Doevenspeck, 2011; Freeman, 2017), that environmental factors have a place in migration theory, and that the climate mobility research community has much to contribute to theory-building (Hunter and Simon, 2022).

Theory<sup>1</sup> matters in empirical climate migration research because theories are formulated to elucidate causal linkages and to explain, predict, and understand phenomena. Theory is critical to the sciences, since it points to a specific locus of attention for research, shapes research questions, guides quantitative model development, and ultimately informs policies and programs. It is a vital part of “sense making” in the social sciences and, as with data and methods, continues to evolve as part of scientific advancement. However, empirical climate migration research is often critiqued because it insufficiently engages with theory, leading some to write-off the contributions as overly simplistic and environmentally deterministic (Morrissey, 2012). The “environmental refugees” framing prevalent in the literature of the 1990s and early 2000s is a case in point (Myers, 1993; Barrios et al., 2006). The use of theory within this framing minimized the role of the individual’s abilities to make decisions within a given context shaped by conditions of the time and place. Ultimately, migrant volition was minimized, demographic and contextual factors were often overlooked, and environmental and structural factors were presented as preeminent. The disconnect between climate (and environmental) migration research and evolving migration theory has limited the development of an important body of empirical scholarship.

Given the varied disciplinary backgrounds of climate migration researchers—from geography, economics, and demography to environmental and computer science—the opportunities to engage deeply with migration theory are often overlooked in favor of focusing on data and methods (Hoffmann et al., 2021). What results is that researchers employ complex analysis approaches within a fairly simplistic

push-pull model or ready-made conceptual frameworks from the environmental migration literature. These data- and methods-focused approaches miss opportunities to advance theory. Empirical case studies provide a unique opportunity to refine and refute theoretical perspectives to ensure that the way researchers and policy-makers fundamentally understand the migration experience continues to develop. The rapidly growing body of empirical literature exploring climate migration conducted by scholars from a wide range of disciplines provides a diversity of perspectives on this complex topic that can help to advance migration theory in important ways. However, by focusing on often complex models and data analytic approaches, scholars may miss these opportunities to contribute to theoretical advances.

The purpose of this article is three-fold: to explore how migration theory is invoked in empirical studies of climate-related migration; to provide suggestions for engagement with theory in the emerging field of climate mobility; and to explore how climate mobility researchers can contribute to migration theory building. In the sections that follow, we first provide a review of migration and other theories that are frequently cited in the climate migration literature (section Brief Review of Migration Theory). Then we examine a selection of recent empirical literature originating from different disciplinary perspectives that engages with theory in different ways (section How Theory Is Employed in the Empirical Literature). Using these 75 empirical climate migration studies conducted from 2010 to the present, we characterize the theoretical framings across the sample to better understand how this corpus of research draws upon theory to advance climate migration science, and then, in section The Way Forward, we use these findings as a springboard to suggest paths forward for advancing theoretical perspectives in meaningful ways in the new field of climate mobilities. The goal is to improve empirical work in the field while ensuring that this work, in turn, helps to advance wider migration theory. In section Conclusion, we provide some brief conclusions and reflect on connections between theory and policy.

## BRIEF REVIEW OF MIGRATION THEORY

According to King (2012, p. 28), “Explicitly or implicitly, the interplay between the agency of the individual actor and the structural context within which that actor maneuvers is at the heart of most studies of migration.” Bakewell (2010) and De Haas (2021) have both criticized the agency vs. structure dualism in the literature, arguing for more holistic approaches—on the one hand, critical realist approaches, and on the other, the aspirations and capabilities framework. While recognizing that it is not either/or but in many cases both/and, there is limited evidence in the climate mobilities literature that authors are aware of this debate. In this section, we list the theories used to code the sample of empirical studies, beginning with those theories that focus more on individual actors (functionalist theories), and proceeding to structural theories and theories of sustained migration, and end the section by

<sup>1</sup>Theory has been defined as an “ordered set of assertions about a generic behavior or structure assumed to hold throughout a significantly broad range of specific instances” (Sutherland, 1975, p. 9), and has four components: “conceptual definitions, domain limitations, relationship-building, and predictions” (Wacker, 1998, p. 361). The special case of migration theory addresses fundamental questions such as who migrates; why do they migrate; what types of mobility do they employ; under what circumstances do they employ them; why do they choose certain destinations over others; and what are the conditions that shape return migrations? (for similar questions see Massey et al., 1993; Bakewell, 2010). When social scientists employ theory, they do so to help provide a systematic explanation for observations (Babbie, 1989), and to organize disparate findings into a coherent picture in an effort to explain social phenomena and human behavior.

addressing more eclectic perspectives. We also briefly describe how environmental factors have been or could be incorporated into each theory<sup>2</sup>.

It is worth noting that we do not draw strong distinctions between terms such as theory, theoretical frameworks, or conceptual frameworks. It has been suggested that some “theories” are actually little more than empirical generalizations or stylized facts (e.g., push-pull or migration hump). A further discussion of these distinctions can be found in Carling et al. (2020). In our view, frameworks are a graphical representation of theory, illustrating causal linkages through diagrams<sup>3</sup>. Thus, we intentionally are inclusive, using *theory* as an umbrella term for the purposes of this study.

## Neoclassical Migration Theory

This theory focuses mainly on differences in wages and employment conditions between countries/regions and the costs of migration. According to neoclassical migration theory, as wage differentials decline, migration should slow down or stop (Lewis, 1954; Massey et al., 1993)<sup>4</sup>. Migration is an individual decision to maximize profits through a process of weighing costs and benefits. Environmental factors can be said to affect wages indirectly, through impacts on rural livelihoods or urban wage rates (see recent work by Mueller et al., 2020), where wages may be construed as income from livelihoods that are sensitive to climate variability and change. Generally neoclassical migration theory focuses on wages, but when expanded it can incorporate any form of utility-maximization. For example, environmental amenities might figure into personal preferences that drive migratory responses (Gosnell and Abrams, 2011).

## Push-Pull Theory

Push-pull is often grouped with neoclassical migration theory, and according to some scholars represents more of an overarching framework or a descriptive *post-hoc* model (Hochleithner and Exner, 2018). Push-pull theory frames migration in terms of negative (push) factors in the place of origin that drive people to move away (such as low wages, poverty, lack of opportunities, weather), combined with a number of positive (pull) factors that attract migrants to a new destination (such as higher wages, social services, family

members, shared cultural values). This theory distinguishes between push and pull factors, and intervening obstacles that can impede migration (such as costs to move and legal barriers; Lee, 1966). Network forces, like the existence of kin or social connections, assist in the move, broadly serving as pull factors. A corollary is that not all people move, and thus the concept of mooring suggests that non-migrants are able to maximize their physical, psychological, and emotional well-being by staying in place (Moon, 1995), an idea that Adams and Kay (2019) relate to a psychological propensity to migrate related to place attachment and other factors. Van Hear et al. (2018) propose a “push-pull plus” model, which distinguishes among predisposing, proximate, precipitating, and mediating drivers that vary in importance depending on the context.

Push-pull theory is very amenable to the case of environmentally induced migration, and indeed underlies some recent population gravity modeling efforts (e.g., McKee et al., 2015; Rigaud et al., 2018) and also informs the Foresight framework described below (Black et al., 2011). Environmental conditions can affect both push or pull factors—e.g., drought in sending areas could push migrants, while more favorable environmental conditions could act as a pull factor, as Van der Geest (2011) found in Ghana. Van Hear et al. (2009) argue that several factors may be operational in any migration flow, and the challenge is to identify which combinations are most important, and which are policy-mutable. It is the search for the relative influence of climate factors that preoccupies much empirical research reviewed here—a pursuit that some see as increasingly irrelevant (Cundill et al., 2021).

## New Economics of Labor Migration (NELM)

NELM situates migration decision making in households. Individuals move to support the larger family/economic unit, either voluntarily or at the behest of the household head or community members (Stark and Bloom, 1985). People act collectively not only to maximize expected income, but also maximize status within an embedded hierarchy, to overcome barriers to capital and credit, and to minimize risk and diversify the incomes (Massey, 2001). NELM both accounts for wage differentials and failures in insurance, credit and savings markets that mean households have to self-insure. NELM is consistent with various forms of environmental migration. For example, seasonal migration in the Sahel, which is fundamentally shaped by environmental characteristics and constraints, can be said to conform to NELM since it is often a household decision, it serves to diversify income streams, and it reduces pressure on household food stocks (van der Land et al., 2018). NELM also fits well within the risk framing of the Intergovernmental Panel on Climate Change, insofar as it conceives of migration as a risk reduction strategy and a means of adaptation (McLeman et al., 2021).

## Mobility Transition Theory/Migration Hump

Originally developed by Zelinsky (1971), the original transition theory followed the literature on modernization (Rostow, 1959) and demographic transition (Caldwell, 1976), in which migration is limited in pre-modern societies, then picks up in an early transitional society with mass rural-urban migration.

<sup>2</sup>A recent review by Hunter and Simon (2022) provides more examples of how environmental factors can and have been incorporated in five theoretical framings: neoclassical migration theory, migration systems, the push-pull model, new economics of labor migration, and political economic approaches.

<sup>3</sup>For example, the Foresight report (Foresight, 2011) authors explicitly cite push-pull theory in their development of the widely cited diagram describing the ways in which environmental factors influence migration decision making. The Foresight framework explains linkages and pathways, but does not have explanatory power. In other words, it explicates how environmental factors largely work through other proximate factors (economic, demographic, etc.), but it cannot be used to predict how an environmental stressor will result in migration. Thus, according to our earlier definition it may fall short of being a “full” theory. Indeed, De Haas (2011) criticizes push-pull theory itself for being inadequate from an explanatory point of view.

<sup>4</sup>Because this has rarely been found to be the case, De Haas (2021) argues that theories focusing on the utility maximizing behavior of individual migrants or migrant-sending households fail to explain many of the patterns of migration that exist in the world.

Furthermore, the theory holds that socioeconomic development creates economic imbalances between regions, which is corrected for through migration (Fussell, 2012). Hochleithner and Exner (2018) suggest that the mobility transition is one of the most empirically confirmed theories of migration, and De Haas (2011) states that it best explains migration patterns within the Mediterranean basin. *Migration Hump*, a related but different theory, hypothesizes that there is an international migration “hump” as incomes rise with the development process, and that in time as a country becomes more prosperous, the level of international migration drops (Martin-Shields et al., 2017)<sup>5</sup>. It helps explain an apparent paradox, which is that migration levels actually increase as income levels increase in low-income settings. From a climate migration perspective, it could be argued that some measures that promote *in situ* adaptation may actually result in an increase in migration levels as local incomes rise (Stojanov et al., 2021).

## Historical-Structural Theories

This category broadly includes macroscale theories such as World Systems, Dependency Theory, Structuration Theory, Dual Labor Market, and the New International Division of Labor. These theories put the emphasis less on individual decision making, and more on structural economic factors that explain migration, particularly from lower income countries to higher income countries, but also from rural to urban areas. We describe a few examples. *World Systems* theory, defined by Wallerstein (1976), is based on an unbalanced world economic order, which is divided into core-states and peripheral areas. Often the peripheral areas have a low degree of autonomy—and/or face a neo-colonial situation. The theory suggests that migration flows are motivated by the unequal distribution of wealth between the rich core and the poor periphery. In this view, international migration is influenced by historically formed macro-structural forces, and is inherently exploitative and self-perpetuating as it leads to underdevelopment in migrant source areas (King, 2012). This has similarities to the *Dual Labor Market* theory (Massey et al., 1993), which posits that international migration stems from the labor demands of modern industrial societies. *Structuration* theory represents a hybrid between structural approaches and those recognizing personal agency. The idea is that society shapes individuals and, in turn, individuals shape society in the ongoing process of change. As applied to migration, it suggests that higher-level structural factors set limits on migration possibilities, but that at local levels people interact with their situations and may choose to migrate, which shapes both the local situations and, over time,

higher-level structures (Giddens, 1984; Morawska, 2007; King, 2012)<sup>6</sup>.

Many of these theories focus on global inequalities, which parallels discussion in the climate justice literature. In regard to migration, the climate migration literature posits that the wealthy nations that contribute most to greenhouse gas emissions are now conveniently promoting “migration as adaptation,” essentially leaving it to poor people to circumstances they did not create, while simultaneously closing borders (Bettini and Gioli, 2015; Gonzalez, 2020). Political economy perspectives may be considered a subset of historical-structural theories. For example, in studies in West Africa, Carr (2005) and Ribot et al. (2020) found that power imbalances and structural factors deprive populations of access to resources and opportunities to prosper in place, thus contributing to migration.

## Environmental Migration Frameworks

These are conceptual diagrams that draw on the aforementioned theories to identify causal pathways through which environmental change may induce migration flows. The most prominent is the Foresight framework (Foresight, 2011), which incorporates a number of the elements of other theories, including neoclassical theory, migrant selectivity, world systems, and push-pull. Important in the Foresight framing is that climate change is, at most, an indirect driver of migration which operates on the direct drivers—namely the pre-existing economic, demographic, social, political, and environmental conditions. Importantly, the Foresight report was one of the first to explicitly recognize “migration as adaptation” (Tacoli, 2009), framing it as an important policy response to the observed and projected impacts of climate and environmental drivers on migration.

## Forced Migration Theory

While there is no theory of forced migration or displacement (Piguet, 2018), there are empirical generalities (Castles, 2003), and there are growing theoretical explorations of both forced migration and immobility. Human mobility occurs on a continuum from voluntary migration to forced displacement (Hunter, 2005), where displacement tends to emphasize “push” more than “pull” factors. In a risk framework, displacement is a function of the likelihood, severity and nature of the hazard, the exposure of people, and pre-existing vulnerabilities [(Internal Displacement Monitoring Center (IDMC), 2015)]. In circumstances of displacement, both staying and leaving carry high risks to personal safety, and thus decisions are made in the context of high risk and high uncertainty (World Bank, 2017). What is clear is that those who are displaced often face needs that are far more acute than other migrants—including landlessness, joblessness, homelessness, marginalization, food insecurity, and increased morbidity and mortality. Thus, the movement occurs over shorter time scales as the intensity of the “push” factors

<sup>5</sup>This is a simplification, of course. As Martin-Shields et al. (2017) point out, the Migration Hump “cannot be explained solely by rising incomes and increased education. It is also driven by other factors, including demographic transition, changes in economic structures, emulation effects in migration processes, rising inequality, credit restrictions and the lowering of migration barriers.” In addition, lack of good governance and limited prospects for a better life were often cited in UNDP’s (2019) *Scaling Fences* report as motivations for migration among African migrants interviewed in Europe.

<sup>6</sup>According to Morawska (2007, p. 12), “Structures [are] patterns of social (including economic and political) relations and cultural formations (re)constituted through everyday practice of social actors... [They] are plural in character (different-purpose organizations, strong and weak informal networks, [sub]cultures), scope (global, regional/national, local), dynamics (more or less stable), and durability (longer- to short-duration).”



are generally higher than in other migration circumstances. As Erdal and Oeppen (2018, p. 985) point out, “[A] starting point for understanding volition in migration is the range and quality of alternatives available to potential migrants if they just stay where they are. In other words, to what extent will they be able to enjoy a reasonable quality of life without migrating? We might consider the migration less voluntary when the answer is ‘not at all’ rather than ‘to some extent.’ The perception of suitable options and necessity of alternatives—and the notion of a ‘reasonable quality of life’—are subjective.” We return to theories of forced migration in our discussion of the way forward (section The Way Forward).

## Theories Addressing Sustained Migration

This category broadly includes theories such as Network Theory, Institutional Theory, Cumulative Causation, and Migration Systems. These theories do not seek to address how a particular migration flow began, but rather how they grow and are sustained over time. Under *Network* theory, networks tie migrants, former-migrants and non-migrants in source and destination areas in webs of kinship, friendship and shared origin (Massey et al., 1993; King, 2012). They increase the chance of international migration because they lower the costs of migration and provide valuable information to potential migrants, which lowers uncertainty levels. Networks contribute to transnationalism, whereby migrants retain strong connections to source areas (Portes, 1999). Under *Institutional* theory, “Once international migration has begun, private institutions and voluntary organizations arise to satisfy the demand created by an imbalance between the large number of people who seek entry into capital-rich countries and the limited number of immigrant visas these countries typically offer” (Massey et al., 1993, p. 450). This includes migrant smuggling networks. *Cumulative Causation* theory posits that each act of migration changes the local social context in which potential migrants make decisions to migrate, for example through the distribution of income, the distribution of land, the organization of agriculture, and culture, among other things, resulting in a culture of migration (Massey et al., 1993). This could lead to social tipping points, where the social and economic viability of migration source areas is undercut (Horton et al., 2021). *Migration Systems* is more of a generalization than a theory. It suggests that international migration flows become stable and continue over space and time, with dyads of sending and receiving countries characterized by relatively intense exchanges of goods, capital, and people (Mabogunje, 1970; Massey et al., 1993). Feedback loops develop that draw new migrants into the flow; for example, diaspora communities develop that share information and resources, facilitating new migration (Fussell, 2012). *World Systems* is sometimes included in this category of theories, since long standing flows are often the result of colonial ties.

According to King (2012, p. 20),

“The attraction of a system approach is that it enables the conceptualization of migration to move beyond a linear, unidirectional, push-pull movement to an emphasis on migration as circular, multi-causal and interdependent, with the effects of change in one part of the system being traceable through

the rest of the system (Faist, 1997, p. 193). Hence systems can be self-feeding (like chain migration), self-regulating (correcting themselves in response to a ‘shock’ to the system) or self-modifying (e.g., shifting to a different destination when one is blocked off).”

From a climate migration perspective, one aspect of this strand of research is that it shifts the lens from climate impacts on migration decision making in sending areas to climate impacts in both sending and receiving areas, or from hotspots to “hot systems” (McDevitt, 2009). Doeveenspeck (2011, p. e64) adopted cumulative causation as a theoretical framing in a study of rural-to-rural environmental migration in Benin, since it accounted for why migration continues without major differences in wages owing to strong translocal connections between migrants and sending communities.

## Aspirations and Capabilities

Sitting somewhere between functionalist and structuralist theories, a more recent theory sees migration decision making as the result of migrant’s aspirations and capabilities (Carling, 2002; De Haas, 2010, 2021). While the primary focus is on personal agency, with migration propensity being a function of aspirations (i.e., life goals, desires, and perceptions related to the costs and benefits of the decision to migrate), structural factors enter in through the migrant’s capabilities (i.e., education, skills, financial resources, legal constraints, disability), which enable or limit an individual to act on their aspirations. The theory purports to better explain why some people migrate but others do not (Carling and Schewel, 2018). In developing this theory, De Haas (2010) seeks to avoid the ecological fallacy that confounds macro-level migration determinants (e.g., population growth, demographic transitions, development levels, environmental degradation, and climate change) with individual migration motives<sup>7</sup>. While there may be a correlation between these factors and migration levels and transitions, people do not migrate because of them, but rather because they aspire to a better life and they have the capability to act on those aspirations.

Environmental amenities and risks may be among the factors that affect aspirations and capabilities—but in this framing they cannot be said to “drive” migration. While they do not directly invoke aspirations and capabilities theory, in their study of climate related mobility owing to seaward impacts in the Ganges Delta, Adams and Kay (2019) speak of the “psychological propensity to move” and “mobility potential,” meaning that some are more predisposed to move, either because of aspirations or disaffection with place. We return to this theory in discussions on the way forward (section The Way Forward).

## Livelihood Framework

The Livelihood Framework is closely tied to Sen’s capabilities theory (Sen, 1984), which relates to what people can do or be with their entitlements, including rights to land and natural resources. While not commonly employed as a migration theory, the livelihood framework developed by the UK Department for

<sup>7</sup>An ecological fallacy is when inferences about individual-level decision making are deduced from inferences about the group to which the individual belongs.

International Development (Carney, 1998) has been applied to migration studies, including environmentally induced migration (de Sherbinin et al., 2008; Tacoli, 2011; Hunter et al., 2015). Theorizing in this area links migration to livelihood strategies and the five livelihood assets—social, human, natural, physical, and financial capital. The livelihood approach is often associated with NELM, since a common assumption is that the capitals are household-based, but can also inform the capabilities part of the aspirations and capabilities theory. Environmental factors play a role primarily *via* natural capital, but can influence all types of capital.

## Other Theories

This category includes theories that are not as prominent as the others, but which we included for completeness. For example, demographers have developed *Life Course Analysis* to focus on how migration is more prevalent at certain life stages (McCollum et al., 2020). According to Wingens et al. (2011, p. 1), “[T]he life course approach constitutes a promising conceptual starting point for overcoming the crucial micro-macro problem in social research by analyzing the dynamic interrelation of structure and agency.” Life course can be applied to climate mobility studies by looking at the propensity by age group and marital and family status of people to move given different climate-related stressors or disasters (Entwisle et al., 2020). Other theories include *Imaginaries* (Salazar, 2011), which focuses on people’s perceptions, cultural norms, and expectations (Hochleithner and Exner, 2018). Finally, some agent-based modelers (e.g., Kniveton et al., 2011) have adopted the *Theory of Planned Behavior* (Ajzen, 1991), which holds that intentions to migrate can be predicted with high accuracy from attitudes toward migration, subjective norms surrounding migration that are socially constructed, and perceived behavioral control. We address the kinds of “other theories” employed in our sample of studies in the next section.

## HOW THEORY IS EMPLOYED IN THE EMPIRICAL LITERATURE

The focus of this paper is on the migration theories employed in qualitative and quantitative studies of climate-induced migration, including modeling work that projects future migration. We take 2010 as a starting point for our literature review since, by that time, the field of climate migration research had sufficiently matured, and after that date there began to be a rapid growth in published empirical studies on the subject (Piguet, 2021; Šedová et al., 2021). We reviewed English-language peer reviewed journal articles (73) and book chapters (2) that fell into one or more of the following categories of empirical research:

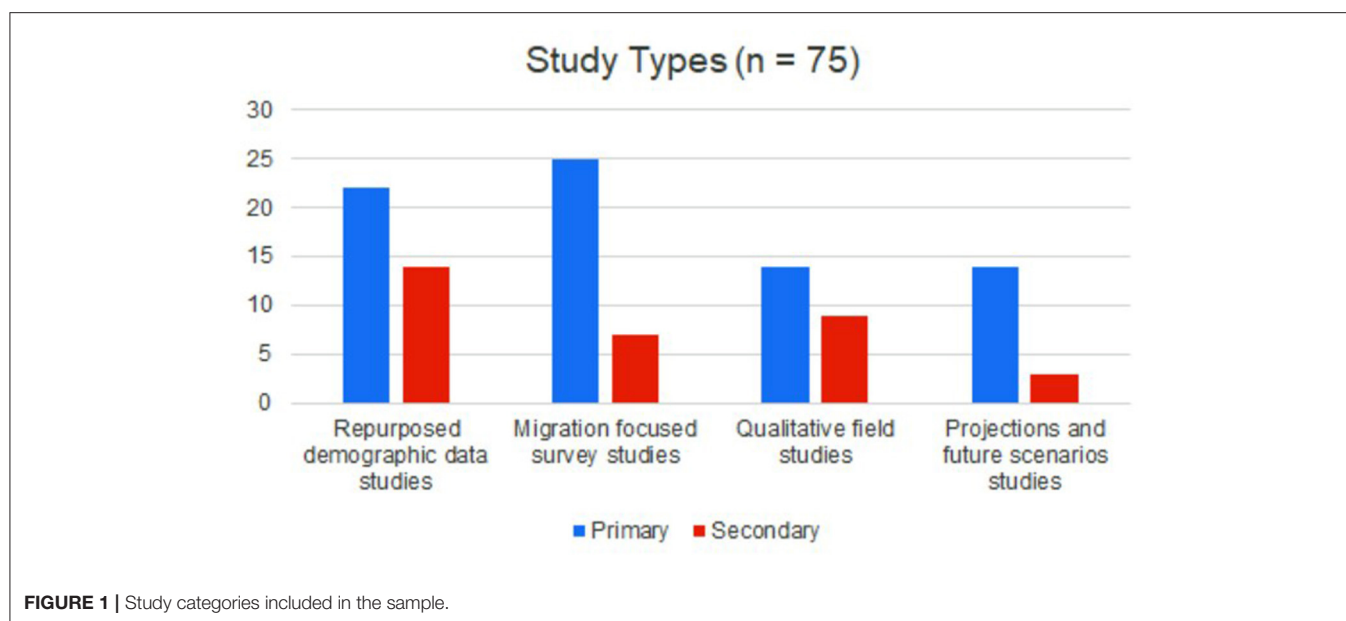
1. **Repurposed demographic and other data:** These studies employ direct or indirect measures of migration from censuses or large-scale demographic surveys collected for other purposes, coupled with broad scale environmental/climate data, either for one time slice or across several time slices. Studies applying “big data” such as cell phone call detail records were included in this category. These studies range in scale from global to local. This category mostly maps to

Piguet’s (2021) Type 1 “spatial analysis,” but also includes some studies that may fall in Type 2 “multilevel analysis.”

2. **Migration focused survey methods:** These studies employ tailored surveys of individuals or households that focus on migration (e.g., past migration history, event history), and either connected to area data on climate, or on individual perceptions of climate variability. These generally focus on more local scales. This category mostly maps to Piguet’s Type 3 “survey,” but also to the Type 2 “multilevel analysis.”
3. **Qualitative field studies:** These mostly local-scale studies employ anthropological techniques, focus group discussions, open interviews, life history, and participant observations related migration behavior, often coupled with data on perceptions of climate variability and change. This category maps to Piguet’s Type 6 “qualitative.”
4. **Modeling, projections and future scenarios studies:** These studies deploy a range of approaches, including agent-based modeling (ABMs), system dynamics, statistical extrapolation (using type 1 data), population gravity modeling, and radiation modeling. These range in scales from global to local. This category is not included in Piguet’s typology, though he does mention ABMs in his section addressing Types 2 and 3.

We used a purposive sampling approach that sought to capture a critical mass of studies under each category as well as a diverse representation across the multiple dimensions of our sample—i.e., category of study, discipline of authors, regions covered, temporal distribution, among others. Hence, our literature search did not rely on the common approach to systematic reviews (e.g., a standardized approach using Boolean search terms), but rather took an iterative approach, assessing our coverage after reviewing 50 articles, and adjusting the sample to cover a sufficient number in each category, with additional studies being identified using keyword searches on the CLIMIG database (University of Neufchatel). The goal was “theoretical saturation”—a point at which additional studies would not contribute substantially to our findings (Saunders et al., 2018; Hennink and Kaiser, 2022)—since the review is aimed less at painting a comprehensive picture across all climate-migration literature than acting as a springboard for discussion of how to better embed migration theory in climate mobility research. **Supplementary Table 3** presents a full list of papers reviewed.

As a guide for representativity, we compared our sample to Piguet’s (2021) typology, from which we derived our own. Piguet found that out of the 635 empirical studies in the University of Neufchatel’s CLIMIG database, 37% were multilevel or survey studies (mostly our Category 2), 30% were qualitative (our Category 3), 15% were spatial analysis (mostly our Category 1), and the remaining 19% were historical analogs and hotspots, which we did not include. Recognizing that not all studies fit neatly into one category, we allowed for primary and secondary category coding. Studies were coded in such a way that both the category of study and the theory applied could have primary and secondary responses, because the same paper may apply different approaches and more than one theory. Combining both primary and secondary types, in our sample of 75 studies representing 108 primary and secondary categories, 33% were



repurposed data, 30% were migration focused surveys, 21% were qualitative field surveys, and 16% were projections and future scenarios (**Figure 1**). These percentages roughly correspond to those indicated by Piguet when accounting for differences in the categorization. Data on theories employed are presented in the next section. In terms of temporal distribution, 23, 37, and 40% of studies were published between 2010–2013, 2014–2017, and 2018–2021, respectively, generally reflecting the growth in the literature over the 12 year period. While we sought to capture a range of empirical study types, publication dates, regions, and disciplines, we acknowledge that the sample we used is neither fully representative of all climate mobility empirical literature, nor are our methods replicable.

In terms of regional representation, of our sample of 75 studies, 24 included Asia, 24 included Africa, 12 included Latin America, 4 included Oceania, 4 included North America, 9 were global in scope, and 1 included Europe. Again, some studies included more than one region. Finally, in terms of post-processing, we recoded disciplines into seven categories, preserving the most represented disciplines (e.g., geography, economics, sociology/demography, political science), but grouping others into three categories: computer science and modeling, natural and physical sciences, and other social sciences.

The range of empirical studies include studies focusing on rapid onset displacement, migration induced by slow or creeping onset events such as sea level rise and multi-year droughts, and studies focusing on a combination of climate and other environmental stressors. For each study we coded the climate factors examined, with some studies including multiple factors. Out of the 75 studies, 46 examined climate variability (mostly precipitation variability); 17 examined extremes such as cyclones, floods or extreme heat; 11 were coastal studies focused on sea level rise and associated impacts; and 7, 6, and

3 included consideration of longer term trends in temperature or precipitation, broader environmental changes, and glacial retreat, respectively.

Out of our sample of 75 studies, the highest portion of primary references were to New Economics of Labor Migration (NELM) (21%), other theories (19%), neoclassical (17%), and environmental migration frameworks (13%), with fewer than 10% each across the others. **Table 1** shows the total and percentage of studies that referenced different theories (or no theory). When considering both primary and secondary theory references, NELM and other theories are most cited, at 24% of cases each, followed by environmental migration frameworks and neoclassical, at 21% each, and livelihoods and push-pull at just around 16% each. The predominance of NELM as a primary theory is likely attributable to its relevance to household risk management in the context of climate shocks.

“Other” (non-migration) theories were widely cited. Breaking down this category, we find that theories cited include behavioral theory (four studies), which underlies the model of private proactive adaptation and protection motivation theory (PMT; Grothmann and Patt, 2005), life course theory (Elder et al., 2003), social network theory, “mobilities theory” (Sheller and Urry, 2006), theory of planned behavior (Ajzen, 1991), socio-ecological systems theory (Hummel et al., 2011), grounded theory<sup>8</sup> (Charmaz, 2014), cultural ecology, political economy, and Reuveny’s theory of three adaptations to environmental

<sup>8</sup>This approach may be considered to fall in the “no theory” category by some, since it represents a way of conducting research that builds new theory based on the evidence collected in the field. The principle is to do research on a certain topic without the goal of testing any specific theory, but rather with the goal of building theory, or at least making generalizations, based on the observations and data. Grounded theory involves the application of inductive reasoning. It was applied by McLeman and Ploeger (2012) in their study of soil quality and its role as a mediating variable in drought migration from Saskatchewan in the 1930s.

**TABLE 1** | Theories cited in the sample.

Theory	Primary theory	Secondary theory	Total	Primary theory %	Secondary theory %	Percent total
NELM	16	2	18	21.3	5.1	24.0
Other theories	14	4	18	18.7	10.3	24.0
Env'tal mig frameworks	10	6	16	13.3	15.4	21.3
Neoclassical	13	3	16	17.3	7.7	21.3
Livelihoods framework	6	7	13	8.0	17.9	17.3
Push-pull	6	6	12	8.0	15.4	16.0
No theory	6	0	6	8.0	0.0	8.0
Aspirations and capab.	1	4	5	1.3	10.3	6.7
Historical-structural	0	4	4	0.0	10.3	5.3
Theories sustained mig.	2	2	4	2.7	5.1	5.3
Forced migration	0	1	1	0.0	2.6	1.3
Mobility transition	1	0	1	1.3	0.0	1.3
Grand total	75	39	114			

stress (Reuveny, 2007). The adoption of behavioral theory, which differentiates between risk appraisal and subjective adaptation appraisal (evaluation of the ability to avoid being harmed), to migration research is a relatively recent development, only appearing in studies published after 2016.

Six studies cited no theory (8%) and 22 studies (29%) only made an implicit reference to the theory that guided their work—meaning that fully one-third of our sample engaged with theory to only a limited degree. In the latter case, the theoretical references emerge from the introductory material, data analysis, or findings, but there is no explicit discussion of theory or citations of theoretical works. For these studies, authors frequently stated that the main purpose of the research was to contribute to the empirical evidence for understanding climate's impact on migration. Thus, the data, in a sense, “speak for themselves,” which means that the authors generally have not thought about the framing of their work in a larger body of evidence or contributing to the advancement of theory.

A primary interest is how researchers from different disciplines apply theory to their studies, so we begin by examining the theories invoked by the discipline of lead authors. In terms of disciplines, 32% of our sample were papers led by geographers, followed by economists (27%), sociologists and demographers (15%), computer scientists and modelers (8%), natural and physical scientists (7%), other social scientists (7%), and political scientists (5%). Interdisciplinarity is important in climate migration research, and two-thirds of our sample had more than one author. Among secondary authors, the mix of disciplines was 27% geography, 26% economics, 22% all other social sciences, 14% Earth and natural sciences (including 7% climate science), 5.5% computer science and modeling, and 2.7% each public health and ecology.

**Figure 2** shows the proportion of primary theories cited by the discipline of lead authors across the top four disciplines. Geographers tend to draw heavily on other theories, environmental migration frameworks such as the Foresight framework, NELM, and livelihood frameworks. Not surprisingly, over half of economists cite neoclassical migration theory

followed by NELM, livelihood frameworks and other theories. A third of studies by sociologists and demographers cite NELM, followed by an equal split among other major theories. A higher proportion of sociologists cite theories of sustained migration than among other disciplines, and they are the only group that cites mobility transition theory. Among the remaining groups of disciplines (natural and physical scientists, political scientists, and other social scientists), NELM, other theories, and environmental migration frameworks are popular. Push-pull theory is the predominant theory cited by computer scientists and modelers. Livelihood frameworks are widely cited across all disciplines, yet NELM is the most widely applied primary theory, accounting for 16 of 75 studies. Roughly a quarter each of those studies citing NELM are by geographers and sociologists/demographers, followed by 19% by economists.

Disciplines have specific patterns of engagement with theory. Sociologists and demographers often engage in theory related to life stages and other demographic processes (e.g., Entwistle et al., 2020), whereas geographers are more likely to adopt livelihood or political economy approaches. We address this more in the next section.

In terms of the theories cited by category of research (**Supplementary Table 2**), the largest category in our sample is migration-focused surveys (Category 2), with 25 studies, 40% of which invoke NELM, with a smattering of other types. Twenty-seven percent of repurposed demographic data studies (Category 1) invoke neoclassical theory, followed by NELM (18%), perhaps reflecting the large proportion of economists who tend to analyze secondary data from censuses and surveys. Qualitative field studies (Category 3) cite in equal proportions environmental migration frameworks and other theories (22% each), while projections and future scenarios studies (Category 4) predominantly cite neoclassical theory (22%), followed by push-pull and other theory, at 14% each. These theoretical framings may be easier to code in quantitative models.

Finally, we explored the possibility that there might be temporal or regional patterns to the theories cited. Temporal trends were not noticeable in the relatively short period covered,



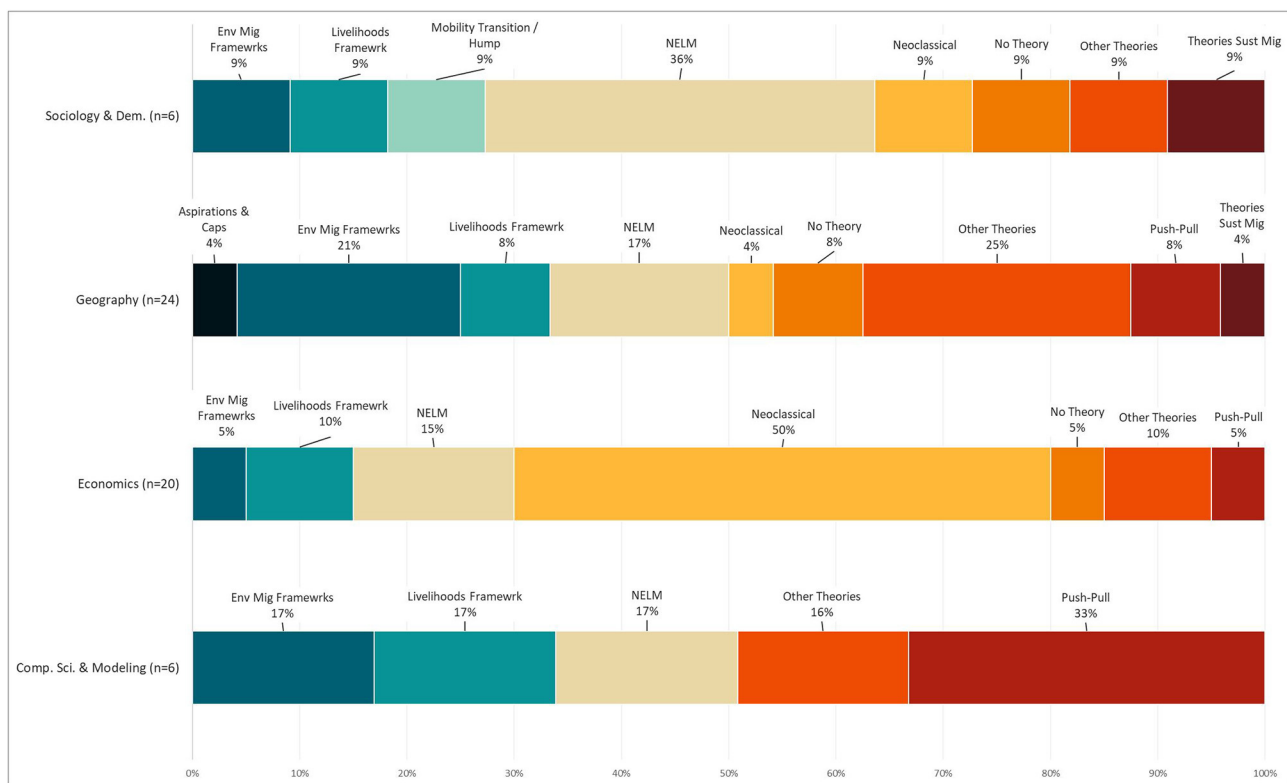


FIGURE 2 | Theories cited by discipline of lead authors.

except some more recent theories like aspirations and capabilities were not cited earlier in the period. In terms of regional breakdown, NELM, livelihood and environmental migration frameworks—many of which emphasize the effects of climate change on small-holder farmers and pastoralists—make up half the theories cited for African studies, and 44% of those in Asia. Similarly, NELM and environmental migration frameworks make up almost 50% of studies in Latin America.

## THE WAY FORWARD

Empirical research is a key component of theory building, because it allows for theories to be examined, refuted, and refined based on real-life experiences. As part of this process of theory development, it is especially important to assess whether a theory can be considered “good” relative to alternative theories (Popper, 1963)<sup>9</sup>. In this section, we examine some exemplary contributions from the corpus of climate migration research and various disciplines to migration (and mobilities) theory, discuss how theories address forced migration and involuntary immobility, and propose some paths forward.

<sup>9</sup>While there is no consensus on what a “good” theory is, most agree that a “good” theory should possess certain virtues including “uniqueness, parsimony, conservation, generalizability, fecundity, internal consistency, empirical riskiness, and abstraction” (Wacker, 1998, p. 361).

As the review here shows, a critical issue for how theory is employed is that it focuses attention on certain things and, unless one is careful, not others. In other words, researchers approach their data expecting to see certain dynamics or relationships, which increases the likelihood of finding them. If the research question is something like, “what is the role of environment in migration,” there is a good chance that researchers simply will not recognize other processes beyond environmental conditions like cumulative causation, structural factors, or political economic factors that condition migration decision-making. Environmental migration and push-pull framings tend to privilege environmental factors (De Haas, 2011), even when those frameworks recognize that environmental factors work through other more proximate determinants such as socioeconomic drivers. As Hunter (2005) notes, while contextual factors are often noted in theoretical perspectives on environmental migration, they are rarely emphasized.

As such, the climate migration literature often gives insufficient attention to the underlying culture and political economy of migrant sending areas (Morrissey, 2012). Local laws and policies, markets rigged against smallholders, and political disenfranchisement all condition vulnerability, and climate factors may only be the final “nudge” that pushes people to leave their communities (e.g., Ribot et al., 2020). This may be why our analysis shows that “other theories” are the most invoked by researchers undertaking field studies,

because many of these theories seek to understand complex socio-environmental systems and to explore behavioral aspects of mobility. Yet for studies relying on secondary data (Category 1 and sometimes Category 2), an understanding of local contexts is often missing, and they depend heavily on neoclassical and NELM theories. Decolonizing climate-migration research is only beginning to be addressed by some authors (Gonzalez, 2020), but has yet to be addressed widely, especially in the migration as adaptation literature, where the benefits of migration for adaptation are often uncritically accepted (Bettini and Gioli, 2015) with little recognition that those doing the adapting have been forced to do so owing to the historical emissions of affluent nations (Samson et al., 2011).

Another issue is that it is conceivable that many people do not identify a theoretical framing, but in the review process they may be asked to consider how their findings relate to theory, which leads them to apply a theory *ex post facto*. Unless explicit attention is given to linking theory to research designs, or there is a robust discussion of how the work contributes to theory, it is often hard to discern the importance of theory to a given work. In light of that, we explore a few exemplary studies that stand out in terms of their treatment of theory.

## Exemplary Studies

Based on more than two decades of research in Nang Rong district, Thailand, Entwisle et al. (2020) use an agent-based model to test theories related to life course transitions, evolving household economic strategies, and changes in social networks at and between places of origin and destination. They posit that this broader demographic/life course perspective is missing from much of the economic literature, with its focus on labor migration. They write, “By incorporating a life course perspective, including a focus on outmigration and return migration associated with the transition to adulthood, and embedding these in a systems approach, we identify a type of climate change impact that heretofore has not been considered: disruptions to established and expected streams of return migration” (p. 1,471). Their results underscore the importance of social networks for both out-migration and return migration.

Lalou and Delaunay (2017), in their exploration of migration in rural Senegal, reject the neo-Malthusian framing of environmental migration as a mechanical and “naturalizing” explanation for migration, which characterizes migration as a forced displacement, and turn instead to NELM, the structuralist approach, social network theory and transnationalism theory, “which all suggest in their own way that environmental migration is not only a response to a strong stimulus from the natural environment but is also migration *per se* with complex causality and a decision process” (p. 270). They argue, as does Doeveenspeck (2011), that it therefore should not be analyzed as totally different in comparison with other forms of migration. They also draw on translocalism, stating though many studies focus on sending areas, the reality is that “migrants maintain links with their home village and participate actively in food security and sometimes in the development of their community’s agricultural or non-farming activities” (p. 270). They see seasonal

and temporary migration being a part of the adaptive strategy of households to risk, rather than as a failure to adapt.

Grace et al. (2018) use a livelihood diversification framework to investigate the relationship between rainfall variability and out-migration in two agriculture-dependent Malian villages where temporary out-migration is well-established. Their study design is based on livelihood and NELM theory, hypothesizing that in poor rainfall years their study communities would experience “either an increase in out-migration or changes in migration behaviors, as migrants and their families seek opportunities to diversify their income sources and reduce risk” (p. 188). The fact that the evidence pointed to reductions in local temporary migration during years following poor rainfall led them to reconsider their hypotheses, positing that the same climate impacts may be experienced by other communities within the region, meaning fewer opportunities outside the village, or that liquidity constraints resulting from climate impacts reduce migration. The authors analyze their data by age and sex, giving an important demographic perspective to their work, and include a researcher from the country of focus on their team.

Barbieri et al. (2010) engage in an extensive review of theory in their study of climate factors influencing migration in Brazil’s Northeast. They write, “disciplinary perspectives have constrained the development of more comprehensive conceptual and modeling approaches unveiling how environmental drivers of migration—particularly climate change—are embedded in other socioeconomic, cultural, political and institutional dimensions” (p. 347). They propose a model in their article that seeks to better marry economic theory with environmental drivers, by embedding climate impacts into the IMAGE-M-B economic model, exploring links between climate change and economic dynamics (particularly income and employment levels), and how they affect population migration.

## Disciplinary Approaches to Theory

Our relatively small sample of studies suggests that sociologists are the most likely to thoroughly embed their studies in theory. One of the first and most detailed explorations of theory in relation to environmental displacement and migration was by sociologist Lori Hunter in her 2005 paper “Migration and environmental hazards” (Hunter, 2005). A decade later, Hunter et al. (2015, p. 379) argued that “theory must effectively integrate the interactions between environmental factors and other migration determinants operating differentially across scales and across time,” including socioeconomic and sociopolitical conditions as well as household compositional characteristics. By the same token, they argue that “in the midst of contemporary climate change, environmental considerations should play a more central role in migration theory, particularly in relation to livelihoods and environmental conditions (both amenities and disamenities) in both urban and rural settings” (p. 387). Building on this, Hunter and Simon (2022) argue that it is important to account for environmental effects in models that explain migration, which otherwise risk misspecification of these effects to socioeconomic determinants. Sociologist/demographer Elizabeth Fussell, who has studied the climate displacement

resulting from Hurricane Katrina in New Orleans, has also contributed significantly to theoretical discussions, pointing out how theory is linked to methods (e.g., how environmental factors are often included by economists in multivariate regression models used in studies of labor migration) and findings (Fussell, 2012).

Geographers have also been at the forefront of theoretical discussions. Graeme Hugo, a population geographer, was a pioneer in the field, and among the first to theorize that environmental migration falls at the “forced end” of a voluntary-to-forced continuum (Hugo, 1996). In a later paper in *Global Environmental Change*, Hugo (2011) includes one of the longest treatments of theory of recent reviews of climate-migration patterns and trends<sup>10</sup>. Hugo led a panel of the International Union for the Scientific Study of Population (IUSSP) on the demography of refugee and forced migration in which he and co-authors explore the importance of migration theories—both functional and structural—to informing the study of climate and other forms of forced migration (Hugo et al., 2018). Political geographers Stephan Hochleithner and Andreas Exner conduct an extensive review of theory for a paper focusing on environmental migration in West Africa in the context of a project led by the Swedish International Centre for Local Democracy (Hochleithner and Exner, 2018). Their consideration of how theory relates to processes in this region is one of the most complete explorations to date in the environmental migration literature.

Geographers fundamentally engage with mobility, often by reflecting on how people interact with place and each other as a natural aspect of human existence. In other words, everything they do consider how people exist within a specific place and how mobility and movement shape and are shaped by an individual's life (e.g., Gidwani and Sivaramakrishnan, 2003; Carr, 2005). This approach provides a much more advanced and nuanced conceptualization of mobility across space and time than those frequently adopted by economists or demographers, and is often grounded in theories that go beyond migration theory, including the new focus on mobilities—which embraces all forms of movement (e.g., voluntary and forced migration, displacement, daily movements, tourism) as well as immobility (Sheller and Urry, 2006; Boas et al., 2019; Cundill et al., 2021). This helps to explain why among geographers, “other theories” represent the largest portion of theories invoked. For example, Quinn et al. (2018) focus on coastal climate mobility in an area near Marseille, France, deploying a social-ecological systems (SES) approach and place theory (Chapin and Knapp, 2015; Masterson et al., 2017) to better understand how people register, experience, and manage SES change. In their view, an SES approach produces a dynamic understanding of sense of place, emphasizing that the way people relate to their local areas sits within wider social and ecological changes. For his part, Wrathall (2012, p. 584) suggests “environmental migration can be viewed as a facet of

social-ecological regime shift.” In other work, Wrathall et al. (2014) invoke political economic theory to understand how environmental stresses further reduce access to resources for the rural poor of coastal Honduras and highland Peru, reinforcing power structures in ways in which migration becomes the only option. These are but a few examples of the theoretical eclecticism of geographic thought on migration.

## Theories of Forced Migration and Involuntary Immobility

We agree with Piguet (2018) that forced migration is an area requiring more theorization. Hugo (1996) recognized that mobility does not fit neatly in discrete categories but is on more of a spectrum from voluntary to forced, with environmental migration being conceived as more on the forced end. Yet even at this forced end of the spectrum, McLeman and Ploeger (2012) note that not everyone moves during a drought (or for that matter following a flood or cyclone), which opens a range of theoretical questions. Indeed, 45 years ago Nigerian demographer Aderanti Adepoju observed: “The preoccupation with the question of motivation (why people migrate?) tends to obscure the other side of the picture—and indeed a large part—which deals with the question of non-mobility, that is, why most people do not migrate from the rural environment” (in Findley and Doumbia, 2011). Climate migration researchers are only beginning to examine theories of immobility. As Zickgraf (2021, p. 1) notes, “Theoretically, ...our understandings of immobility in relation to environmental change are underdeveloped and oversimplified, and do not do justice to the diversity, dynamism, or unevenness of (im)mobilities.”

Given that not all people move in situations of duress, an adequate mobility theory needs to explain why. The lack of theorization has been ascribed in part to policy categories of “refugees” and “forced migrants” as opposed to “voluntary migrants” (Bakewell, 2008; Erdal and Oeppen, 2018) rather than to actual differences in circumstances and motivations, which may be mixed (Van Hear et al., 2009). Fussell (2012) highlights *volition* as one of the three dimensions of migration theory (in addition to time and space), and agrees that it is precisely this legal categorization that has discouraged refugee and migration researchers from joining efforts to advance a theory of involuntary migration. She writes, “Although environmentally induced migration may be framed as voluntary, insofar as migrants make decisions, the predisposing conditions of those decisions—in this case the insufficiency of natural-resource-based livelihoods—arguably determine the outcome” (p. 18). On the other hand, Bettini and Gioli (2015) critique early neo-Malthusian approaches as asserting that migration is a “reactive survival strategy to which a [household] is forced when confronting a dose of environmental stress in excess of its coping capacity.” This is migration as failure to adapt which tends to couch migration in negative terms and portray migrants as passive victims without agency.

Beyond the now sterile debate between “maximalists and minimalists” and migration as adaptation or failure to adapt (McLeman and Smit, 2006; Morrissey, 2012), however, there is

<sup>10</sup>Compare Hugo's three-and-a-half page (27 paragraph) treatment of theories addressing demographic change, climate change and migration, for example, Kaczan and Orgill-Meyer's (2020) comparatively slender two paragraph treatment of theory in their review for *Climatic Change*.

**TABLE 2 |** Aspirations–capabilities-derived individual mobility types.

		Migration capabilities	
		Low	High
Migration aspirations	High	Involuntary immobility (feeling “trapped”)	Voluntary mobility (most forms of migration)
	Low	Acquiescent immobility	Voluntary immobility and involuntary mobility (refugees, resettlement)

Based on De Haas (2021, Table 1, p. 22).

real room for exploring degrees of volition in the context of climate mobility, and incorporating these considerations into migration theory and research. Erdal and Oeppen (2018) argue that “volition in relation to migration decisions is closely tied to available *acceptable alternatives* and the agency to act on those options. Whether someone’s migration is labeled as voluntary or not, however, depends on the labellers’ perception of what constitutes ‘acceptable’ alternatives” (p. 987 emphasis added). Anything short of death may, depending on one’s perspective, be deemed an acceptable alternative. If, for example, remaining in extreme poverty or in an environmentally degraded/hazard prone region is considered by the outside observer as acceptable, then migration will by definition be labeled as more or less voluntary. From a migrant perspective, perceptions of acceptable alternatives are shaped by the migrant’s beliefs and access to information (Colburn, 2008).

Increasingly the field of climate mobility is addressing the question of involuntary immobility, which again raises questions about why some are able to move while others cannot move or are resistant to doing so in spite of steadily worsening conditions. Theory can illuminate these cases. Adams and Kay’s (2019) exploration of inherent propensity to migrate and Quinn’s (2018) discussion of place attachment represent important contributions to theoretical discussions of why people do not move in the face of apparent risks. More recent work seeks to embed climate-migration scholarship in risk frameworks developed under the Intergovernmental Panel on Climate Change (IPCC) (McLeman et al., 2021). This framing suggests that there is a predisposition for people to want to remain in place rather than migrate, because migration implies disruptions to households and communities, and that as risk levels increase or *in situ* adaptation is unsuccessful, thresholds are passed which result in the act of migration.

**Aspirations and Capabilities Theory as a Recent Advance**

Perhaps because of its relative recency, aspirations and capabilities theory was only invoked as a primary or secondary theory by five of the studies in our sample (Table 1). The theory emerged in the early 2000s (Carling, 2002; De Haas, 2010) and was further improved in the subsequent decade (Carling and Schewel, 2018; De Haas, 2021). We expect that more empirical studies of climate mobility will make use of the aspirations and capabilities framework in the coming decade. The framework has the potential for advancing our understanding of the complex links between climate impacts and human mobility, and for addressing the range of potential mobility scenarios from

voluntary to forced, and from mobile to immobile (Table 2). It is able to explain, for example, why migration may decline in the aftermath of climatic events or when slow-onset processes cause gradually declining conditions for gaining a livelihood. In such circumstances, the aspirations to move increase, yet the ability to move, especially over longer distances, declines. Push-pull theory, neoclassical migration theory, NELM and other theories discussed in section Brief Review of Migration Theory are less able to capture the complex realities of a world in which different types of climatic stressors interact with different types of human mobility among heterogeneous populations with unequal access to resources needed to move or adapt locally (Cundill et al., 2021). Using the aspirations and capabilities framework to guide field research design in diverse empirical settings across continents, climatic zones, socio-ecological systems and rural-urban divide, has the potential to yield new insights into climate mobilities.

**Peering Into the Future**

Future modeling of climate-induced migration has heavily depended on neo-classical and push-pull theories (50 percent of the total sample). De Haas (2011) writes “While scenarios approaches focus on future constellations of contextual factors, it is important to also ground the assessment of the effects of contextual change on migration on state-of-the-art theories on migration determinants. This is important to emphasize, because much migration analysis in policy and, sometimes, research is still based on push–pull or gravity models, which can lead to misleading analyses of economic and environmental stress leading to mass migration” (p. S60). De Haas argues for a greater appreciation of structural and demographic factors that underlie major migration systems such as those between Africa and Europe and Central America/Mexico and the United States, which ultimately have greater predictive power than environmental influences. Modeling work would do well to consider a broader range of theoretical frameworks, which by extension likely implies greater complexity that better captures multiple causal paths and decision-making contexts.

**CONCLUSION**

We argue in this article that it is important for researchers to explicitly frame their work in theory, even when the research goal is simply to “fill knowledge gaps” or “contribute to the empirical evidence base” on climate mobility. The reality is that even in simply filling gaps, researchers carry models of how the



world works in their minds, and those mental models guide their work. So it is far better to make those conceptual models explicit than to hide them under the guise of “letting the data speak for themselves.” Our results show that the application and testing of the rich body of migration theory by researchers in the domain of environmental and climate migration tends to be spotty at best. In fact, most researchers focus on theories such as NELM (Stark and Bloom, 1985), with its emphasis on rural household-level decision making and migration as a risk reduction strategy, or the most recent conceptual models such as the Foresight framework (Black et al., 2011; Foresight, 2011). While there is nothing inherently wrong with these theories, their frequent implementation may suggest that few alternative theories were considered by the authors, and hence tested. Furthermore, theories focusing on individual-level decision making (e.g., Carling and Schewel, 2018; De Haas, 2021) are often emphasized over structural theories that stress macroeconomic and demographic factors as fundamental explanatory factors underlying migration, particularly from lower income countries to higher income countries. Yet these structural approaches are often the most important for international migration studies (Massey et al., 1993; De Haas, 2010; King, 2012; Clemens, 2021), and have extensive empirical evidence to validate them (De Haas, 2011; Hochleithner and Exner, 2018). Finally, as we have addressed in the last section, there is little attention to theories of forced migration (Erdal and Oeppen, 2018) or immobility (Schewel, 2020; Zickgraf, 2021), both of which are critical to understanding climate mobility.

Importantly, theory can also inform (or misinform) policy. Theories contribute to development orthodoxies [e.g., modernization (Rostow, 1959) and demographic transition (Caldwell, 2007; Handwerker, 2019)], and undergird the frequent neo-Malthusian framing of climate, conflict and the “threat” of mass migration (Verhoeven, 2011) found so often in the media and development discourse (De Haas, 2020; Durand-Delacre et al., 2021). This may lead to simplistic policy responses. The specter of mass migration owing to climate impacts has, in its best guise, been raised as a warning of the likely consequences of continued high emissions (e.g., Rigaud et al., 2018). At its worst, reference to “climate refugees” has fueled nationalistic and xenophobic responses, even when the intent is otherwise (Durand-Delacre et al., 2021). In essence these are political messages. We have an obligation to ground politics and policy on the best theories and empirical research, which address different causal explanations and are based on a transdisciplinary perspective<sup>11</sup>.

In closing, beyond the ways in which this field employs theory, the emerging empirical research on climate mobility

presents a wonderful opportunity for theory building. Rigorous interdisciplinary research in varied cultural and economic contexts—such as the studies being conducted by climate mobility researchers—is actually key to advancing theoretical approaches. Yet researchers have to show how their empirical work engages with theory, rather than simply referring briefly to the theoretical framing employed by their study before moving on to methods and results. Empirical research is a key component of theory building because it allows for theories to be examined, refuted, and refined based on real-life experiences (Popper, 1963). Thus, we advocate for a two-pronged approach: build on existing theory on the one hand, and utilize approaches such as grounded theory (Charmaz, 2014), in which theory is developed inductively through the analysis of empirical evidence, on the other. This will help to root climate mobility work in the broader corpus of migration studies and serve to enrich the theoretical bases for future work.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

## AUTHOR CONTRIBUTIONS

AS conceived of the study and led the development of the literature survey (instrument, coding, etc.), coded studies, reviewed the literature on theory, and led the write up of results. KGr contributed substantially to the introduction, way forward, and conclusion sections. KGr, SM, KGe, MP, and AB contributed to the development of the instrument used to code theoretical approaches employed by the sample studies, conducted coding of studies, analyzed survey results, and contributed ideas and text to the manuscript. All authors contributed to the article and approved the submitted version.

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<sup>11</sup>In this regard, it is important that theory and research not be based on predefined policy categories of migrants or driven solely by policy imperatives. As Bakewell (2008) notes, building on Turton (2003), “the role of academic research should be to reflect critically on the taken-for-granted assumptions of policy makers rather than simply confirming or legitimizing them: to make them visible and open to inspection” (p. 437–438). Erdal and Oeppen (2018) call on “scholars to challenge the status quo more, not only by deconstructing government labeling, but also by further unpacking the assumed dichotomy between forced and voluntary migration, thereby examining voluntariness” (p. 994).

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fclim.2022.882343/full#supplementary-material>

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