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# It's not just about women: broadening perspectives in gendered environmental mobilities research

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## ABSTRACT

Understanding how gendered differences manifest in mobilities linked to environmental change is part of understanding the human experience of environmental change. To synthesize empirical research on how gender, environment, and mobilities interact and to identify priorities for future research, we perform a rigorous scoping review of 120 peer-reviewed scientific articles on the nexus. We present diverse findings across contexts but find that a common narrative in the evidence suggests that men are more likely to migrate in response to environmental changes while women are generally more immobile due to pre-established social norms including gender roles. In turn, this is found to exacerbate women's vulnerabilities to environmental risks. While this holds true in certain contexts, many studies are women-centric and fail to move beyond the simplistic association of women with immobility, and immobility with vulnerability. Based on our analysis, we advocate for grounding empirical research in robust theoretical frameworks from rich traditions in gender studies, feminist scholarship, and gender and migration research. This approach would start with a shared acknowledgment that gender is socially constructed, relational, dynamic, and intersectional. This will, in turn, contribute to a more nuanced understanding of how social inequalities mitigate the relationship between mobilities and environmental change.

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Gender; environmental change; migration; mobilities; evacuation; climate change; immobility; scoping review

## 1. Introduction

Early reports on how environmental change affects human mobility were more focused on establishing the 'big picture' of causality and assessing the volume of future displacement (Myers, 1993; El-Hinnawi, 1985), rather than providing more granular takes on the nexus as a socially differentiated process. Academic research and grey literature have since become well attuned to the fact that the impacts of climate change and mobility responses to them vary greatly, even within the same area, and that the impacts of environmental change on human mobility are not limited to questions of magnitude (Cundill et al., 2021; Piguet, 2013; Piguet, 2022). Scholarship identifies sources of differentiated vulnerabilities, whereby vulnerability is a dynamic condition that has been historically produced over time putting some at a higher risk than others rather than being (exclusively) the product of contemporary environmental change (Taylor, 2014; Adger, 2006). Climate change and other forms of environmental change cannot be understood as simply geophysical processes. In complex systems, intersecting social factors shape the strategies that people can access to adapt to socio-ecological change, including mobility (Ali et al., 2023; Erwin et al., 2021; Hummel, 2021). One of the most salient factors mediating the relationship between global environmental change and human mobility is that of gender.

Gender is an organizing principle in social life that affects all people, structures, and processes, including human mobility (Lama et al., 2021). This is evident from the vast body of literature on gender and migration (Donato et al., 2006; Hondagneu-Sotelo, 2018), but how gender roles, values, norms and identities shape, and are shaped by, human mobility in the context of global environmental change has only more recently emerged as a dedicated field of study. The majority of earlier climate or environmental migration debates took place as if migration were a gender-neutral phenomenon, or as if gender were the exclusive property of women (Detraz and Windsor, 2014; Gioli and Milan, 2018). Several scholars have reviewed the gender-mobility-environment triad, offering valuable conceptual insights and examining available empirical evidence (Lama et al., 2021; Hummel, 2021; Gioli & Milan, 2018; Chindarkar, 2012; Hunter & David, 2009).

We seek to complement this previous work by engaging in what is, to the best of our knowledge, the first attempt to methodically review and analyze empirical literature on the nexus – what we refer to as gendered environmental mobilities (GEM) research. "Environmental mobilities" encompasses the entire mobility spectrum from more forced forms of mobility (e.g. displacement and evacuation) to more preemptive, as well as (return) migration, and micro-mobilities.<sup>1</sup> In contrast to past reviews that focus on gendered mobilities in contexts of

climate change, we synthesize evidence on various environmental shocks including geophysical and nuclear disasters. We also include immobility, an outcome often overlooked in environmental mobilities research (Zickgraf, 2021b). While all forms of (environmental) mobilities are influenced by gender dynamics, our reference to GEM denotes empirical research that specifically illuminates the gendered dimensions.

Through a scoping review of 120 peer-reviewed scientific articles, we first assess the current geographical and methodological landscape. This examination provides insights into the origins and scope of our existing knowledge base. Our findings reveal, for example, that despite the socially and locally constructed nature of gender, the majority of empirical investigations on this topic are confined to a handful of countries. We then categorize and synthesize empirical findings within our sample along two intersecting axes: their placement in the mobility process (encompassing decision-making and subsequent impacts) and their outcomes in terms of (im)mobility (comprising both mobility and immobility).

Current evidence suggests that men are more likely to migrate in response to environmental change, especially as labour migrants. Owing to pre-existing social structures including gender norms and relations, women are generally found to be less mobile. In turn, it is often found that the out-migration of men increases the burdens placed on women in points of origin, further exacerbating their vulnerability to environmental risks. However, gendered environmental mobilities literature disproportionately focuses on women as subjects of study, often highlighting their vulnerabilities as if they were intrinsic to their gender. The mobility experiences of men and other gender groups are rarely explored through a gender lens, and how their vulnerabilities are (re)produced in relation to environmental mobilities is often left unexplained. This tendency risks perpetuating a narrow portrayal of women and their societal roles, reinforcing or essentializing gender inequalities.

Based on our analysis, we advocate for a future GEM research agenda that transcends women-centric or descriptive case studies and instead adopts contextual, dynamic, and relational approaches that seek to unearth – and ultimately rectify – the structural inequalities driving differential (im)mobility aspirations, opportunities, trajectories, and impacts. Rather than assuming gender as the sole or primary source of vulnerability for women, we propose that future investigations delve into the multifaceted sources of vulnerability and agency between and within gender groups and identities. Through deeper theoretical engagement and comparative, intersectional research, we might elucidate the nuances of the nexus and discern what sets it apart from other strands of gender and migration as well as gender and environment scholarship.

## 2. Methods

Scoping reviews are ideal for determining the volume, geographical coverage, nature of studies and type of evidence available in a body of literature (Munn et al., 2018). Widely used in medical sciences, scoping reviews have gained traction in social sciences: recently, they have been used to map the literature on “left-behind women” in the context of international

migration (Fernández-Sánchez et al., 2020), to identify research gaps on the health effects of climate change for gender-diverse populations (Simmonds et al., 2022) and to assess the evolution of empirical adaptation research in the global South (Vincent & Cundill, 2022). We apply the Arksey and O'Malley (2005) methodological framework for conducting scoping reviews in order to identify research gaps in existing empirical evidence on the interlinkages between gender and environmental mobilities.

We identified relevant studies through two databases: CLIMIG<sup>2</sup> and SCOPUS. We limited our search to articles published (in English, French or Spanish) in peer-reviewed scientific journals as proxy of quality and also for feasibility and time constraints. Thus, although several insightful books and grey literature discussing this nexus have been published (e.g. GIZ, 2021, CARE, 2020, IOM, 2014), they are beyond the scope of this paper. A Boolean search for three sets of terms – one related to human mobilities, one to gender, and one to environmental changes (Figure 1) – was conducted in each database for publication titles, abstracts and keywords.<sup>3</sup> In order to focus on the most recent literature, only articles published between 2010 and 2021 were included, which rendered 5108 citations.

An initial title screening was conducted for all citations rendered by SCOPUS to exclude those unrelated to environmental mobilities: approximately 4000 studies deemed irrelevant – e.g. discussing animal or DNA migration – were excluded (Figure 1). If a clear decision could not be made, citations were kept for further screening. To ensure that all relevant records were included, we independently screened 30% of titles and found no discrepancies. Then, the title and abstract of 1161 records were screened for relevance based on two criteria: (1) Does the citation refer to an empirical study? (2) Does the citation refer to a study on gender and environmental mobilities? At this stage, 199 records were identified. Articles including gender as a mere control variable without commenting or addressing it in their results were excluded.

A form was developed to confirm the relevance of articles and to extract study characteristics including region, method used, characteristic of movement and main findings (Appendix A). We independently extracted data, meeting frequently to agree on the terminology and to resolve discrepancies. Although quality assessment does not usually form part of the Arksey and O'Malley's framework, these research meetings became an opportunity to discuss the quality of the studies, which resulted in the exclusion of 5 articles. In addition, 73 studies were excluded based on the eligibility criteria while one was unobtainable, leaving our sample at 120 studies. This is, in fact, a number much higher than we anticipated.

## 3. Situating the empirical literature

To situate the research findings synthesized below, we first evaluate the empirical literature in terms of geographical distribution, methods, and units of analysis. The geographical distribution of studies influences findings and the research questions themselves. This is also the case for methods as they can carry behind deep epistemological considerations

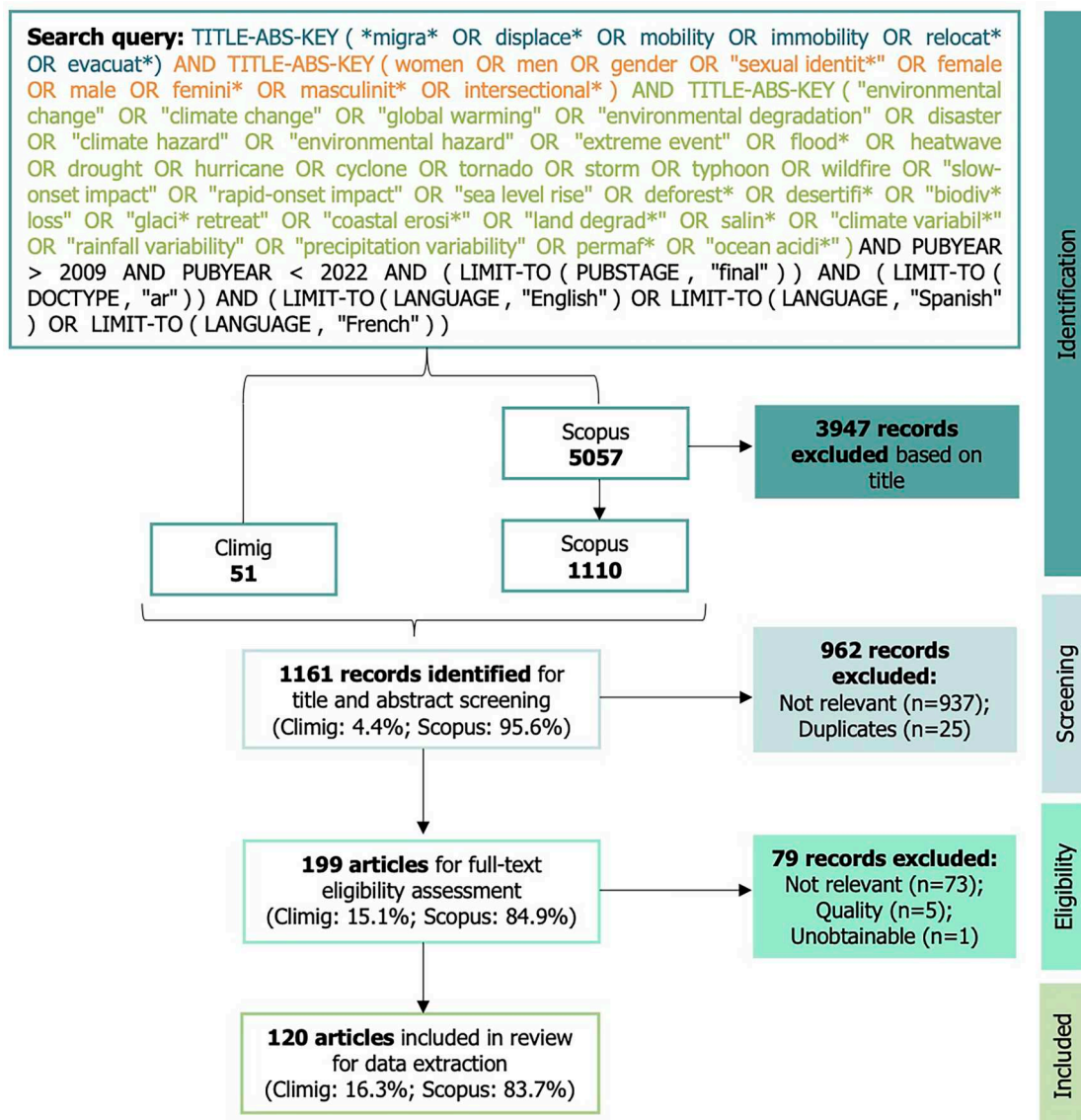


Figure 1. Flow diagram of the selection protocol used in this study.<sup>9</sup>

that impact how researchers approach social phenomena: quantitative research, which is for the most part connected to positivism, is often associated with objectivity, causality, and replicability (Park et al., 2020), whereas qualitative research (often connected to constructivism) tends to advocate for a contextual understanding of social phenomena through the eyes of participants (Denzin & Lincoln, 2005). Therefore, methods can influence whose (or what type of) knowledge is sought and accepted, which, in turn, carries deep consequences for research findings, especially when combined with varying power inequalities across locations (Hesse-Biber, 2012).<sup>4</sup>

### 3.1. Geographical distribution of studies

Most case studies have been conducted in Asia (50%), followed by Africa (21%) and North America (21%) (Figure 2). South and Central America, although already among the most sensitive regions to climate mobilities, remains under-researched – a regional gap previously highlighted by Zickgraf (2021a) and

Kaenzig and Piguet (2014) in relation to human mobility and climate change.

This research disparity is not just a question of geographical balance: considering where studies have been conducted is particularly relevant because gender is a social construct, and as such, it is deeply rooted in the social, political and environmental context of a place (Brickell, 2006). The norms, roles, and attributes associated with being male, female and other gender identities, as well as the relations between (and among) these different groups are locally constructed, constantly changing over time and space (Bondi & Davidson, 2003; Massey, 1994). Likewise, the consequences of stepping outside of gender norms or traditional gender roles are contingent on the social context.

Taking the two countries with the highest number of case studies – Bangladesh and the United States tied at 23 studies each (Figure 3) – exemplifies why location matters when studying gender as the way it intersects with other social identities appears to be different. In Bangladesh, being married appears to be critical for women either to access shelters





Figure 2. Year of publication and region of study.<sup>10</sup>

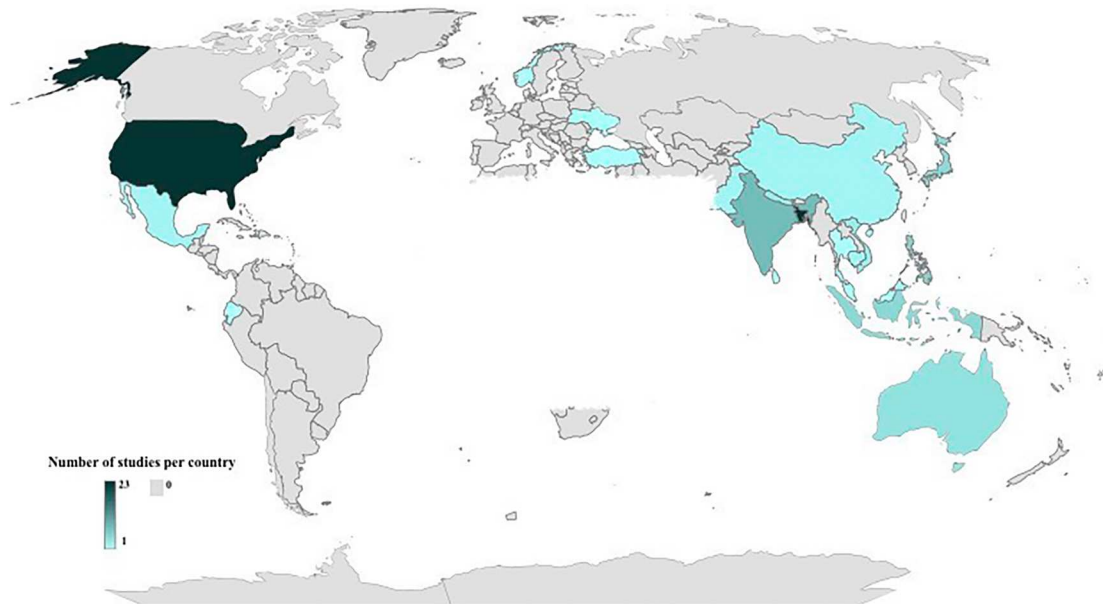


Figure 3. Geographical distribution of case studies.

more safely in the event of a disaster (Ayebe-Karlsson, 2020b) or to determine their success in adopting migration as an adaptation strategy (Evertsen & van der Geest, 2020); whereas in the USA race and class appear to be more relevant – for instance, to predict evacuation rates and experiences (Li et al., 2010; Meyer et al., 2018). Differences in economic development, religious customs and colonization histories (amongst others) between these countries have brought about very different internal power inequalities, which explains why some identities are more salient than others and intersect with gender at varying degrees.

### 3.2. Type of methods used

Seventy-two percent of studies in our sample use quantitative methods, which aligns with broader research on environmental mobilities (see Type 2 studies in Piguet, 2022). Quantitative studies in our sample capture how socio-economic factors

(including gender) impact the likelihood of moving in a context of environmental change, how specific environmental events affect men's and women's (im)mobility differently, and how, in turn, environmental mobilities impact the health and well-being of men and women, amongst others. An exclusive focus on quantification, however, might be insufficient as it often fails to capture the subjective dimension of mobility decision-making as well as the context in which it takes place (Durand-Delacre et al., 2021). Quantitative approaches risk flattening gender (and other social identities) to mere statistical categories or as disaggregated mobility patterns (Mahler & Pessar, 2006), overlooking how social inequalities intersect to shape mobilities. This reduction of gender to statistical categories risks compressing women (and other gender groups) to a homogenous category with similar needs and options (Gioli & Milan, 2018), overlooking that gender is a social relation constituted at the intersection of other axes of difference including race, ethnicity and age, and thus creating

different needs, vulnerabilities and priorities within gender groups (Mollett & Faria, 2013). It is important to note that 22% of these studies are marked by mixed-methods designs, which can counter these risks.

Much of the literature relies on household surveys. This may be partially explained by the dominant view within the 'migration as adaptation' discourse that an individual's migration results from a collective decision taken by the household for its benefit. Influenced by the New Economics of Labour Migration theory (Stark & Bloom, 1985) and the Sustainable Livelihoods Approach (Serrat, 2017), migration is seen as a livelihood strategy to diversify incomes and to insure against risk, allowing physically separated families to sustain or adapt to environmental shocks. Thus, labour migration decisions are often analysed as if made jointly by the migrant and those who stay. However, these approaches neglect that within households, men and women often enjoy different access to and control over resources, including mobility decision-making power and capabilities to enact mobility (Elmhirst & Darmastuti, 2015; Radcliffe, 1991). Thus, household data could hide intra-household power dynamics. Furthermore, focusing on the household level *alone* might overlook questions of who can access and control resources including those derived through mobility, such as remittances (Zickgraf et al., 2022).

When it comes to who provides information at the household level, two-thirds of the articles did not specify their data source. This is problematic because gender shapes access to and control over knowledge (Nyantakyi-Frimpong, 2019). Of those studies that did specify the source, more often than not it is the head of the household, regardless of their gender. This, in practice, means that men are often those who provide information for the entire household. For instance, two studies in our sample focus on male heads only either because the

sample size of female heads was too small (Carrico & Donato, 2019) or because local customs prohibited interactions between women and researchers (Paul et al., 2010). Only a few articles set out to interview an equal number of male and female heads of household (e.g. Ajaero, 2017; Nnadi et al., 2021). This does not entirely resolve the issue because the power of men in a female-headed household might be very different from the power of a woman in a male-headed household, especially as women tend to carry the burden of reproductive tasks, but it seems like a first step in the right direction. According to Vigil (2021), even if resource-intensive, an adequate approach to account for intra-household power dynamics would be to hold individual-level interviews with various household members, accounting for gender and age differences. Only one study (Massey et al., 2010) in our sample uses this approach, although not to account for power dynamics at the household level.

#### 4. Results: classification of research findings

We identified two axes that helped us to categorize the results related to gender reported in our sample: placement in the mobility process (decision-making and subsequent impacts) and (im)mobility outcome (mobility and immobility). Using these two axes, we distinguish four main categories: the first two shed light on mobility decision-making for individuals who move and for those who stay. Although immobility is the physical flip side of mobility, much of the existing literature seeks only to explain mobility outcomes (e.g. evacuation, labour migration), forgetting that staying can also be the outcome of a decision-making process. Categories 3 and 4, on the other hand, discuss the gendered impacts of mobility in a context of environmental change for those individuals who move and for those who stay, respectively (Figure 4). These

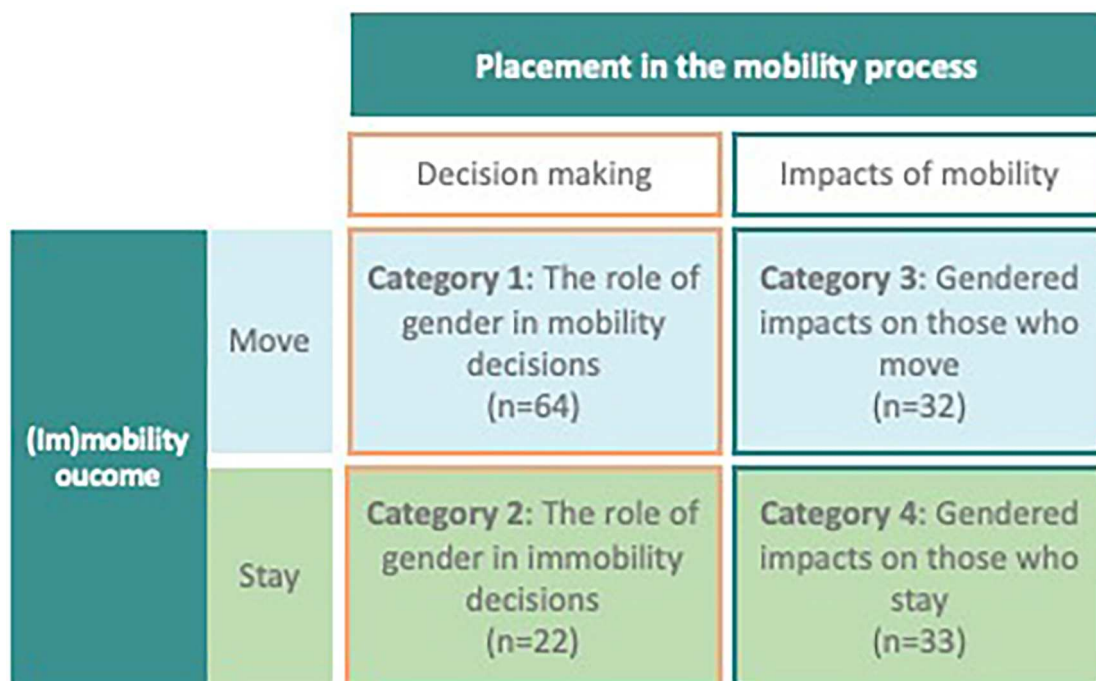


Figure 4. Classification of results according to theme.

categories should be taken as a summary of the results available in the empirical literature instead of a recommendation of what should be studied. Additionally, rather than categorizing studies as a whole, we extracted and categorized their multiple findings and so studies may appear in more than one category (see Annex B).

#### 4.1. *The role of gender in mobility decisions*

Under Category 1 are results that elucidate on the role of gender in mobility decision-making for individuals who move. Here, we have included all mobility outcomes that represent a (potential) physical move from an origin area. Thus, results speak to both reactive (e.g. displacement, evacuation) and more proactive (e.g. labour migration, relocation) forms of mobility. Not all articles classified under this category set out to examine mobility outcomes that have already materialized: some study intentions to move in case of hypothetical events. For instance, Cahyanto and Pennington-Gray (2015) assess the likelihood of evacuating in the event of a hurricane for tourists staying in Florida while Mudombi and Muchie (2013) assess how different perceptions regarding future water access will affect mobility decisions of female-headed and male-headed households.

Results indicate that men are more likely to engage in labour migration in response to environmental stressors. This finding can be explained because men are the primary breadwinners within these households and societies (Gray & Mueller, 2012; Khan et al., 2018) or because they are in charge of livestock – and thus need to migrate in search of pastures and water (Nkuba et al., 2019; Lama, 2018). Male migration is perceived as one of the most viable adaptation strategies to the point that, in Nepal, men who do not migrate from places facing climate change impacts are actually perceived as a burden to households (Gautam, 2017).

That is not to say there is no evidence regarding women's migration in response to environmental change. For instance, Khan and colleagues (2018) show how women's labour migration is intensifying as an adaptation strategy: in the growing absence of fishermen, women in India are being pressured to migrate in order to increase their income in a context of climate variability and cyclones – although the majority do so with their husbands and children. Women are more often associated with marriage-related migration – but results are ambiguous. Using data from Malawi, Becerra-Valbuena and Millock (2021) find that droughts increase the probability of women's migration related to marriage, albeit the effect is small. However, two studies find that women's marriage mobility is delayed following environmental shocks either because households retain women for farm labour in the hopes of realizing a higher future bride price (Dillon et al., 2011) and/or to limit potentially high expenses associated with marriage (Gray & Mueller, 2012).

As for evacuation decision-making, Category 1 results indicate that women are more likely to evacuate than men. For example, Kuligowski and colleagues (2020) find that women were almost three times more likely than men to evacuate during the Chimney Tops 2 fire in Tennessee (USA). This finding extends to intended evacuation behaviours in response

to hypothetical events such as earthquakes, tsunamis, hurricanes or wildfires: Reiningier and colleagues (2013) find that women have a higher likelihood to follow mandatory evacuation orders than men in southern Texas in the event of a hurricane. Perceived risk is one explanation for this result: there is evidence that women tend to exhibit higher levels of risk perception than men in extreme events (Buylova et al., 2020). As “providers of family wellbeing” (Ferdous & Mallick, 2019, p. 93) women's caregiving roles and responsibilities, along with their limited access to resources, and higher exposure heighten their risk and their risk perception (Fothergill, 1996).

#### 4.2. *The role of gender in immobility decisions*

Category 2 includes results that speak to immobility from a gendered perspective. Remaining in a place is also the outcome of a decision-making process, and it is only by looking at immobility through this lens that we gain a deeper understanding of the capabilities and aspirations of those who stay (Zickgraf, 2021b; Obokata et al., 2014).

Results show that gendered divisions of labour – whereby women are often more involved in (unpaid) reproductive tasks than men (Ferrant et al., 2014) – feed into gender inequalities including access to employment and labour market participation, which result in greater immobility among women facing environmental change. Findings suggest that domestic responsibilities and chores related to child or elderly care limit women's access to off-farm work even when flooding causes agricultural losses (Enete et al., 2016) while obligations to household tasks have been found to increase the immobility of female farmers facing rainfall variability (Ahmed & Kiester, 2021).

Gender norms and roles play a role in women's immobility during sudden-onset events. In India and Bangladesh, social norms restrict women's autonomy in decision-making, dissuading them from complying with evacuation orders during flooding, especially in the absence of men as women are required to obtain permission from a male family member before evacuating (refer to Madhuri, 2016, for the Indian context, and Ferdous & Mallick, 2019, for insights into Bangladesh). In certain instances, women are encouraged to remain immobile during cyclones, as expressed by Bangladeshi participants who assert that women “belong to the home” (Ayeb-Karlsson, 2020a, p. 14). Coupled with the pervasive fear of sexual violence women face in or en route to public shelters, this contributes to women staying at home rather than evacuating during disasters (Farmer et al., 2018; Paul et al., 2010). Moreover, entrenched gender roles, which typically assign the role of protector to men, can further constrain women during disasters. Ayeb-Karlsson (2020a) shows that in Bangladesh, men often feel it is their obligation to protect their wives, daughters and mothers from disasters, leading women to wait for men before evacuating to shelters.

Additional sociodemographic factors help explain women's disproportionate immobility in contexts of sudden-onset events. For instance, women with disabilities in Cambodia face multiple barriers to evacuating during natural hazards. In addition to fearing for their safety in evacuation shelters, they often do not receive timely evacuation information as

they typically remain at home due to their impairments (Gartrell et al., 2020). Unmarried women confront the risk of societal judgment and reputational damage – ‘losing their honor’ – potentially becoming undesirable for marriage if they evacuate alone to cyclone shelters in Bangladesh, which leaves them more vulnerable than married women (Ayeb-Karlsson, 2020b). Additionally, in Vietnam, older women encounter greater obstacles in migrating and seeking alternative livelihoods compared to older men or younger women, primarily due to gendered structures of responsibilities. This contributes to their immobility following floods (Ylipaa et al., 2019). These examples hint at the importance of using intersectional approaches to gain a deeper and more nuanced understanding of gendered (im)mobility decision-making.

While the findings here suggest that gender norms tend to promote women’s immobility during disasters, they seem to conflict with results from Category 1, which indicate that women are more inclined than men to evacuate during sudden-onset events. This apparent contradiction can be attributed to several factors: firstly, variances in the geographical and therefore socio-cultural locations of studies encompassed in each category; secondly, differences in study methodologies; and thirdly, variations in the types of hazards examined. To begin, over half (14) of the evacuation studies in Category 1 were conducted in the USA – a nation characterized by relatively low gender inequality. In contrast, most cases in Category 2 were undertaken in countries with less pronounced gender equality norms and a higher gender gap in labour force participation, such as Bangladesh, India, and the Philippines (with only two studies conducted in the USA).<sup>5</sup> This, coupled with the predominance of predictive studies in Category 1 – particularly notable with 11 cases in the USA alone, compared to merely 2 in Category 2 – helps elucidate this inconsistency. Despite women displaying a heightened perception of risk during disasters and expressing greater intentions to evacuate than men (as outlined in section 4.1), pre-disaster attitudes may not align with actions taken during actual emergencies due to underlying gender disparities. For example, Bateman and Edwards (2002) demonstrate that although women are more inclined to have a household evacuation plan in preparation for a hurricane, their restricted access to resources, such as a functional vehicle, may hinder their ability to evacuate. Additionally, even if men initially perceive less risk than women, once they recognize the imminent danger it has a stronger effect on their evacuation, leading to a higher likelihood of evacuation compared to women with similar levels of risk exposure and perception (Bateman & Edwards, 2002). Consequently, studies focusing solely on evacuation intentions offer only approximations of actual evacuation behaviour, as they fail to account for the myriad obstacles individuals encounter during sudden-onset events, which can severely curtail their mobility.

Furthermore, the nature of the hazard appears to influence mobility during disasters: within our dataset, findings regarding evacuation behaviour vary across most sudden-onset events. However, wildfires stand out, consistently linked with increased female evacuation and decreased male mobility. Research by Whittaker et al. (2016) and Tyler and Fairbrother (2018) reveals that, during wildfire seasons in Australia, men often remain behind to safeguard their homes and properties, while women

evacuate with children and elderly family members. Conversely, in Southern California wildfires, men were observed to be more resistant than women to evacuation orders (Roberson et al., 2012). In these instances, men’s reluctance to evacuate can be attributed to the societal expectation that they serve as protectors of property during disasters. Hence, conducting comparative studies across different hazards and countries could provide insights into these varying findings.

### 4.3. Gendered impacts of mobility for those who move

Results included in Category 3 discuss the gendered impacts of mobility for individuals who move. One-third of results under this category come from women-focused studies whereas none exclusively investigates men’s mobility experiences.

Generally speaking, research finds that mobility increases the vulnerability of women, particularly following a sudden-onset disaster. On the one hand – and in line with results in Category 2 – studies show that women’s mobility can increase their risk of falling victim to violence. Following the 2010 earthquake in Haiti and Typhoon Haiyan in the Philippines, girls and women were found to be particularly vulnerable to sexual and gender violence due to overcrowding and lack of privacy in IDP camps (Davis & Bookey, 2011 for Haiti, Tanyag, 2018 for the Philippines). A sense of insecurity can also restrict women’s and girls’ mobility at destination: in their study about women who have internally migrated for work following floods in India, Patel and Giri (2019) found that they fear going out and having to confront men who consume alcohol or drugs.

Reactive, unplanned movements can negatively impact both the mental and physical health of individuals, but women seem to bear the brunt. Following evacuation or relocation, women are found to suffer more mental health issues than women who stay in devastated areas (e.g. Adams et al., 2011; Sezgin & Punamäki, 2016) and higher levels of distress and anxiety than displaced men (Zahlawi et al., 2019, Ayeb-Karlsson, 2021). In the aftermath of Hurricane Katrina, young women evacuees were more likely to increase alcohol and tobacco consumption than men (Cepeda et al. 2010), although Kamo and colleagues (2011) find older displaced women to be more resilient than older displaced men following the same disaster, exemplifying the role age can play on mobility impacts. When it comes to physical health, results show that women displaced in the aftermath of sudden-onset events in Bangladesh are less likely to deliver babies in health centres than mothers from non-displaced households (Haque et al., 2020), while in cases of slow-onset changes migrant women struggle to access maternal and general health services (Baada et al., 2021).

In some cases, gendered norms at destination may limit women’s entry into the labour market. Samuels (2012) explains that, after relocating to the Great Love neighbourhood in Banda Aceh (Indonesia) in the aftermath of the 2004 tsunami, women’s daily mobility was limited due to gendered norms that prevented them from driving motorcycles. This, in turn, made them more dependent on expensive and time-consuming transportation, which affected their access to job opportunities in the city centre. Gendered divisions of labour also affect women’s employment opportunities in disaster recovery contexts: following Katrina, undocumented migrant



women were kept from working in reconstruction efforts due to the absence of family support services, which reproduced “gender-based hierarchies of opportunity” (Blue, 2021, p. 181).

Although more evident in the literature discussing the gendered consequences of mobility for those who stay (Category 4), findings in this category hint at mobility increasing the burden on migrant women. In the context of disasters, for instance, in addition to having to manage their own needs and personal trauma, both women and girls “bear the burden of intense care obligations as a result of living in makeshift and insecure shelters in evacuation camps” (Tanyag, 2018, p. 573). In certain cases, women’s mobility can also trigger social stigma. In one of the rare instances where women who have migrated for work are the focus of a study in the field of environmental mobilities, Evertsen and van der Geest (2020) find that migrant women working in the garment industry in Bangladesh face social stigma due to the stronghold of *pardah* – defined as “the broader set of norms and structures that set standards of female morality” (Amin, 1997, p. 213). In the garment sector women are not physically segregated from men but rather work alongside them, which is highly stigmatized because not being able to cover their bodies while working could lead to the “increased attention by male coworkers, leading to accusation of the women being immoral and ‘loose’” (Evertsen & van der Geest, 2020, p. 18). This, in turn, creates a bad reputation for “city girls,” which not only affects the migrants in question but also their families as their value in the marriage market decreases, increasing the dowry to be paid to the groom’s family. These higher social costs related to female migration can also influence migration decision-making ex-ante: if they are too high, women might decide to stay in place rather than migrate. This means women will wait longer than men before migrating, and in many cases will do so only when risks are large, which limits both the utilization of migration as an adaptation strategy and its efficiency (Evertsen & van der Geest, 2020).

The mobility of women can also create changes at the micro-level that improve their status. Following the resettlement programme associated with the 2004 Asian tsunami in Sri Lanka, Burgher women successfully negotiated with the government a transport route and electricity supply for their resettlement (de Mel, 2017). Other studies show that, through mobility, women can achieve greater autonomy in decision-making – although it is often accompanied by increased responsibilities and burden (Akinbami, 2021) – related to increased incomes and enhanced confidence (Patel & Giri, 2019).

Although scant, a few articles do discuss the negative impacts mobility can have on men. Ohira and colleagues (2016) find that evacuation following the Great East Japan Earthquake may have been associated with an increased risk of hypertension for men but not for women. As for employment at destination, in Bangladesh, after migrating internally due to cyclones, men are temporarily excluded from the local labour market due to their lack of knowledge, skills or capital, which can sometimes bring about conflicts with host communities (Sams, 2019). Another study in Bangladesh shows that, due to gender segregation in the labour market at destination, men usually work intermittently as day labourers whereas women have more stable contracts in the garment sector: this, in turn, raises the importance of women’s income within the household, which clashes with socially

accepted gender norms (Evertsen & van der Geest, 2020). However, this preference for hiring women can be traced to gender biases and stereotyping whereby women are perceived as more compliant with lower salaries or bad working conditions, which increases their vulnerability in the labour market. Another study shows that following large-scale land acquisitions in Tanzania, male migrants recorded (slightly) higher vulnerability to food insecurity than migrant women as the off-farm jobs female migrants performed, unlike men’s, were not based on natural resources and were thus less vulnerable to climate change stressors (Atuoye et al., 2021). Furthermore, Sultana et al. (2020) find that, following severe floods in Bangladesh, men who migrate seasonally for work face difficult conditions as they have no access to proper shelter, adequate sanitation or drinking water, and are vulnerable to exploitation in cities.

#### 4.4. Gendered impacts of mobility for those who stay

Category 4 discusses the gendered impacts brought about by mobility for those who stay. An overwhelming majority of these results discuss the consequences of male out-migration for women whereas only two articles explore the impacts of female mobility (Chandra et al., 2017; Yoshioka-Maeda et al., 2018). Many of the results refer to women as “left behind” by their husbands, brothers, or fathers without investigating how women perceive themselves.

The most common finding is that male out-migration overburdens women (especially those working in agriculture) as women take on activities and responsibilities traditionally performed by men in addition to their own. Besides being primarily responsible for household chores, child and elderly care, women become fully responsible for farming activities (Chowdhury & Masud, 2020; Ibnouf, 2011; Sugden et al., 2014) and are burdened with the task of securing food as sole family caretakers (Islam & Shamsuddoha, 2017). They also take on new responsibilities that were previously performed by men such as ox ploughing (Chidakwa et al., 2020), charcoal production (Djoudi & Brockhaus, 2011), small ruminant herding (Djoudi et al., 2013) or home repair (Ingham et al., 2019). In a few instances, the increased workload and involvement of women in agricultural tasks and off-farm employment changes the customary gendered division of labour and traditional roles, including of men as primary breadwinners: In Sudan, Mexico and Zambia during men’s migration intra-household decision-making is transferred onto their female partners, making them the *de facto* heads of households (Ibnouf, 2011; Oswald Spring, 2013; Rosen et al., 2021, respectively). In instances of rapid-onset hazards, the absence of men has “forced the transgression of the cultural taboo of women operating outside of the home” (Ingham et al., 2019, p. 168) as they are in charge of evacuating family members while protecting livestock.

Nonetheless, most results indicate that this redistribution of responsibilities does not necessarily challenge gender relations given that access and control over resources<sup>6</sup> and decision-making remains unchanged. Despite women’s increased roles and responsibilities in agricultural labour during men’s absence, in India and Nepal men continue to make the decisions over how money is spent (Sugden et al., 2014), whereas in Vietnam women (especially older) continue

to lack the rights associated with farm management (Ylipää et al., 2019). In Mali, Djoudi and colleagues (2013) find that gender inequity regarding access to land remains unchanged even if the workload of women has increased due to male migration in the context of droughts, while Brockhaus et al. (2013) show that short-term local male migration has created a new tenure regime no longer regulated by traditional authorities but by annual monetary deals which continues to leave out women from being able to access agricultural land. Only a few results mention a positive impact of male migration on female empowerment: In Vietnam, a high rate of male migration results in increased participation of women in decision-making related to farming activities and cash investments (Nhat Lam Duyen et al., 2021), whereas in Bangladesh women's decision-making improved after the migration of male family members (Chowdhury & Masud, 2020).

The increase in workload aligns with findings from a scoping review on “left-behind women” in the context of international migration (Fernández-Sánchez et al., 2020), but carries additional consequences in environmentally-degraded contexts as it decreases women's options to adapt in or ex-situ, leaving them more vulnerable than men to environmental changes. In Zambia and Bangladesh, it constrains their off-farm employment prospects (Rosen et al., 2021, Penning-Rowell et al. 2013) while in Nigeria it reduces the time they can allocate for agricultural training (Nnadi et al., 2021). In other cases, the absence of men reduces the capacity of women to invest in off-farm activities (Sugden et al., 2014) or limits their access to climate and weather information (Ahmed & Eklund, 2021), forcing them to pursue *in situ* coping strategies with limited resources, which can lead to heavier agricultural losses. When facing sudden-onset events, cultural constraints – and additional factors including poor education, lack of skills, and lack of freedom of choice – limit the coping strategies women can deploy (Ferdous & Mallick, 2019). In some patriarchal communities in India, after flooding and in the absence of their husbands, women cannot benefit from relief funds as they are not considered to be heads of households (Madhuri, 2016). Within the most vulnerable households, male mobility affects not only the partner of those who move – as environmental mobilities research skews heteronormative, partners are women exclusively – but also girls. In Zambia, the financial insecurity generated by climate change impacts can force girls into early marriage as parents are no longer able to care for them (Rosen et al., 2021).

In a few cases, authors discuss the negative consequences that female mobility can bring to the wellbeing of men. For instance, Yoshioka-Maeda and colleagues (2018) explore the physical and mental burden of fathers who, following the nuclear disaster stayed in Fukushima to work even after their families had evacuated. Another study showcases how Bangladeshi women migrating for work is perceived as a manifestation of the male guardian's failure to fulfil his responsibilities as a man (Evertsen & van der Geest, 2020).

## 5. Discussion

A growing number of empirical studies seek to understand how gender, mobilities, and environmental change interact –

over half of the studies in our sample were published from 2018 to 2021 alone. This surge in research suggests an expanding scientific appetite for knowledge on the nexus. Adding more case studies that speak to gender, however, may not significantly advance our theoretical understandings if we ask similar questions from the same vantage points.

A noticeable aspect of the reviewed scholarship is the consistent absence of clear definitions of what ‘gender’ means and how it is operationalized. While discrete case studies have made valuable contributions, our analysis reveals an opportunity to further integrate empirical investigation with theoretical reflections (also highlighted by Gioli & Milan, 2018). Noting a general isolation from other relevant fields, we propose a gendered environmental mobilities research agenda that taps into and builds upon the rich traditions of established disciplines like gender studies, feminist and masculinity studies, and gender and migration.<sup>7</sup> Engaging in dialogue with other fields of study will also help us respond more effectively to environmental changes, including the impacts of climate change, by illuminating what is and is not specific about the vulnerabilities they (re)produce.

One way in which future research could advance our current understanding is by starting with a shared acknowledgment that gender is socially constructed, relational, dynamic, and intersects with other dimensions of identity. Conceptualizing gender as socially constructed can help correct the geographical bias in GEM research. Currently, certain societies' gender norms and values receive disproportionate attention. By focusing more on regions like South America and especially by employing comparative research designs, we might uncover fresh insights that either support or challenge existing findings elsewhere.<sup>8</sup> This approach can enrich our understanding by emphasizing the importance of local contexts rather than seeking a global, reductive, and ultimately unhelpful narrative about how gender intersects with environmental mobilities. Moreover, highlighting gender as a social construct enables future quantitative GEM research to avoid reducing gender to a rigid statistical variable or conflating it with assigned sex.

Qualitative research in our analysis tends to consider the social construction of gender. However, these studies predominantly focus on women at the expense of broader gender relations. This is also a critique directed at the 2012 framework proposed by Chindarkar to analyze the gender dimensions of climate change-induced migration: Gioli and Milan (2018) point out that, while useful in many respects, it falls short in its treatment of gender by equating it solely with women and women with vulnerability. Unfortunately, this remains a valid critique of the field.

Although women-only research marks a significant improvement from gender-blind research, it risks perpetuating the misconception that gender, and gendered vulnerabilities, ‘belong’ to women. The field has overlooked to ask how vulnerabilities are produced for other gender groups in relation to environmental mobilities. Although male out-migration is frequently documented as it increases the burdens for women in areas of origin, it is rarely treated as a possible burden for *men*. The few studies that touch upon men's (im)mobilities through a gender lens indicate that societal pressures to protect and provide can drive them into precarious migration situations (Sams, 2019) or compel them to stay in hazardous

environments despite the associated risks (Yoshioka-Maeda et al., 2018). Through engagement with migration and masculinities research (e.g. Charsley & Wray, 2015; Wojnicka, 2019), we might better understand and critically reflect on gendered vulnerabilities in the male experience of environmental change. Future studies, for instance, could delve into how men experience and respond to the (potential) pressures of ‘migration as adaptation’.

Scholarship in the sample is even more silent on the experiences of non-binary, gender fluid, and transgender individuals and their families in disaster evacuation or preemptive mobility scenarios. While accessing these populations might be challenging due to social stigma and marginalization in certain contexts, deliberately including and comparing diverse gender identities could help counteract the bias toward studying gender primarily as it relates to women. This approach would enable us to move beyond an oversimplified portrayal of women as either victims or champions of the environment (Arora-Jonsson, 2011), depicted as either ‘left behind’ or ‘empowered’ through men’s mobility (and, to a lesser extent, their own).

However, we caution against merely expanding on a gender-as-vulnerability approach. This could inadvertently repeat past mistakes and result in a well-intentioned but misguided ‘add men and stir’ or ‘add non-binary and stir’ solution. Research focusing on understudied gender identities is critical for understanding how all mobilities are enacted and experienced through gender, but, as a field, we should shift toward conceptualizing gender as a dynamic social force and a relational construct. To address this limitation, it is essential to examine gender within the framework of relational and unequal power dynamics. Instead of isolating vulnerabilities associated with women, men, and individuals with diverse gender identities, future GEM research could explore how their experiences are shaped by interactions with other gender groups (Butler, 2004). This perspective transcends the notion that gender is synonymous with women and challenges binary perspectives, rejecting the simplistic “add women and stir” approach (Cornwall & Rivas, 2015). Alongside Lama and colleagues (2021) we advocate for analyzing the relationship between environmental change, gender, and mobilities as a discursive, dynamic process. In a welcome departure from the notion of gender as rigid and fixed in social structures, Boas and colleagues (2023) examine the fluidity of gender relations in Bangladesh and how these are renegotiated in various environmental, social and political contexts.

Lastly, as argued by Kimberlé Crenshaw (1989), gender is constituted at the intersection of various other axes of difference, such as race, ethnicity, sexuality, age, ability, and class, creating diverse needs, vulnerabilities, resistances, and priorities within gender groups. In the context of environmental change, these intersecting identities impact individuals’ freedom to decide whether to stay, leave, or return, and influence the multi-scalar repercussions of their (im)mobilities. To move beyond monolithic, descriptive accounts of (im)mobility decisions and impacts for women, men, and other gender identities, it is imperative that future GEM research embraces more intersectional methodologies (Cundill et al., 2021). By doing so, researchers can critically analyze the sources of vulnerable and privileged social positions *within* gender groups confronting environmental risks (Arora-Jonsson, 2011; Walker et al., 2019).

## 6. Conclusion

In this contribution, we performed a scoping review of 120 articles published between 2010 and 2021 to methodically and comprehensively examine the nature and extent of the empirical evidence on the interlinkages between gender and environmental mobilities. We noted diverse case studies and findings regarding the gendered aspects of (im)mobility decision-making and impacts – for those who leave and those who remain in areas affected by environmental risks. Broadly, existing evidence indicates that men tend to migrate more frequently in response to environmental changes, often seeking employment opportunities. This pattern is shaped by pre-established social norms and gender roles, resulting in women generally being less mobile – although evidence on evacuation is somewhat ambiguous: in certain contexts women show higher evacuation intentions, whereas other studies indicate that they are also more likely to be trapped during disasters. The most common finding in our review was that the migration of men leads to increased responsibilities and burdens for women, exacerbating their pre-existing vulnerabilities to environmental risks. We do not wish to imply that such findings are invalid; instead, we argue that there are opportunities for improvement in future efforts. While it is certainly true that in certain contexts, women exhibit more immobility compared to men, current research fails to investigate the specific characteristics, beyond gender, that differentiate these groups. Furthermore, few have sought to understand agency in women’s immobility choices: women are not necessarily ‘left behind’.

To transcend the restrictive equation of women with immobility, and immobility with vulnerability, we advocate for grounding empirical research in robust theoretical frameworks, connecting to existing conceptualizations of gender in environmental mobilities (e.g. Lama et al., 2021) and expanding upon gender studies, feminist perspectives, and intersectional approaches, among others. Engaging in dialogue with other fields of study will also drive us toward identifying what distinguishes gendered environmental mobilities from gendered mobilities in other contexts.

One relatively simple step forward would be for researchers to dare to define what it is that they mean (and do not mean) by gender. Consistent with the broader literature on gender, we encourage future GEM research to move beyond sex differences and into fluid, relational identities embedded in social power relations, subject to (re)negotiation and shaped by intersecting social identities. Such approaches can help us to analyze and ultimately rectify the structural inequalities driving differential (im)mobility aspirations, opportunities, trajectories, and impacts, rather than assuming gender as the primary social axis mediating the relationship between environmental change and human mobility.

## Notes

1. For a discussion on ‘climate mobilities’ see Boas et al., 2022.
2. The CLIMIG database (<https://climig.com>) systematically tracks scientific peer-reviewed publications connecting migration, the environment and climate change.
3. In October 2021.



4. Power asymmetries (real or perceived) deeply affect the research process as they can impact research access, the interactions between researcher and participants, and the data collected (van den Boogaard, 2019). In some instances, power asymmetries based on race, educational status, class and gender can even be directly tied to the creation and continuation of power asymmetries (Alcalde, 2007) or to the (re)negotiation of gender identities (Arendell, 1997). Feminist and critical theory methodologies have been foundational to the exploration of positionality within research, and could be useful to better acknowledge how researchers' social identities and assumptions impact their work.
5. Data from the Gender Inequality Index – which measures inequality between women and men in health, empowerment and labour market participation – points to lower levels of gender inequality in the USA: while in 2023 the GII in the USA was equal to 0.180, in Bangladesh, India and the Philippines it stood at 0.498, 0.437 and 0.388, respectively (UNDP, 2024).
6. Including land, whose access and ownership is unequally distributed across the world due to customary laws that continue to privilege male inheritance (even if men are away), women's lack of information about land access, and their exclusion in decision-making processes.
7. Also, we can engage with concepts like transnational parenting, for instance, to generate new questions from diverse angles.
8. Additionally, it would be interesting to investigate the origin of researchers publishing studies on the nexus as this, too, affects the production of knowledge. Through a diversification of cases and researcher backgrounds, we might better tease out cultural specificities while also building a more global picture of these dynamics.
9. An initial list of keywords, based on past reviews of environmental mobilities, our own research and terms relevant to research on gender, was piloted in both databases. After rapidly screening the results rendered during these searches, we redefined the search query by adding or deleting relevant concepts and associated keywords.
10. Numbers do not add to 120 as some articles study several regions.

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## Appendix

### Appendix A: Forms to assess the relevance and eligibility of articles

#### Form 1 to assess the relevance of articles

- (1) Does the citation refer to an empirical study?
- (2) Does the citation refer to a study on gender and environmentally-related mobility?

If yes to both questions, include articles. If not, exclude.

#### Form 2 to assess the eligibility of articles

- Research question/aim
- Main findings
- Data source (primary, secondary or both)
- Type of method (quantitative, qualitative, mixed)
- Specific method
- Livelihood of participants
- Geographic level
- Region
- Location of case study (countries)
- Type of hazard (slow or rapid-onset)
- Specific hazard
- Type of migration (internal, cross-border, both)
- Duration of migration
- Characteristic of movement



**Appendix B: Summary of articles included in this review**

Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Adams et al. (2011)	Psychological well-being and risk perceptions of mothers in Kyiv, Ukraine, 19 years after the Chernobyl disaster	Quantitative	No livelihood specified	Subnational	Europe (Ukraine)	Rapid-onset (compound)	No trajectory specified	Evacuation	Category 3
Ahmed and Eklund (2021)	Climate Change Impacts in Coastal Bangladesh: Migration, Gender and Environmental Injustice	Qualitative	Farming	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	Labour migration	Category 4
Ahmed and Kiester (2021)	Do gender differences lead to unequal access to climate adaptation strategies in an agrarian context? Perceptions from coastal Bangladesh	Mixed methods	Farming	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1, Category 2, Category 4
Ajaero (2017)	A gender perspective on the impact of flood on the food security of households in rural communities of Anambra state, Nigeria	Mixed methods	No livelihood specified	Subnational	Africa (Nigeria)	Rapid-onset (single)	From rural areas	Return migration	Category 3
Akinbami (2021)	Migration and Climate Change Impacts on Rural Entrepreneurs in Nigeria: A Gender Perspective	Qualitative	No livelihood specified	Subnational	Africa (Nigeria)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 3
Apatu et al. (2013)	Factors Affecting Household Adoption of an Evacuation Plan in American Samoa after the 2009 Earthquake and Tsunami	Quantitative	No livelihood specified	Subnational	Oceania (American Samoa)	Rapid-onset (multiple)	From rural areas	Evacuation	Category 1
Atuoye et al. (2021)	Who are the losers? Gendered-migration, climate change, and the impact of large scale land acquisitions on food security in coastal Tanzania	Quantitative	No livelihood specified	Subnational	Africa (Tanzania)	Slow-onset (multiple)	No trajectory specified	Immobility, Labour migration	Category 3
Ayeb-Karlsson (2020a)	When the disaster strikes: Gendered (im)mobility in Bangladesh	Mixed methods	No livelihood specified	Subnational	Asia (Bangladesh)	Rapid-onset (single)	No trajectory specified	Evacuation, Immobility	Category 2
Ayeb-Karlsson (2020b)	'I do not like her going to the shelter': Stories on gendered disaster (im)mobility and wellbeing loss in coastal Bangladesh	Qualitative	No livelihood specified	Subnational	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	Evacuation, Immobility	Category 1, Category 2, Category 3
Ayeb-Karlsson (2021)	'When we were children we had dreams, then we came to Dhaka to survive': urban stories connecting loss of wellbeing, displacement and (im)mobility	Qualitative	No livelihood specified	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	To urban areas	Displacement, Immobility, Return migration	Category 3
Baada et al. (2021)	Mothers in a 'Strange Land': Migrant Women Farmers' Reproductive Health in the Brong-Ahafo Region of Ghana	Qualitative	Farming	Subnational	Africa (Ghana)	Slow-onset (multiple)	Rural-rural	No characteristic specified	Category 3
Becerra-Valbuena and Millock (2021)	Gendered migration responses to drought in Malawi	Quantitative	Farming	National	Africa (Malawi)	Slow-onset (single)	From rural areas	Labour and marriage migration	Category 1
Bemzen et al. (2019)	Climate Change-Induced Migration in Coastal Bangladesh? A Critical Assessment of Migration Drivers in Rural Households under Economic and Environmental Stress	Quantitative	Farming, Fishing	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1
Blue (2021)	Gendered constraints on a strategy of regional mobility: Latino/a migration to post-Katrina New Orleans	Mixed methods	No natural-resource based	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Labour migration	Category 3
Bohra-Mishra et al. (2017)	Climate variability and migration in the Philippines	Quantitative	No livelihood specified	National	Asia (Philippines)	Both slow and rapid-onset (multiple)	No trajectory specified	No characteristic specified	Category 1
Brockhaus et al. (2013)	Envisioning the future and learning from the past: Adapting to a changing environment in northern Mali	Qualitative	Farming, Herding	Subnational	Africa (Mali)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1, Category 4

(Continued)

Continued.

Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Broder et al. (2020)	"My Kids Are My Priority": Mothers' Decisions to Evacuate for Hurricane Irma and Evacuation Intentions for Future Hurricanes	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1, Category 2
Buylova et al. (2020)	Household risk perceptions and evacuation intentions in earthquake and tsunami in a Cascadia Subduction Zone	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (multiple)	From urban areas	Evacuation	Category 1
Cahyanto and Pennington-Gray (2015)	Communicating Hurricane Evacuation to Tourists: Gender, Past Experience with Hurricanes, and Place of Residence	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Cahyanto et al. (2014)	An empirical evaluation of the determinants of tourist's hurricane evacuation decision making	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Carriaco and Donato (2019)	Extreme weather and migration: evidence from Bangladesh	Quantitative	Farming, Herding	Subnational	Asia (Bangladesh)	Rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1
Cepeda et al. (2010)	Patterns of substance use among hurricane Katrina evacuees in Houston, Texas	Mixed methods	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	Urban-urban	Evacuation	Category 3
Chakma and Hokugo (2020)	Evacuation Behavior: Why Do Some People Never Evacuate to a Cyclone Shelter During an Emergency? A Case Study of Coastal Bangladesh	Mixed methods	No livelihood specified	Subnational	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	Evacuation	Category 2
Chandra et al. (2017)	Gendered vulnerabilities of smallholder farmers to climate change in conflict-prone areas: A case study from Mindanao, Philippines	Qualitative	Farming	Subnational	Asia (Philippines)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 4
Chen and Cheng (2020)	Evaluation of seismic evacuation behaviour in complex urban environments based on GIS: A case study of Xi'an, China	Quantitative	No livelihood specified	Subnational	Asia (China)	Rapid-onset (single)	From urban areas	Evacuation	Category 1
Chen et al. (2020)	Households' Intended Evacuation Transportation Behavior in Response to Earthquake and Tsunami Hazard in a Cascadia Subduction Zone City	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (multiple)	From urban areas	Evacuation	Category 1
Chidakwa et al. (2020)	Women's Vulnerability to Climate Change: Gender-skewed Implications on Agro-based Livelihoods in Rural Zvishavane, Zimbabwe	Qualitative	Farming	Subnational	Africa (Zimbabwe)	Slow-onset (multiple)	From rural areas	Immobility	Category 4
Chowdhury and Masud (2020)	Impact of Flood-Induced Migration on Livelihood and Gender Relations: A Study on Chulmari, Kurigram   The Consortium on Gender, Security and Human Rights	Qualitative	No livelihood specified	Subnational	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	Labour migration	Category 4
Davis and Bookey (2011)	Farm avisyen pap kase: Respecting the right to health of Haitian women and girls	Qualitative	No livelihood specified	Subnational	Central America & Caribbean (Haiti)	Rapid-onset (single)	To urban areas	Displacement	Category 3
de Mel (2017)	A grammar of emergence: culture and the state in the post-tsunami resettlement of Burgher women of Batticaloa, Sri Lanka	Qualitative	No livelihood specified	Subnational	Asia (Sri Lanka)	Rapid-onset (single)	Rural-rural	Displacement, Relocation	Category 3
Demirchyan et al. (2021)	Predictors of permanent emigration in a long-term cohort of Spitak earthquake survivors in Armenia	Quantitative	No livelihood specified	Subnational	Asia (Armenia)	Rapid-onset (single)	No trajectory specified	No characteristic specified	Category 1
Dillon et al. (2011)	Migratory Responses to Agricultural Risk in Northern Nigeria	Quantitative	Farming	Subnational	Africa (Nigeria)	Slow-onset (single)	From rural areas	No characteristic specified	Category 1, Category 2
Djoudi and Brockhaus (2011)	Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali	Qualitative	Livestock and forest-based	Subnational	Africa (Mali)	Slow-onset (single)	From rural areas	Immobility, Micro-mobility	Category 4
Djoudi et al. (2013)	Once there was a lake: vulnerability to environmental changes in northern Mali	Qualitative	Livestock and forest-based	Subnational	Africa (Mali)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 4
Do (2019)	Fukushima Nuclear Disaster displacement: How far people moved and determinants of evacuation destinations	Quantitative	No livelihood specified	Subnational	Asia (Japan)	Rapid-onset (compound)	From urban areas	Evacuation	Category 1

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Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Enete et al. (2016)	Socioeconomic assessment of flooding among farm households in Anambra state, Nigeria	Quantitative	Farming	Subnational	Africa (Nigeria)	Rapid-onset (single)	From rural areas	No characteristic specified	Category 1,
Evertsen and van der Geest (2020)	Gender, environment and migration in Bangladesh	Qualitative	Farming, Fishing	Subnational	Asia (Bangladesh)	Slow-onset (single)	Rural-urban	Labour migration	Category 2
Farmer et al. (2018)	Scared of the Shelter from the Storm: Fear of Crime and Hurricane Shelter Decision Making	Qualitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1, Category 3, Category 4
Ferdous and Mallick (2019)	Norms, practices, and gendered vulnerabilities in the lower Teesta basin, Bangladesh	Qualitative	Farming	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 2, Category 4
Gartrell et al. (2020)	Disaster experiences of women with disabilities: Barriers and opportunities for disability inclusive disaster risk reduction in Cambodia	Mixed methods	Farming	Subnational	Asia (Cambodia)	Both slow and rapid-onset (multiple)	From rural areas	Evacuation, Immobility	Category 2
Gautam (2017)	Seasonal Migration and Livelihood Resilience in the Face of Climate Change in Nepal	Mixed methods	Farming	Subnational	Asia (India, Nepal)	Slow-onset (multiple)	Rural-urban	Labour migration	Category 1
Gray (2010)	Gender, Natural Capital, and Migration in the Southern Ecuadorian Andes	Quantitative	Farming, Herding	Subnational	South America (Ecuador)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1, Category 2
Gray and Mueller (2012)	Natural disasters and population mobility in Bangladesh	Quantitative	No livelihood specified	National	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	No characteristic specified	Category 1
Gray and Mueller (2012)	Drought and Population Mobility in Rural Ethiopia	Quantitative	Farming, Herding	Subnational	Africa (Ethiopia)	Slow-onset (single)	From rural areas	Labour and marriage migration	Category 1, Category 2
Gray et al. (2014)	Studying Displacement After a Disaster Using Large Scale Survey Methods: Sumatra After the 2004 Tsunami	Quantitative	No livelihood specified	Subnational	Asia (Indonesia)	Rapid-onset (single)	No trajectory specified	Displacement	Category 1
Haque et al. (2020)	The effects of household's climate-related displacement on delivery and postnatal care service utilization in rural Bangladesh	Quantitative	No livelihood specified	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	Displacement	Category 3
Hidayati (2021)	Migration as a coping strategy of Indonesian farmers in the face of climate change	Qualitative	Farming	Subnational	Asia (Indonesia)	Both slow and rapid-onset (multiple)	From rural areas	Labour migration	Category 1
Ibnouf (2011)	Challenges and possibilities for achieving household food security in the Western Sudan region: the role of female farmers	Mixed methods	Farming	Subnational	Africa (Sudan)	Slow-onset (single)	From rural areas	No characteristic specified	Category 4
Ingham et al. (2019)	Adaptive flood mobilities in Bangladesh	Qualitative	No livelihood specified	National	Asia (Bangladesh)	Rapid-onset (multiple)	From rural areas	No characteristic specified	Category 4
Islam and Shamsuddoha (2017)	Socioeconomic consequences of climate induced human displacement and migration in Bangladesh	Qualitative	No livelihood specified	National	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	No trajectory specified	Displacement, Immobility	Category 4
Jacobson et al. (2019)	When is migration a maladaptive response to climate change?	Quantitative	No livelihood specified	Subnational	Asia (Cambodia)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1
Joarder and Miller (2013)	Factors affecting whether environmental migration is temporary or permanent: Evidence from Bangladesh	Quantitative	Resource-based livelihood	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	No trajectory specified	No characteristic specified	Category 1
Kaimba et al. (2011)	Effects of cattle rustling and household characteristics on migration decisions and herd size amongst pastoralists in Baringo District, Kenya	Quantitative	Transhumance pastoralism	Subnational	Africa (Kenya)	Rapid-onset (multiple)	From rural areas	Labour migration	Category 1
Kamo et al. (2011)	Displaced Older Adults' Reactions to and Coping With the Aftermath of Hurricane Katrina	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From urban areas	Displacement, Evacuation	Category 3

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Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Khalil et al. (2020)	Female contribution to grassroots innovation for climate change adaptation in Bangladesh	Mixed methods	Farming, Fishing	Subnational	Asia (Bangladesh)	Rapid-onset (single)	Rural-urban	No characteristic specified	Category 4
Khan et al. (2018)	Women's perspectives of small-scale fisheries and environmental change in Chilika lagoon, India	Qualitative	Fishing	Subnational	Asia (India)	Both slow and rapid-onset (multiple)	From rural areas	Labour migration	Category 1, Category 4
Kuligowski et al. (2020)	Modelling evacuation decision-making in the 2016 Chimney Tops 2 fire in Gatlinburg, TN	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From urban areas	Evacuation	Category 1
Kulkarni et al. (2017)	Evacuations as a Result of Hurricane Sandy: Analysis of the 2014 New Jersey Behavioral Risk Factor Survey	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Kumasi et al. (2019)	Small-holder farmers' climate change adaptation practices in the Upper East Region of Ghana	Mixed methods	Farming	Subnational	Africa (Ghana)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1
Kyne and Donner (2018)	Kyne – Donner Model of Authority's Recommendation and Hurricane Evacuation Decisions: A Study of Hypothetical Hurricane Event in the Rio Grande Valley, Texas	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Lama (2018)	Gendered consequences of mobility for adaptation in small island developing states: case studies from Maafushi and Kudafari in the Maldives	Qualitative	Fishing	Subnational	Asia (Maldives)	Slow-onset (multiple)	No trajectory specified	Labour migration	Category 1, Category 2
Li et al. (2010)	Katrina and Migration: Evacuation and Return by African Americans and Vietnamese Americans in an Eastern New Orleans Suburb	Mixed methods	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation, Return migration	Category 1
Lim, et al. (2019)	Flood evacuation decision modelling for high risk urban area in the Philippines	Quantitative	No livelihood specified	Subnational	Asia (Philippines)	Rapid-onset (single)	From urban areas	Evacuation	Category 1, Category 2
Lindvall et al. (2020)	Health Status and Health Care Needs of Drought-Related Migrants in the Horn of Africa-A Qualitative Investigation	Qualitative	No livelihood specified	Subregional	Africa (Ethiopia, Kenya, Somalia)	Both slow and rapid-onset (multiple)	No trajectory specified	Displacement	Category 3
Madhuri (2016)	The Impact of Flooding in Bihar, India on Women	Qualitative	No livelihood specified	Subnational	Asia (India)	Rapid-onset (single)	No trajectory specified	Displacement, Evacuation	Category 1, Category 2, Category 4
Mallick and Vogt (2012)	Cyclone, coastal society and migration: empirical evidence from Bangladesh	Mixed methods	Farming	Subnational	Asia (Bangladesh)	Rapid-onset (single)	Rural-urban	No characteristic specified	Category 1, Category 4
Mallick and Vogt (2013)	Population displacement after cyclone and its consequences: empirical evidence from coastal Bangladesh	Quantitative	Resource-based livelihood	Subnational	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	Displacement	Category 1, Category 4
Massey et al. (2010)	Environmental change and out-migration: evidence from Nepal	Quantitative	Farming, Herding	Subnational	Asia (Nepal)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1, Category 2
Merdjanoff (2013)	There's no place like home: Examining the emotional consequences of Hurricane Katrina on the displaced residents of New Orleans	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From urban areas	Displacement	Category 3
Meyer et al. (2018)	Previous hurricane evacuation decisions and future evacuation intentions among residents of southeast Louisiana	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Morita et al. (2018)	Demographic transition and factors associated with remaining in place after the 2011 Fukushima nuclear disaster and related evacuation orders	Quantitative	No livelihood specified	Subnational	Asia (Japan)	Rapid-onset (compound)	From urban areas	Evacuation, Immobility	Category 1, Category 2
Moriyama et al. (2017)	Effect of Residence in Temporary Housing After the Great East Japan Earthquake on the Physical Activity and Quality of Life of Older Survivors	Quantitative	No livelihood specified	Subnational	Asia (Japan)	Rapid-onset (compound)	Rural-rural	Evacuation	Category 3

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Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Mudombi and Muchie (2013)	Perceptions of water access in the context of climate change by rural households in the Seke and Murewa districts, Zimbabwe	Quantitative	Farming	Subnational	Africa (Zimbabwe)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1
Mueller et al. (2014)	Heat stress increases long-term human migration in rural Pakistan	Quantitative	Farming	National	Asia (Pakistan)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1
Mueller et al. (2020)	Do social protection programmes foster short-term and long-term migration adaptation strategies? A comparative analysis of gender and youth issues in rice production in North, Central, and South Vietnam	Quantitative	Farming	Subnational	Africa (Zambia)	Slow-onset (multiple)	From rural areas	No characteristic specified	Category 1
Nhat Lam Duyen et al. (2021)	Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso	Quantitative	Farming	Subnational; Comparative	Asia (Vietnam)	Both slow and rapid-onset (multiple)	No trajectory specified	Labour migration	Category 4
Nielsen and Reenberg (2010)	Climate change and women's place-based vulnerabilities – a case study from Pakistani highlands	Mixed methods	Resource-based livelihood	Subnational	Africa (Burkina Faso)	Slow-onset (multiple)	From rural areas	Labour migration	Category 1
Nizami and Ali (2017)	The effect of climate information in pastoralists' adaptation to climate change: A case study of Rwenzori region, Western Uganda	Mixed methods	Farming	Subnational	Asia (Pakistan)	Both slow and rapid-onset (multiple)	Rural-urban	Immobility	Category 4
Nkuba et al. (2019)	Impacts of variability and change in rainfall on gender of farmers in Anambra, Southeast Nigeria	Mixed methods	Transhumance pastoralism	Subnational	Africa (Uganda)	Both slow and rapid-onset (multiple)	Rural-rural	Labour migration	Category 1
Nnadi et al. (2019)	Equity and implications of response strategies on gender relations: Identifying ways of mainstreaming gender into response strategies in Southeast Nigeria	Mixed methods	Farming	Subnational	Africa (Nigeria)	Slow-onset (single)	From rural areas	Labour migration	Category 4
Nnadi et al. (2021)	At the intersections of multiple marginalisations: displacements and environmental justice in Mexico and Ethiopia	Mixed methods	Farming	Subnational	Africa (Nigeria)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 4
Nygren and Wayessa (2018)	Gender and climate change in the Indian Himalayas: global threats, local vulnerabilities, and livelihood diversification at the Nanda Devi Biosphere Reserve	Mixed methods	No livelihood specified	Subnational; Comparative	Africa, North America (Ethiopia, Mexico)	Both slow and rapid-onset (multiple)	Rural-rural; Urban-urban	Displacement, Relocation	Category 3
Ogra and Badola (2015)	Evacuation and Risk of Hypertension After the Great East Japan Earthquake: The Fukushima Health Management Survey	Mixed methods	Farming	Subnational	Asia (India)	Both slow and rapid-onset (multiple)	From rural areas	Labour migration, Micro-mobility	Category 4
Ohira et al. (2016)	Dual vulnerability among female households	Quantitative	No livelihood specified	Subnational	Asia (Japan)	Rapid-onset (compound)	No trajectory specified	Evacuation	Category 3
Oswald Spring (2013)	Climate Change, Migration and Women: Analysing Construction Workers in Odisha	Mixed methods	Farming	Subnational	North America (Mexico)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 4
Patel and Giri (2019)	Cyclone evacuation in Bangladesh: Tropical cyclones Gorky (1991) vs. Sidr (2007)	Quantitative	Not natural resource – based	Subnational	Asia (India)	Both slow and rapid-onset (multiple)	To urban areas	No characteristic specified	Category 3
Paul et al. (2010)	The 'last resort'? Population movement in response to climate-related hazards in Bangladesh	Qualitative	No livelihood specified	Subnational; Comparative	Asia (Bangladesh)	Rapid-onset (single)	From rural areas	Evacuation	Category 2
Penning-Rowell et al. (2013)	Heterogeneous Evacuation Responses to Storm Forecast Attributes	Qualitative	Farming	National	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 1, Category 4
Petrolia et al. (2011)		Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1

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Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Picardo et al. (2010)	Physically and sexually violent experiences of reproductive-aged women displaced by Hurricane Katrina	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Displacement	Category 3
Reid and Rezek (2011)	Stress and Support in Family Relationships After Hurricane Katrina	Qualitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	Urban-urban	Displacement	Category 3
Reininger et al. (2013)	Intention to comply with mandatory hurricane evacuation orders among persons living along a coastal area	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Roberson et al. (2012)	Attitudes on wildfire evacuation: Exploring the intended evacuation behaviour of residents living in two Southern California communities	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From rural areas	Evacuation	Category 1, Category 2
Rød et al. (2012)	Risk communication and the willingness to follow evacuation instructions in a natural disaster	Quantitative	No livelihood specified	Subnational	Europe (Norway)	Rapid-onset (multiple)	No trajectory specified	Evacuation	Category 1
Rosen et al. (2021)	"Burnt by the scorching sun": climate-induced livelihood transformations, reproductive health, and fertility trajectories in drought-affected communities of Zambia	Qualitative	Farming	Subnational	Africa (Zambia)	Slow-onset (single)	From rural areas	No characteristic specified	Category 4
Sadri et al. (2015)	Hurricane Evacuation Route Choice of Major Bridges in Miami Beach, Florida	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From urban areas	Evacuation	Category 1
Sams (2019)	Climate Induced Migration and Social Mobility Among Migrants: Evidence from the Southwest Coastal Region of Bangladesh	Qualitative	No livelihood specified	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	Rural-urban	No characteristic specified	Category 3
Samuels (2012)	Moving from Great Love: Gendered Mobilities in a Post-Tsunami Relocation Neighborhood in Aceh, Indonesia	Qualitative	No livelihood specified	Subnational	Asia (Indonesia)	Rapid-onset (single)	Urban-rural	Micro-mobility, Relocation	Category 3
Sezgin and Punamäki (2016)	Women's disaster-related mental health: The decision to leave or to stay after an earthquake	Quantitative	No livelihood specified	Subnational	Europe (Turkey)	Rapid-onset (single)	From urban areas	Relocation	Category 3
Simelton et al. (2021)	When the "Strong Arms" Leave the Farms – Migration, Gender Roles and Risk Reduction in Vietnam	Mixed methods	Farming	Subnational; Comparative	Asia (Vietnam)	Rapid-onset (multiple)	From rural areas	Labour migration	Category 4
Singh (2014)	Women, Environment and Sustainable Development: A Case Study of Khul Gad Micro Watershed of Kumoun Himalaya	Quantitative	Farming	Subnational	Asia (India)	Slow-onset (multiple)	Rural-urban	Labour migration	Category 4
Sloand et al. (2017)	Experiences of violence and abuse among internally displaced adolescent girls following a natural disaster	Mixed methods	No livelihood specified	Subnational	Central America & Caribbean (Haiti)	Rapid-onset (single)	To urban areas	Protracted displacement	Category 3
Sugden et al. (2014)	Agrarian stress and climate change in the Eastern Gangetic Plains: Gendered vulnerability in a stratified social formation	Mixed methods	Farming	Subregional	Asia (India, Nepal)	Both slow and rapid-onset (multiple)	From rural areas	No characteristic specified	Category 4
Sultana et al. (2020)	Coping and resilience in riverine Bangladesh	Mixed methods	Farming, Herding	Subnational	Asia (Bangladesh)	Both slow and rapid-onset (multiple)	Rural-urban	Evacuation, Labour migration	Category 1, Category 3
Tanyag (2018)	Resilience, Female Altruism, and Bodily Autonomy: Disaster-Induced Displacement in Post-Haiyan Philippines	Qualitative	No livelihood specified	Subnational	Asia (Philippines)	Rapid-onset (single)	No trajectory specified	Protracted displacement	Category 3
Temple et al. (2011)	Teen dating violence and substance use following a natural disaster: does evacuation status matter?	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (single)	From urban areas	Evacuation, Immobility	Category 4
Thiede and Gray (2017)	Heterogeneous climate effects on human migration in Indonesia	Quantitative	Farming	National	Asia (Indonesia)	Slow-onset (multiple)	No trajectory specified	No characteristic specified	Category 1, Category 2
Tyler and Fairbrother (2018)	Gender, households, and decision-making for wildfire safety	Qualitative	No livelihood specified	National	Oceania (Australia)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1, Category 2

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Author (year)	Title	Type of Method	Livelihood	Geographic level	Region (countries)	Type of hazard	Trajectory	Characteristic of movement	Category(ies)
Udas et al. (2018)	Gendered Vulnerabilities in Diaras	Qualitative	Farming	Subnational	Asia (India)	Rapid-onset (single)	From rural areas	No characteristic specified	Category 1, Category 3, Category 4
Vázquez et al. (2018)	Risk Perceptions of Future Hurricanes: Survey Evidence from the Northeastern and Mid-Atlantic United States	Quantitative	No livelihood specified	Subnational	North America (USA)	Rapid-onset (multiple)	No trajectory specified	Evacuation	Category 3
Weinreb et al. (2020)	Effects of changes in rainfall and temperature on age – and sex-specific patterns of rural-urban migration in sub-Saharan Africa	Quantitative	No livelihood specified	Regional	Africa (Many)	Slow-onset (multiple)	Rural-urban	No characteristic specified	Category 1
Whittaker et al. (2016)	Gendered responses to the 2009 Black Saturday bushfires in Victoria, Australia	Mixed methods	No livelihood specified	Subnational	Oceania (Australia)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1, Category 2
Witvorapong et al. (2015)	Social Participation and Disaster Risk Reduction Behaviors in Tsunami Prone Areas	Quantitative	No livelihood specified	Subnational	Asia (Thailand)	Rapid-onset (single)	No trajectory specified	Evacuation	Category 1
Xu et al. (2017)	Influences of Sense of Place on Farming Households' Relocation Willingness in Areas Threatened by Geological Disasters: Evidence from China	Quantitative	Farming	Subnational	Asia (China)	Rapid-onset (single)	From rural areas	Relocation	Category 1
Ylipaa et al. (2019)	Climate Change Adaptation and Gender Inequality: Insights from Rural Vietnam	Qualitative	Farming	Subnational	Asia (Vietnam)	Both slow and rapid-onset (multiple)	From rural areas	Immobility, Labour migration	Category 2, Category 4
Yoshioka-Maeda et al. (2018)	Difficulties of fathers whose families evacuated voluntarily after the Fukushima nuclear disaster	Qualitative	Not natural resource – based	Subnational	Asia (Japan)	Rapid-onset (compound)	From urban areas	Evacuation, Immobility	Category 4
Zahlawi et al. (2019)	Psychosocial support during displacement due to a natural disaster: relationships with distress in a lower-middle income country	Quantitative	No livelihood specified	Subnational	Oceania (Vanuatu)	Rapid-onset (single)	Rural-rural	Displacement, Return migration	Category 3
Zander and Garnett (2020)	Risk and experience drive the importance of natural hazards for peoples' mobility decisions	Quantitative	No livelihood specified	Subnational; Comparative	Asia, Oceania (Australia, Philippines)	Both slow and rapid-onset (multiple)	No trajectory specified	No characteristic specified	Category 1
Zander et al. (2016)	Exploring the effect of heat on stated intentions to move	Quantitative	No livelihood specified	National	Oceania (Australia)	Slow-onset (single)	No trajectory specified	Relocation	Category 1
Zander et al. (2019)	Human mobility intentions in response to heat in urban South East Asia	Quantitative	No livelihood specified	Subregional	Asia (Indonesia, Malaysia, Philippines)	Slow-onset (single)	From urban areas	No characteristic specified	Category 1