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CENTER FOR STUDY OF SCIENCE, TECHNOLOGY & POLICY

CLIMATE MIGRATION

Unravelling the nexus between climate change and migration with an intersectional focus

Climate Migration:

Unravelling the Nexus Between Climate Change and Migration With an Intersectional Focus

Center for Study of Science, Technology and Policy

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Executive Summary

Contemporary migration is complex and diverse. Since the 1980s, human mobility has been increasingly linked to climate change, particularly because of the impacts of sea-level rise and coastal erosion and the changes in frequency, occurrence, and intensity of natural disasters. While migration as a response to climate-induced phenomena can take many shapes and forms, research has shown that it is extremely difficult to isolate a clear link between the two. Therefore, over the last decade, there has been a shift away from conceptualising climate mobilities as mass international movements of climate refugees, triggered as a response to environmental impacts. Instead, there is an increased focus on smaller-scale, contextually determined human mobilities to incorporate a wide range of mobility patterns of varying temporalities and spatialities. Immobilities, either voluntary or forced, and the various factors that drive these decisions are also being increasingly considered an integral part of this conceptualisation of climate migration.

The impacts of climate drivers on mobility are therefore highly context-specific and often intersect with other economic, political, social, cultural, and demographic factors. Also, climate change impacts exacerbate pre-existing socio-economic vulnerabilities and everyday risks. Therefore, decisions to migrate (or not to) and the specific migratory outcomes that may emerge are dependent on how these complex interactions occur in a given context. As climate change impacts are not uniform across all populations, the specific outcomes may vary for different individuals even within the same household. Vulnerabilities and risks, both environmental and nonenvironmental, are closely linked to experiences of identity.

Against this backdrop, this report explores the nexus between climate change and migration with an intersectional lens. The objective is to reconceptualise climate migration with its pluralities, identify key components, and map these complex phenomena.

In our conceptualisation of climate migration, **first**, we **emphasise the interplay of contextual stressors** that come together in multiple ways to shape everyday risks, vulnerabilities, and adaptive capacities. **Second**, **we explore the role of adaptive capacities of individuals and groups** in the processes of climate migration. Adaptive capacities play a critical role in determining responses to various risks based on differential risk perceptions and lived experiences. **Third**, **we consider the interconnections between various adaptation strategies.** These strategies are typically **multiple and multiscalar** depending on the location of risks and the nature of thresholds that are surpassed to cope with the risks experienced. Climate migration has both spatial and temporal dimensions. To gain insights into the intersectional experiences of this spatio-temporality, **we focus on households that are usually stretched**

through migration, which results in differential adaptation responses both within and across households.

To contextualise this proposed framework and test its robustness, the report examines five case studies from the Indian context. These include (1) migratory movements of the pastoral community from western Rajasthan and Gujarat's Kuchchh region, (2) migratory patterns emerging in the semi-arid region of Kolar in Karnataka, (3) drought-triggered migration in Odisha and West Bengal, (4) rural out-migration in the Uttarakhand region of the Himalayas, and (5) migration triggered by recurrent and intense flooding in Bihar and Assam. The case studies provide a glimpse into the vast geographical and sociocultural diversities in India while presenting various adaptation strategies that emerge from each context. These adaptation strategies may lead to mobility outcomes for certain individuals while rendering others immobile.

Drawing from the findings of the case studies discussed, the analysis focuses on identifying (1) triggers that initiate various adaptation strategies (including mobility outcomes) to cope with different risks, (2) repercussions of migratory decisions and outcomes, and (3) different factors that impact adaptive capacities of individuals and groups and shape various adaptation strategies (including decisions to migrate).

Our proposed framework aims to function **as a holistic system mapping tool** for studying **climate migration**, which allows the identification of potential grey areas, where proactive responses can be tailored at an appropriate scale and location. The framework also demonstrates the potential for scaling and replication to various project objectives, employing different research methods at multiple scales as a way forward.

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Abbreviations

ADB	Asian Development Bank
AR5	The Intergovernmental Panel on Climate Change's (IPCC's) Fifth Assessment Report
AR6	IPCC's Sixth Assessment Report
GSDP	Gross State Domestic Product
IPCC	The Intergovernmental Panel on Climate Change
NRC	National Register of Citizens
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act 2005
NSS	National Sample Survey
TERI	The Energy and Resources Institute
UN	United Nations
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNDPPA	The Department of Political and Peacebuilding Affairs (DPPA)
PBSO	Peace Building Support Office
WMO	World Meteorological Organization

1. Introduction

Contemporary migration is complex and triggered by contextual intersections of economic, political, social, cultural, demographic, and environmental factors. The migratory patterns that emerge are also complex and often mixed. Mixed migrations can occur in combinations of internal and international, voluntary and forced, and skilled and unskilled. They can be triggered by conflict, environmental reasons, or other factors and can be temporary, permanent, or circular movements (Vertovec, 2015). Research indicates that while economic drivers continue to impact human mobility (both within and across nation-states), environmental factors are also significant drivers, particularly climate change (Hugo & Bardsley, 2014). The Intergovernmental Panel on Climate Change's (IPCC's)[1] Sixth Assessment Report (AR6) noted that climate change acts as direct drivers (through climatic hazards) and indirect drivers (through deteriorating climate-sensitive livelihoods) of human mobility and displacement (IPCC, 2022).

Since the mid-1980s, climate change has been increasingly linked to population movements, particularly because of its impacts on sea level, coastal erosion, inundation, and the change in the frequency, occurrence, and intensity of natural disasters (Brown, 2008, as cited in Detraz & Windsor, 2014). Globally, the Asia and the Pacific region has been identified as one of the most adversely impacted by climate hazards[2] such as floods, droughts, soil degradation, typhoons, and cyclones, resulting in the displacement of a large number of people (Asian Development Bank, 2012; Pörtner et al., 2022). In India alone, nearly 20 million people were impacted by climate-change hazards in 2020 (Bharadwaj et al., 2022).

Climate change and climate-related hazards affect livelihoods and food security, increase exposure to disease, worsen poverty, increase competition over resources, and create political and economic instability in addition to altering or triggering human mobility and increasing the loss of life (Bharadwaj et al., 2022; Detraz & Windsor, 2014; United Nations Environment Programme, UN Women, UNDP and UNDPPA/PBSO, 2020). According to the IPCC, climate change also impacts economic, social, and cultural assets and investments; infrastructure; services (including ecosystem services); ecosystems; and species (Reisinger et al., 2020).

[1] The **IPCC** was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) and is endorsed by the United National General Assembly to study the nature and consequences of climate change.

[2] **Hazard**: 'The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources' (IPCC, 2019, pp. 814–815)

A recent report on gender, climate, and security described climate change as the 'ultimate "threat multiplier"' of the 21st century as it exacerbates existing vulnerabilities, especially to those already at risk (United Nations Environment Programme, UN Women, UNDP and UNDPPA/PBSO, 2020, p. 9). The IPCC (2019, p. 822) defines *risk* as

> the potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential *impacts* of climate change as well as human *responses* to climate change.

Everyday risks also emanate from pre-existing vulnerabilities based on existing sociopolitical structures and social differences (among other factors), resulting in varying levels of exclusion and inclusion. This positionality in turn determines the adaptive capacities[3] of different individuals and groups involved (based on their intersecting identities) to respond to multiple risks presented in a context. As the IPCC (2022, p. 53) also notes, 'the intersection of gender with race, class, ethnicity, sexuality, indigenous identity, age, disability, income, migrant status and geographical location often compounds vulnerability to climate change impacts (very high confidence), exacerbates inequity and creates further injustice (high confidence)'.

Migration that emerges as a response to or in anticipation of climate hazards or anthropogenic climate change occurs in many forms and patterns based on contextual vulnerabilities and risks. And given its growing importance, migration as a response to climate-induced phenomena has increasingly gained attention among researchers and policymakers alike. However, McLeman et al. (2021) stated that this body of literature has evolved slightly independent from the climate change scholarship. Further, Cattaneo et al. (2019, pp. 1–2) highlighted the lack of a 'unified theoretical approach that adequately represents the relationship between climate change and human mobility'. Also, there is limited research linking climate change, gender, and mobility where gender is not reduced to a binary categorisation or applied as a mere statistical entity (Lama et al., 2021).

At the policy level, too, the recognition of the impact of climate change on pre-existing socio-economic vulnerabilities and everyday risks, particularly for the marginalised and the poor, is limited (Rao et al., 2021). Further, as Cundill et al. (2021, p. 2) noted, 'a major research unknown is how multiple drivers interact with one another, in the context of intersecting social vulnerabilities, to render some people mobile and others immobile'. Therefore, the conditions

[3] **Adaptive capacity**: 'The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences' (IPCC, 2019, p. 804)

that trigger as well as prevent mobility outcomes are equally important in the context of climate migration to understand the intersectional experiences and impacts for those at risk.

However, as prior research (for example, see Bardsley & Hugo, 2010; Lama et al., 2021) suggests, one of the major challenges in framing climate migration is the difficulty in establishing a clear link between decisions to migrate and environmental factors. The 'scarcity of good data' to understand the environmental effects on migration is another challenge (Massey et al., 2010, p. 2) although, more recently, there has been significant growth in studies linking climatic drivers and migration (Cattaneo et al., 2019). Also, there is increased availability of data on climatic factors (both slow onset as well as data measuring sudden onset climatic hazards) and human migration at both micro and macro levels (Beine & Jeusette, 2021).

Climate change as a migration trigger is often embedded within other contextual economic factors where issues such as poverty, 'population pressures, malnutrition, landlessness, unemployment, over-rapid urbanization, pandemic diseases and government shortcomings, together with ethnic strife and conventional conflicts' can further exacerbate the push factors for migration (Bhagat & Rajan, 2017, p. 2). Similarly, Cundill et al. (2021) emphasised that migration is not always driven by climate change even within the hotspots of climate change. Education, health, job opportunities, and marriage are some of the major drivers of migration. *Environmental migrants* are harder to distinguish unless the impact of the environmental change is so overwhelming that it triggers a forced movement of a visibly significant population.

Human mobility is often one of the several adaptive responses to an increase in perceived risk[4], and this interrelationship would be increasingly important for considering future impacts on (multiple) mobility patterns within a specific context (Bardsley & Hugo, 2010; Cattaneo et al., 2019). Also, it is important to emphasise that an increase in vulnerability to climate change does not necessarily mean an increase in the probability of migration (Cattaneo et al., 2019). Despite the intent to move, not all individuals or groups have the capacity to move or want to move, irrespective of the risk posed. Zickgraf (2021) observed that when faced with the same adverse conditions, the proportion of people who leave is often lower than those who stay. Immobility and mobility are dynamic, often mixed, and relational (Boas et al., 2022).

Therefore, there is a need to further explore the interconnections between climate change and migration by reconceptualising risks and vulnerabilities within the interplay of multiple contextual stressors impacting different mobility (and immobility) outcomes for different individuals while also simultaneously considering the dynamic interrelationship between

[4] **Risk perception**: 'The subjective judgment that people make about the characteristics and severity of a risk' (IPCC, 2019, p. 822)

different places involved in the migration processes. Understanding contextual vulnerabilities will also need an intersectional lens as climate change experiences and impacts are not uniform across all individuals.

There is an increased awareness in the climate change scholarship that perceptions of risk and its impacts on people are determined by the social position and multiple (and often intersecting) experiences of identity although there is limited disaggregated and contextually embedded data available (Rao et al., 2021). The extension of this discussion (on positionality) within the nexus between climate change and migration is further limited and under-researched with respect to (a) impacts on women and marginalised populations (Chindarkar, 2012) and (b) different mobility and immobility outcomes emanating from these intersections (Cundill et al., 2021).

This report primarily aims to unravel some of the complexities and nuances that emerge at these multiple intersections.

2. Climate Change and Migration in India

Climate change impacts are a particularly important consideration in the Asian context as a large percentage of the population is poor, facing several developmental challenges, and experiencing exacerbated vulnerabilities due to environmental hazards and the degradation of natural resources. In particular, India is witnessing a constant rise in average annual temperatures along with shifts in annual rainfall and standard precipitation index, causing increased frequency of cyclones, droughts, floods, landslides, lightning, hailstorms, and dust storms (IMD, 2021, as cited in Bharadwaj et al., 2022), making it one of the most vulnerable countries to climate change (Bhagat, 2017a).

- India's average temperatures are projected to increase by 1.1°C–4.1°C, over the 1986–2005 baseline, by the end of the century (*Climate Risk Country Profile: India*, 2021).
- With 4°C warming, there is a likelihood of increased occurrence of extremely wet monsoons, from once in 100 years to once in every 10 years by the end of the century (The World Bank, 2013).
- Between 2021–2050, the projected number of heatwaves will continue to increase, and the temperature will increase by 4.5°C to 6.4°C from the normal (CSTEP, 2022).
- Droughts are expected to be more frequent, particularly in north-western India, Jharkhand, Orissa, and Chhattisgarh. Overall crop yields will significantly decline by the 2040s because of frequent droughts (The World Bank, 2013).

India is differently exposed to climate change on multiple fronts owing to its diverse geography, which includes 8,000 km of coastline, vast glaciers in the Himalayas, and 70 million hectares of forests. Broadly, there are six physiographic regions in the country: 'Himalayan mountains in the north, Peninsular Deccan Plateau, the Indo-Gangetic Plains, Thar Desert in the west, Coastal Plain, and the Islands', where each region experiences a differential climate change impact (*Climate Risk Country Profile: India*, 2021, p. 5).

Overall, a large portion of India's land surface is experiencing degradation because of issues such as salination, alkalisation, waterlogging, and wind erosion (*Climate Risk Country Profile: India*, 2021). While these issues are triggered by poor land management practices, they are exacerbated by climate change through dryland expansion and desertification processes, and India's central region is the most at risk to these changes. In drylands and desert regions in the north-western part of India, precipitation levels are increasing, and the likelihood of an increase in droughts in the long run is high.

India's long coastline is particularly vulnerable as many sections are low-lying and densely populated (*Climate Risk Country Profile: India*, 2021). Sea-level rise is causing an increased risk of floods, and tropical storms can trigger large-scale human displacement and relocation to higher-elevation areas (Bhagat, 2017a). One study notes that the sea levels have already increased by 8.5 centimetres over the last 50 years, with a prediction of 36 million Indians living in chronic flooding areas to be impacted by 2100 (Panda, 2020). The eastern coast is the most vulnerable because of the significantly high number of cyclones observed in the Bay of Bengal in the last century (Bhagat, 2017a).

Bhagat (2017a) also reported that human-induced triggers exacerbate climate change events. For example, the Western Ghats, which extends over 160,000 km, has witnessed increased urbanisation and tourism, thereby impacting the biodiversity in the region and possibly altering temperatures and precipitation levels. Similarly, increased development activities in the Himalayan region have caused land degradation and deforestation.

While nearly 1% of the population, comprising 20 million people, was affected by climate-related hazards in the year 2020 alone, the number is likely to increase in the absence of adaptation measures. A recent report projects 13 to 34 million people to be impacted by extreme river floods by the 2040s and another 5 to 18 million to be affected by coastal flooding from the 2070s to the end of the century (*Climate Risk Country Profile: India*, 2021). Those living in the climatic hotspots of coastal areas, mountain ranges, semi-arid regions, and cities—particularly the vulnerable and the poor—are some of the worst affected (Rao et al., 2021).

Also, nearly 70% of the population lives in rural areas, where a majority of the people are dependent on agriculture as their primary source of livelihood, making them also vulnerable to climate change impacts. Therefore, climate change will inevitably impact the agricultural productivity and food production of these populations, sometimes leading to migratory outcomes. As IPCC (Pörtner et al., 2022, p. 13) also notes, the vulnerability in rural areas 'will be heightened by compounding processes including high emigration, reduced habitability and high reliance on climate-sensitive livelihood (high confidence).'

Interlinking climate change impacts with migration, Bhagat added that

> the climate change–induced biophysical vulnerability is likely to affect almost all macro regions of India, namely the Himalayas, dry areas, the Western Ghats and coastal areas, but the impact on migration will be mediated through socio-economic vulnerability to the climate change and the ability to migrate. (R. B. Bhagat, 2017a, p. 26)

2.1. Migration trends in India

The 2011 census identified a total of 453 million migrants, out of a total population of 1,210 million, where most movements were internal and within the state—only 15% were interstate migration (Bhagat, 2017a). In 2011, there were 54 million interstate migrants. Assuming that this trend continued during the period 2011–2021, there would have been 66 million interstate migrants in India in 2021. When contrasted with the 18 million overseas emigrants (IOM, 2022, as cited in Rajan & Bhagat), the total number of internal migrants, including the intrastate migrants, is likely to be more than four times that of the emigrating population in India (Rajan & Bhagat, 2022). Further, India witnesses one of the largest internal displacements in the world, primarily because of disasters. According to the Internal Displacement Monitoring Centre (IDMC), 80 disaster events (primarily flooding and storms) were reported in 2021 because of which approximately 4.9 million displacements[5] occurred. By the end of 2021, over half a million people were internally displaced.

Despite these large internal movements, there is a heavy focus on international migration in migration scholarship. Also, in the Indian context, there is limited data available to accurately estimate internal migration—the Census of India and the National Sample Survey (NSS) being the only two major data sources. However, neither of the data sources captures short-term migration—typically circular, seasonal, or daily commuting—because of the way migration is defined. Census identifies migrants based on their place of last residence and duration of residence (in years) and attributes the movements to a finite set of (singular) reasons (Bhagat, 2008; Rajan & Bhagat, 2022). Other reasons such as disasters, both natural and man-made (including riots or social disturbances), or other drivers for forced migration are inadequately addressed (Bhagat, 2008) while homogenising the complexity behind various decisions to migrate. On the other hand, the NSS recognises migrants as those who have moved from their *usual place of residence* after living there for at least six months or more (Bhagat, 2016). Prior research (for example, see R. B. Bhagat, 2008, 2016, 2017b) has noted that despite the vast data available on migration, there are several inadequacies. Data are often not available in a timely manner and incomparable across different sources, overlooking the complexities and nuances (including multiple individual migratory movements) within the vast possibilities of internal migration outcomes.

While at the national level, data reflect a simplified understanding of the internal migratory movements, the intersectional variations are lost in the process. For example, women primarily

[5] IDMC describes internal displacement as 'each new forced movement of a person within the borders of their country recorded during the year'. However, this estimate may include multiple displacements experienced by the same individual. (Source: https://www.internal-displacement.org/countries/india)

migrate for marriage or as a part of a family migration; however, there could be other reasons that drive their mobility, and the temporalities could vary. Nadimpalli (2021) noted in her work that as part of sociocultural practices, married women typically moved back to their rural maternal homes for childbirth and postnatal care, sometimes for periods longer than six months. These types of movements could be missed in the data because of definitional limitations and their place of residence at the time of enumeration (Bhagat, 2008). And if women are solely identified as dependents based on their singular reason for migration, their contribution to the local economy (particularly within the informal sector) could also be excluded from statistics (Bhagat 2017). Migrants, especially daily wage workers, also often live in precarity with poor housing conditions typically in urban peripheries with little or no access to basic services, amenities, and social security. They are also marginalised by their poor political representation and lack of formal residency rights while facing discrimination because of their ethnicity, caste, class, and gender, among other differences. For migrants within India, institutional constraints, lack of recognition, sociocultural barriers, and being identified as *problematic outsiders* in their receiving cities create layered vulnerabilities, which also complicate their *right to the city* because of intersectional identities (Yon & Nadimpalli, 2017).

The following section (3) discusses previous scholarship on climate migration frameworks and identifies some of the research gaps. Building on this discussion, Section 4 proposes a broad framework that allows an integrated and intersectional[6] approach linking climate change and migration, which is later contextualised through the review of five well-documented case studies in India. Section 5 builds on the findings of these case studies to discuss the (1) triggers of climate migration, (2) repercussions of migratory decisions, and (3) the various factors that are likely to impact and shape the adaptive capabilities of different individuals and groups. Section 6 brings together discussions from the previous sections to highlight the identified key components of the climate migration framework. Limitations and the way forward are discussed in Section 7.

[6] **Intersectionality**: The term intersectionality was introduced by the legal feminist scholar Kimberlé Crenshaw (1989, p. 139) who defined it 'as the multidimensionality' of marginalised subjects' lived experiences, particularly in the context of understanding Black women's experiences in work in the United States.

3. Conceptualising Climate Migration

In the international policy discourse on climate migration, mobility has been either assumed to be caused by a failed adaptive response to climate risks experienced in situ or is a risk reduction adaption strategy (Lama et al., 2021). The former may create *climate refugees* who are considered a major security concern (both for the state and its people), particularly in the context of migration from the Global South to the Global North (Cundill et al., 2021; Lama et al., 2021). This conceptualisation assumes a single causal relationship between climate change impacts and migration, with the expectation of mass international migration. However, most migrations driven by climate change impacts are likely to be short-distance internal movements (ADB, 2012; Cundill et al., 2021) because of the limited sources available for long-distance (or international) migration, especially post a disaster and also because of the extent of the social and economic ties of those involved (Chindarkar, 2012). These migratory movements are also more likely to be temporary although contextual factors determine specific outcomes. Therefore, since the early 2010s, an increasing number of studies have focused on 'indirect, small-scale' and more-context specific human migration occurring in the context of climate migration while considering the socio-economic and political factors that influence these movements (Boas et al., 2022, p. 3365). And as stated earlier, immobility outcomes occur in relational terms with mobilities, both spatially and temporally.

The correlation between climate change and its impact on human mobility is a complex phenomenon that cannot be easily established without considering the circumstances within which it occurs. Bardsley and Hugo (2010, p.239) explained that one way of addressing this complexity would be to reconceptualise the linkages between mobility and environmental risk to design effective migration policies that would aid in facilitating 'the mobility of people when required to enhance their well-being and, where possible, maximise social and economic development in the places of both origin and destination'. The authors further added that when climate change migration is effectively governed and managed, it could also minimise humanitarian crises and evade conflict. Further, climate-induced migration is a 'gendered and socially embedded process' (Chindarkar, 2012, p. 3); therefore, the conceptualisation of climate-induced migration must also be sensitive to differential vulnerabilities, risks, and adaptive capacities that result in multiple (and multidirectional) mobilities (and immobilities).

The following sections discuss some of these existing frameworks for conceptualising climate migration before proposing a broad framework that attempts to address some of the research gaps and incorporates intersectionality by juxtaposing climate change and migration scholarship.

3.1. Thresholds of change: Linking climate risk and migration

McLeman et al. (2021) have argued that while climate migration has increasingly gained attention in the last two decades, the scholarship has evolved somewhat independently from the climate change impact scholarship, which they attribute to the absence of IPCC's risk framework within the climate migration literature. The authors further stated that while IPCC's risk framework (within the Fifth Assessment Report [AR5]) discusses climate migration, it is not specifically integrated within the conceptualisation of climate risk. Rather, climate migration is discussed 'within a broader framing of human security (Chapter 17 of AR5), with the implication that migration is not in itself a "risk" but is situated within the "socio-economic processes"' (McLeman et al., 2021, p. 24). The IPCC's risk framework considers the interactions and interconnectedness among coupled systems and 'climate change risk is understood to be a function of the nature of specific climatic hazards; exposure of people, resources, and systems to such hazards; and the vulnerability of people, resources, and systems to the hazards' (McLeman et al., 2021, p. 2).

To address this gap, the authors proposed a framework that considered *thresholds of change* which initiate climate-induced migration(s) for better establishing the correlation between climate risk and migration processes. They explained that 'migration is inherently disruptive to households' and decisions to migrate are taken when the contextual **thresholds** are surpassed and attempts to achieve in-situ adaptation responses become inadequate or inconsequential over time (McLeman et al., 2021, p. 3). However, not all outcomes result in migration; immobility is also a potential outcome. **Human agency** is an important element of this framework where its role in decision-making (both migration and immobility) is determined by the **adaptation capabilities** and **vulnerabilities** experienced at the household level. This human agency shapes the characteristics of mobility patterns, particularly the extent and reach of movements (i.e., movements across local, regional, national, or international borders) and the temporalities of movements.

Within this framework, the relationship between risk and the response to climate change is ongoing and dynamic, which can result in multidirectional (and multiscalar) mobility outcomes. The framework also highlights that a mobility outcome does not result in the elimination of risks in their entirety. At times, migration exacerbates vulnerabilities due to irregular livelihoods, inadequate access to housing, civic amenities, and government-aided services at the destination (Bhagat, 2017b; C. Singh, 2019), thereby multiplying the original risk.

Thresholds

Building on the works of Bardsley and Hugo (2010), the **thresholds** discussed by McLeman (2018, p. 319) are defined as a tipping point 'within the processes of human-environment interaction through which climate adaptation and migration take place'. These tipping points occur because of some form of stimulus that causes a change in the situation and transforms resilience[7] for those impacted. As McLeman (2018, p.323) explained, 'an inherently resilient (or adaptive, and therefore less vulnerable) system is one where the threshold between a system's present state and a potentially undesirable one is distant or not easily crossed'. In the context of climate-induced migration, thresholds refer to particular aspects of natural or human systems or a combination of both. McLeman et al. (2021) added that these thresholds help understand how climate change can impact movements at various scales—at both origin and destination communities. The authors further explained that the framework provides 'a basis for unifying terminology and understandings of climate-migration processes across the physical, environmental, and social sciences, and with international policymaking where decisions are often informed by IPCC reporting' (McLeman et al., 2021, p. 24).

McLeman and colleagues' framework was proposed for linking climate risk assessments and climate migration scholarships with an emphasis on human agency. This human agency is shaped by experienced vulnerability and adaptive capabilities, which in turn determine mobility outcomes. While the framework recognises that migration decisions are context-specific and emerge from interactions between economic, political, social, cultural, and demographic factors (occurring at different scales), it does not elaborate on the intersectional variations of vulnerability and adaptive capabilities of different individuals through the process of migration.

[7] **Resilience**: 'The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning, and/or transformation' (adapted from the Arctic Council, 2013, as cited in IPCC, 2019, p. 823).

3.2. Integrating a gender and intersectional lens into climate migration

Prior research has established that 'gender relations are an integral part of the climate-change process and the social transformations these set in motion' (Pearse, 2017, as cited in Rao et al., 2021, p. 2). Further, gender does not exist in isolation, it intersects with other structures of social differences such as race, ethnicity, caste, religion, age, and sexual orientation. Here, gender is understood as a social construct; a process that needs to be analysed in relational terms within a context.

This social construction of power relationships between different individuals and groups defines their levels of exclusion and inclusion in society, and research (for example, see R. B. Bhagat & Rajan, 2017; Chindarkar, 2012; Detraz & Windsor, 2014; Rao et al., 2021; United Nations Environment Programme, UN Women, UNDP and UNDPPA/PBSO, 2020) shows that these power relationships determine gender divisions of labour (both within and outside of the household), work patterns, access, control, use and ownership of natural and other resources, access to services (such as social protection and health), access to credit and other financial resources, and gendered mobilities. Gender role expectations also determine caregiving responsibilities, access to education, and levels of participation in decision-making and agency in addition to shaping adaptive capacities to tackle both real and perceived risk in the context of climate change. Further, men and women cannot be categorised as homogenous groups as it would only reinforce existing inequalities and overlook the intersecting nature of the marginalisation that individuals within these groups experience (United Nations Environment Programme, UN Women, UNDP and UNDPPA/PBSO, 2020).

Chindarkar (2012) proposed a framework that examined the **gendered dimensions** of factors that trigger climate migration and the **differential impacts** of both the **process** and **outcomes** of climate migration, particularly on women. Unlike Mcleman et al.'s framework (2021) that accommodated movements at multiple scales (including global), Chindarkar's (2012) focus was on internal movements (within a nation-state). The author included a gender-sensitive vulnerability assessment framework, emphasising differential experiences for women **throughout the process** of climate-induced migration, which is often under-researched. The author highlighted concerns of security (emerging from sexual and gender-based violence, lack of safe shelters, health status, fragmented social networks, and other issues emanating from sociocultural exclusions) and inadequate emergency relief (inadequate or inappropriate responses for diverse needs and lack of timeliness), the two main issues faced by women during climate migration.

Chindarkar's framework linked this gendered vulnerability assessment with migration outcomes to provide gendered insights into decisions of climate migration. However, the findings could be limiting in some ways as the binary distinction of gender could identify women as the more vulnerable social category by focusing on the material differences and their limited capacity to make decisions to migrate (Lama et al., 2021). This approach could overlook the social and cultural context that shapes everyday practices, vulnerabilities, and inequalities for different women.

Approaching from a mobilities framework and forefronting **intersectionality**, Cundill et al. (2021) emphasised both **immobility (either forced or by choice) and mobility outcomes** as part of climate mobilities conceptualisation. The factors that drive mobility outcomes can also drive immobility outcomes; therefore, both these outcomes must be considered to gain insights into existing social vulnerabilities. In their framework, the authors considered experiences of intersecting identities of individuals and their transitions in the life course, which are shaped by both external structures and internal structures (operating within a household), as key determinants impacting the ability to migrate. These internal structures of power determine the distinct gender roles within a household and translate into different decisions and outcomes for those who migrate and those who stay behind, thereby also establishing a dynamic relationship between the place of origin and destination. Their research pointed to

> a more focused climate mobilities research agenda that includes understanding multiple drivers of mobility and multi-directional movement; intersecting social factors that determine mobility for some and immobility for others; and the implications for mobility and immobility under climate change and the COVID-19 recovery. (Cundill et al., 2021, p. 1)

Lama et al. (2021) explored the nexus between gender, migration, and climate change and explained that to better understand their interrelation, gender and mobility must be seen as a process and climate change as a risk modifier. This approach allows a deeper understanding of the root causes of migration and the factors that contribute to the existing differential vulnerabilities and risks.

In their framework, the authors argued that it is climate variability more than climate change that can be perceived at a human scale—both spatial and temporal changes; therefore, the climate variability is likely to have a greater impact on mobility. Similarly, gendered processes (determining differential access to resources and inequity) facilitate and impact mobility outcomes. In their framework, gender is considered an *organising principle* rather than an exclusive category. This approach was echoed in the vulnerability framework adopted by Udas et al. (2021, pp. 44–45) who studied the flood-impacted Gandak river basin in Bihar (see Case Study 5 in Section 4 for details), where they explained that

> gendered life is defined as an organizing principle of social life, creating and ordering relations between people in a hierarchical manner as well as giving meaning and legitimization with respect to performance, resource allocation and social practices to certain sex-based groups belonging to specific social categories.

Lama et al.'s (2021) approach, therefore, emphasised an exploration of the power structures that contribute to the dynamic (re)structuring of social categories to allow a deeper exploration of the gendered dimensions (beyond binary categories of gender) of migration in the context of climate change.

4. Proposed Framework

Using Lama et al.'s framework as a starting point, our proposed framework attempts to contribute to the limited literature exploring the nexus between migration and climate change with an intersectional focus. There are several components in our proposed framework. They include (a) interplay of multiple stressors, (b) contextual vulnerability and risks, (c) thresholds, and (d) adaptive capacities, where the unit of analysis to examine these components is a household (see [e] in Figure 1). The framework aims to holistically map the interconnectedness of these components and build a comprehensive understanding of the climate migration phenomena. The interplay of these components is first and foremost considered to be time- and context-specific and determined by the ongoing relationship between origin and destination(s).

Climate migration outcomes (see [f] in Figure 1) within this framework include a broad range of mobility patterns with varying temporalities and spatialities (including daily commuting and localised movements) triggered to adapt to or overcome everyday risks experienced after surpassing situational thresholds. Immobility outcomes, either forced or voluntary, emerging from the same circumstances become equally important in understanding climate migration. Human agency is an important factor that shapes the characteristics of both mobility and immobility outcomes. Also, mobility outcomes do not necessarily cease other adaptation strategies undertaken at the origin, towards both climatic and non-climatic risks.

Further, when decisions to migrate occur, new thresholds are experienced at the destination (see (c) in Figure 1), leading to new adaptation strategies. Therefore, as shown in Figure 1, at a household level, multiple adaptation strategies are undertaken in-situ and ex-situ (particularly migration) and are interlinked, sometimes extending to multiple locations through migration.

Within this framework, following Lama et al. (2021), *gender and migration are viewed as a process* in the conceptualisation of climate migration, and climate change is viewed as a *risk modifier* that can alter/exacerbate existing gender inequalities. For understanding these gendered contextual processes, an intersectional lens (as highlighted in Figure 1) is therefore applied throughout the migratory processes. The intent is to bring to the forefront, the multiple vulnerabilities and risk experiences of different individuals based on their differing adaptive capacities, leading to varying multiple mobility and immobility outcomes.

Each of the components of the framework and the rationale behind them are elaborated further in the following sections.

(a) Stressors: **Multiple stressors** impact both origin and destination(s) to continually shape the dynamic interrelationship between climate change and migration. These stressors could be

pertaining to environmental or other contextual factors such as social, economic, cultural, political, or demographic factors. Also, different drivers can be predominantly active at a given time and place, which may shift and change. This approach allows an exploration of the multiple stressors (see [a] Stressors in Figure 1) that come into play and impact contextual vulnerabilities and risks and shape different adaptation strategies, including mobility and immobility outcomes.

(b) Contextual vulnerabilities and risks: In this framework, we build on IPCC's (2019, p. 826) definition of **vulnerability** (see [b] Contextual vulnerabilities and risks in Figure 1): 'the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt'. We also consider vulnerability that is produced historically, shaping varying experiences of risks for different individuals (Lama et al., 2021). This conceptualisation emphasises the **social construct of vulnerability** that extends beyond climate change impacts, resulting in different adaptation strategies. Or as Lama et al. (2021, p. 327) explained, 'climate change, gender and migration come to shape vulnerability in conjunction with other social, economic and political factors operating at different scales'. Similarly, Bhagat (2017a) explained that climate change vulnerability is the outcome of both biophysical vulnerability and socio-economic vulnerability. The former is related to risk, emanating from climate change and extreme hazards, and the latter is related to adaptive capacity and an 'outcome of income level, poverty, educational level, social capital and network' (Bhagat, 2017a, pp. 25–26). In our framework, **everyday risks** (which are multiple and dynamic) are also contextually shaped and vary for different individuals in relational terms with vulnerabilities. In Figure 1 (b), these continually evolving vulnerabilities and risks are considered throughout the process with an intersectional lens.

(c) Thresholds: Expanding on Mcleman's (2018) framework, **thresholds** (see [c] Thresholds in Figure 1) will remain an important tipping point. They are considered triggers for multiple adaptation strategies, both in situ as well as decisions to migrate (or not to migrate), at both origin and destination based on perceived and real risks. Responses to risks are often multiple, dynamic, and interconnected and sometimes occur simultaneously (both within and across households). Therefore, we consider thresholds that cause both in-situ and ex-situ adaptation as well as the interlinkages between them as critical components in understanding decisions that shape climate migration outcomes, including immobilities. Further, these differing and multiple strategies to adapt to the challenges of *everyday risks* would offer intersectional insights into *who moves? Who stays? And when? And in what ways?* Finally, thresholds will also be used to establish the ongoing and dynamic relationship between different places, both in situ and ex situ, involved in the migration process.

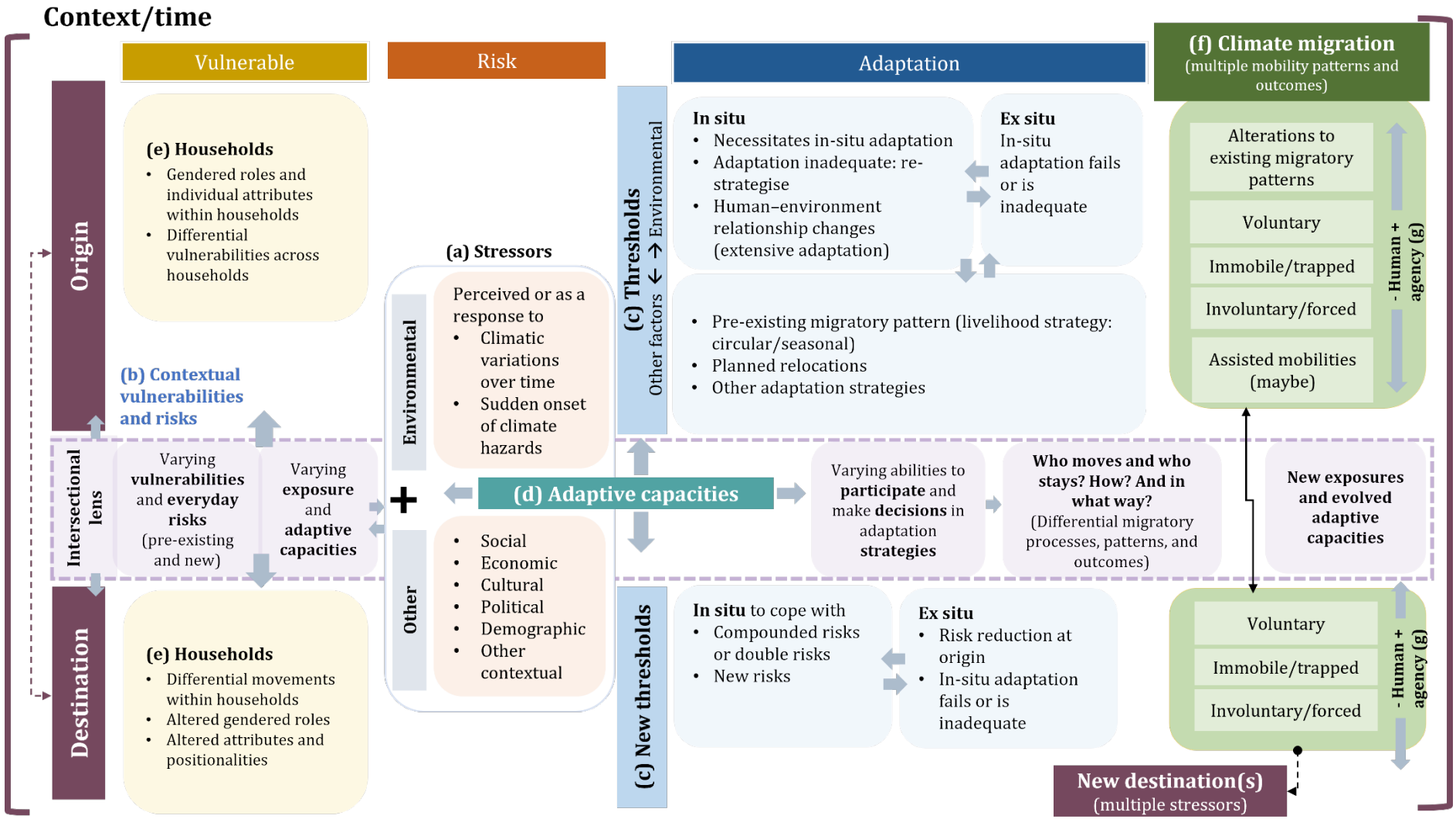

Figure 1: Conceptualising climate migration from an intersectional perspective

(d) *Adaptive capacities:* As shown in Figure 1 (see [d] Adaptive capacities), an important determinant that shapes vulnerabilities, risk perceptions, and responses to risks is **adaptive capacities**. They are impacted by both internal subjectivities and external factors. In our framework, we acknowledge that adaptive capacities are dynamic and contextually determined but serve as a critical link between risks and adaptation based on the thresholds encountered. The conceptualisation of adaptive capacities is elaborated further in Section 5.3 of this report.

(e) *Unit of analysis:* Finally, in our proposed framework, we consider households (see Figure 1 [e]) as a unit of analysis by building on the works of C. Singh (2019). As the author explained, migration and commuting have an impact on household structures with differential impacts on members within the same household. She explained that when migration causes some members of the household to migrate and some to remain, it results in a reorganisation of their livelihoods and lives as households *stretch* and start to function across space and time. This stretching of households is also discussed in the works of Banerjee et al. (2017, p. 61) who stated that a 'household, which occupies a specific geographical location, could be connected to multiple locations through a migrant worker and/or access to remittances'. The ongoing relationship between origin and destination(s) is also reflected in our conceptual framework, as shown in Figure 1.

These complex spatio-temporal dimensions trigger a structural change in migrant households, resulting in the reorganisation of labour and care responsibilities, shift in identities, and alteration (sometimes renegotiation) of power dynamics within the household (C. Singh, 2019). This restructuring has a subsequent impact on the risk management strategies that are employed by different members both within and across households. Therefore, using households as a unit of analysis also allows intersectional insights into how climate change has varying impacts even for the same household, leading to diverse mobility outcomes.

Through our proposed framework, we aim to **holistically map climate migration** for a given context and time with all its complexities, pluralities, and nuances. The objective is to move away from generalisations and static categorisations of climate migration and emphasise contextual processes, multiple drivers, and outcomes (both mobility and immobility) to help identify possible entry points for policy interventions at specific scales.

4.1. Contextualising the framework

Broadly, climate-induced migrations have been framed and analysed from the perspective of the onset of climatic hazards as either slow-onset processes or fast- or sudden-onset processes (Bharadwaj et al., 2022; Cattaneo et al., 2019; Detraz & Windsor, 2014). Slow-onset processes could include desertification, extreme temperatures, droughts, land degradation, and sea-level rise, whereas sudden-onset processes could include hurricanes, tornadoes, floods, and landslides. Both these processes have different impacts on decisions and patterns of migration as well as policy outcomes. Timelines for preparing for disasters would also vary. In either case, the movement can be voluntary, forced, or involuntary.

In terms of migratory patterns, the sudden onset of climatic events can result in nonlinear movements where migratory trajectories can be unexpected and destinations or paths can be unknown and may 'surprise' policy or challenge institutional capacities to cope with the change (Bardsley & Hugo, 2010). On the other hand, migration as a livelihood strategy is typically linear, often occurring in conjunction with other socio-economic factors along established routes and networks or fewer new paths (Bhagat & Rajan, 2017). Linear patterns are closely linked to how society's collective experience or perception of natural resource conditions and hazards vary in the context of climate change (Bardsley & Hugo, 2010). The wealth of those who are vulnerable can also determine their adaptive capabilities and ability to migrate (Cattaneo et al., 2019).

Given the difficulty in categorising the complex migratory movements that emerge from climate change impacts, we focus on thresholds that initiate different adaptation strategies, including decisions to migrate (or not to) depending on the risks and vulnerabilities (including non-climatic factors) presented at a given context and time. The adaptive strategies can be multiple, sometimes combining both in situ and ex situ (including migration) for different household members.

In the following sections, case studies from India are analysed through the lens of our proposed framework. This is intended to highlight the pluralities of climate migration, which will be discussed in greater detail in the subsequent sections.

Case 1: Migratory movements of the pastoral community from western Rajasthan and Gujarat's Kachchh region

Focusing on the drought and famine-prone semi-arid region of western Rajasthan, Vipul Singh (2012) studied the nomadic pastoral community in the region, the Rebaris[8]. Rebaris have a long history of engaging in pastoralism as a mode of sustenance to cope with harsh environmental conditions. Typically, they have *stretched* households with a part of the family rooted in permanent villages and the rest (predominantly male) migrating for nine months, only to return during the relatively greener monsoon periods. Their migratory movements are slow, both intrastate and interstate, and sometimes extend to 1000 km, with differing onward and return routes (see Figure 2).

A similar study of the Rebari and Jat communities in the Kachchh district of Gujarat conducted by the Maldhari Rural Action Group in 2021–22 identified the pastoral migratory movement as an established livelihood strategy, where pastoralists depend on 'climate foresight and smart land-use strategies to adapt to climate variabilities' (Pineiro & Bhagat-Ganguly, 2022, para. 1.). These groups of pastoral families (*dang*) typically rely on their leader (*mukhi*) to determine the route by considering a range of factors including fodder and water availability, a place to stay, accessibility to markets (to sell milk and manure), and the number of farmers that they would potentially deal with in addition to safety. Routes and patterns were dynamic and subject to change based on varying conditions, ensuring that they did not intersect with other *dang* routes (Pineiro & Bhagat-Ganguly, 2022).

V. Singh's (2012) fieldwork in the district of Pali (Rajasthan) noted that contrary to expectations, the economic prosperity in the region resulted in an increase in longer-distance migratory movements. This prosperity largely emerged from the state's shift in assistance to cultivation from grazing, with increased incentives and resources for those engaged in the former. This shift has reportedly modified the temporality of existing migratory movements of the Rebari community to more long term and long distance, even up to 1500 km. A similar change in movements and temporalities was reported by Pineiro and Bhagat-Ganguly (2022). Another study of the Raika pastoralists in the Pali and Jodhpur districts of Rajasthan has identified declining and degrading pastures in the origin and reduced availability of feed and fodder resources throughout the routes of migration as factors determining migratory routes and timelines of migration (Meena et al., 2021).

To cope with changing sociopolitical conditions and climatic fluctuations (with increased droughts and low water tables) in addition to market demands, pastoralists modified the

[8] A traditional camel and sheep-herding nomadic community

livestock type and numbers during migration—largely determined by the availability of government and philanthropic support to certain livestock in the event of a calamity (Pineiro & Bhagat-Ganguly, 2022; V. Singh, 2012).

In addition to the environmental stressors, pastoralists experience multiple risks as a migrant community. At their place of origin, they are marginalised and often viewed as a community with a low sociopolitical stake because of long periods of absence and the inability to vote during those periods (V. Singh, 2012). They are also invisible from the public distribution system and voting lists as they lack residential proof (Pineiro & Bhagat-Ganguly, 2022).

On their migratory routes, they witness hostile environments, mainly because of the general shift towards annual multicropping and the unwillingness of cultivators to offer grazing pastures unlike before (V. Singh, 2012). Prior grazing zones that have now become protected spaces are also off-limits to pastoralists (Pineiro & Bhagat-Ganguly, 2022). Given their marginal positionality at places of origin and destination(s), pastoralists are vulnerable to theft, physical and sexual harm, and violence throughout their journey (V. Singh, 2012). Pastoralists experience a unique form of placelessness as *outsiders* at multiple locations because of their mobility patterns, and as a result, lack recognition from the state to receive institutional support in the form of government policies and schemes (Pineiro & Bhagat-Ganguly, 2022; V. Singh, 2012). The pastoralists' 'characteristic strategies of sustainable land use and efficient utilisation of resources as well as their mobility and market access' (Pineiro & Bhagat-Ganguly, 2022, 2. Challenges to pastoral livelihood, para. 2) are undergoing a transformation under the influence of multiple stressors acting at both their place of origin and destination.

The migratory patterns of the pastoral community as identified in both studies are incredibly complex, with varying routes and destinations and dissimilar onward and return routes. Migration helps mitigate risks at their origin; however, it comes at the cost of encountering other (and often varied) risks at different destinations along the migratory routes. The previously traditional nomadic pastoralism has now transformed into a long-distance migration strategy, as a response to various risks and to enhance their livelihoods.

Some of these multiple vulnerabilities and risks, experienced at both origin and destination(s), are shown in Figure 2—drawing from the findings of V. Singh (2012). In both the studies, however, the intra- and interhousehold dynamics and the gendered experiences remain unexplored. The maintenance of kinship and cultural ties with the origin or hometowns through migration is also explored in a limited capacity in these studies.

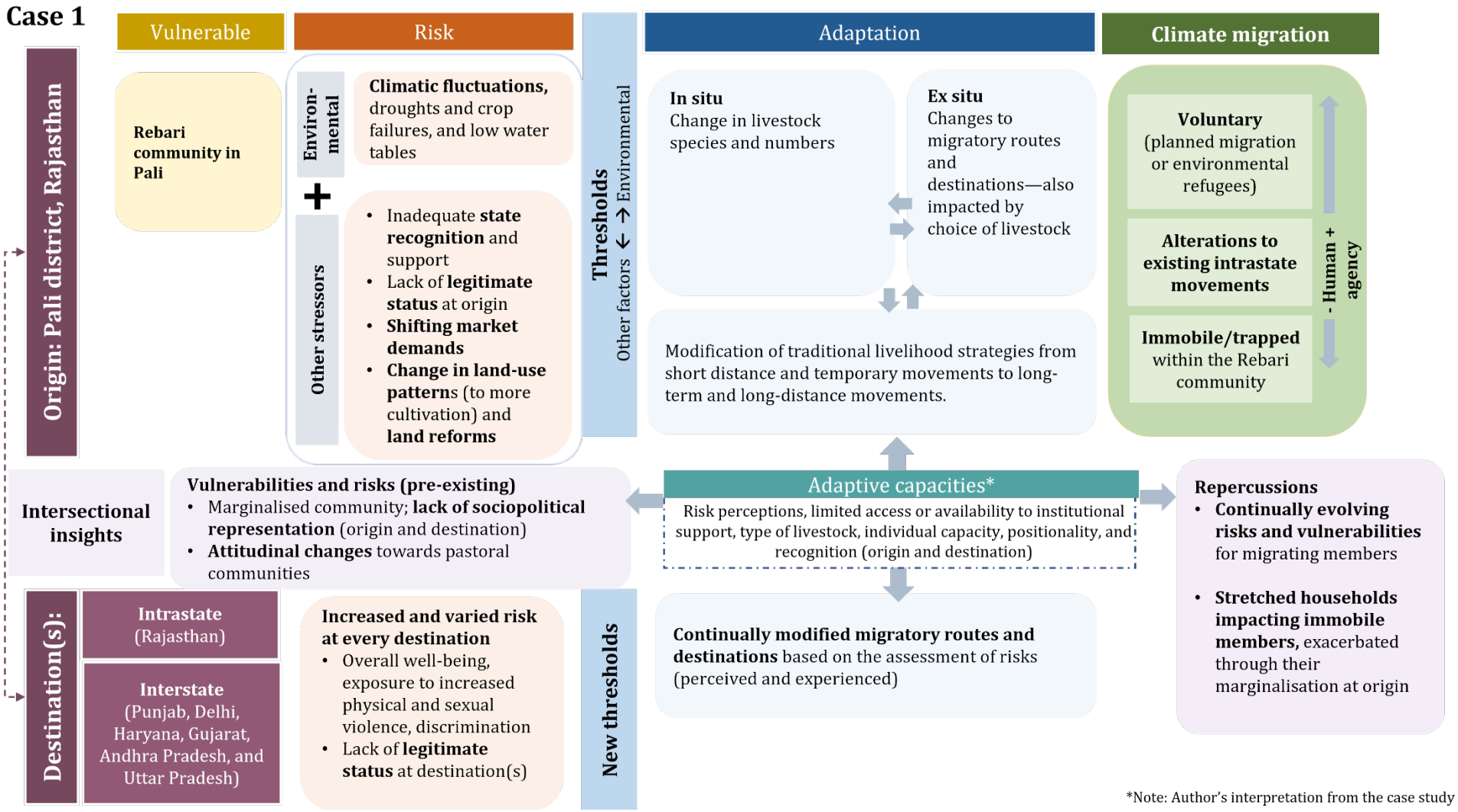

Figure 2: The case of Rebari in Rajasthan (adapted drawing from V. Singh, 2012)

Case 2: Migratory patterns in Kolar, Karnataka

Rural-to-urban migration is already established as a key livelihood strategy in India, mainly as a way to cope with risks and seek alternative livelihood opportunities, especially for those who are engaged in agriculture (C. Singh, 2019). These strategies often occur as seasonal and circular migration of labour for coping and accumulation of economic resources (Deshingkar & Start, 2003). India's semi-arid regions are witnessing increased climate variability, compounded by the degradation of natural resources, and it impacts agricultural productivity.

Against this backdrop, C. Singh (2019) examined Kolar and Gulbarga, two rural districts in Karnataka that are least developed and have been witnessing frequent droughts, water scarcity, and degradation of natural resources. This case study discusses the author's findings from Kolar, located close to the city of Bengaluru. As shown in Figure 3 the marginal and small landholder farmers have resorted to migration as a livelihood strategy to cope with the adverse impacts of climate change on agricultural productivity and reduced opportunities to seek casual work (both agriculture and non-agricultural) in surrounding villages. The fluctuations in average temperature and rainfall have already transformed the cropping patterns and caused a shift from multi- to monocropping of cash and horticultural crops. Although this in-situ adaptation increases economic viability, C. Singh (2019) noted that monocrops are more vulnerable to climate variability and market fluctuations and require more water. The migratory movements that were originally short-distance inter-rural commuting have now expanded to nearby urban areas for pursuing non-agrarian jobs, requiring low to moderate skills. Job availability in industries located in the urban peripheries of Bengaluru has increased. The commuting of women migrants has increased as well. Figure 3 shows some of these adaptation strategies implemented at the origin.

The author further noted that migrant households have different types of movements and compositions, depending on who stays behind, who moves, how, and for what time periods. She added that 'asset bases, social networks, political agency, skills, household dynamics, and personal attributes' determine these multiple and varied compositions of households 'to have a range of differential outcomes on household and individual well-being' (C. Singh, 2019, p. 308).

She also observed the differential gendered outcomes that manifest based on these household configurations. For example, when the entire family migrates, women are double-burdened with new jobs and the additional responsibility of making a house a *home*—creating a familiar and secure space for the family in a new place. Women who stayed behind (often not by choice), engaged in nonpaid agricultural work, did household chores and childcare responsibilities in addition to taking on a new role as the head of household while renegotiating sociocultural norms to establish their voice and agency in the community. In cases when women commuted for work to urban peripheries, the commuting time and costs and the involvement of middlemen to grant

them job security greatly impacted the economic viability of the movement. On the other hand, the author noted that while men were *allowed* to migrate to urban areas for work, they often lived in precarious circumstances with little pay. However, with fluctuating climatic conditions impacting agricultural returns, the men were forced to extend their stay in urban areas; they also did not want to lose face by returning.

C. Singh's (2019) case presents an array of migratory outcomes propelled by climatic triggers embedded deep within other contextual determinants of vulnerability and exclusion. Each migratory decision had a differential impact on both migrating and nonmigrating members within the household. The migratory outcomes themselves were multiple and dynamic with varying temporalities and different economic and sociocultural consequences on the members and the household structures. The risk management behaviours observed were complex and often stretched beyond the local, drawing 'on assets and agency in the rural and the urban' (C. Singh, 2019, p. 313). This case demonstrates an intersectional perspective on multiple vulnerabilities and risks experienced differently within and across households and the multitude of responses that emerged based on the risk management response adopted, leading to both migratory and nonmigratory outcomes that change continuously based on time and context.

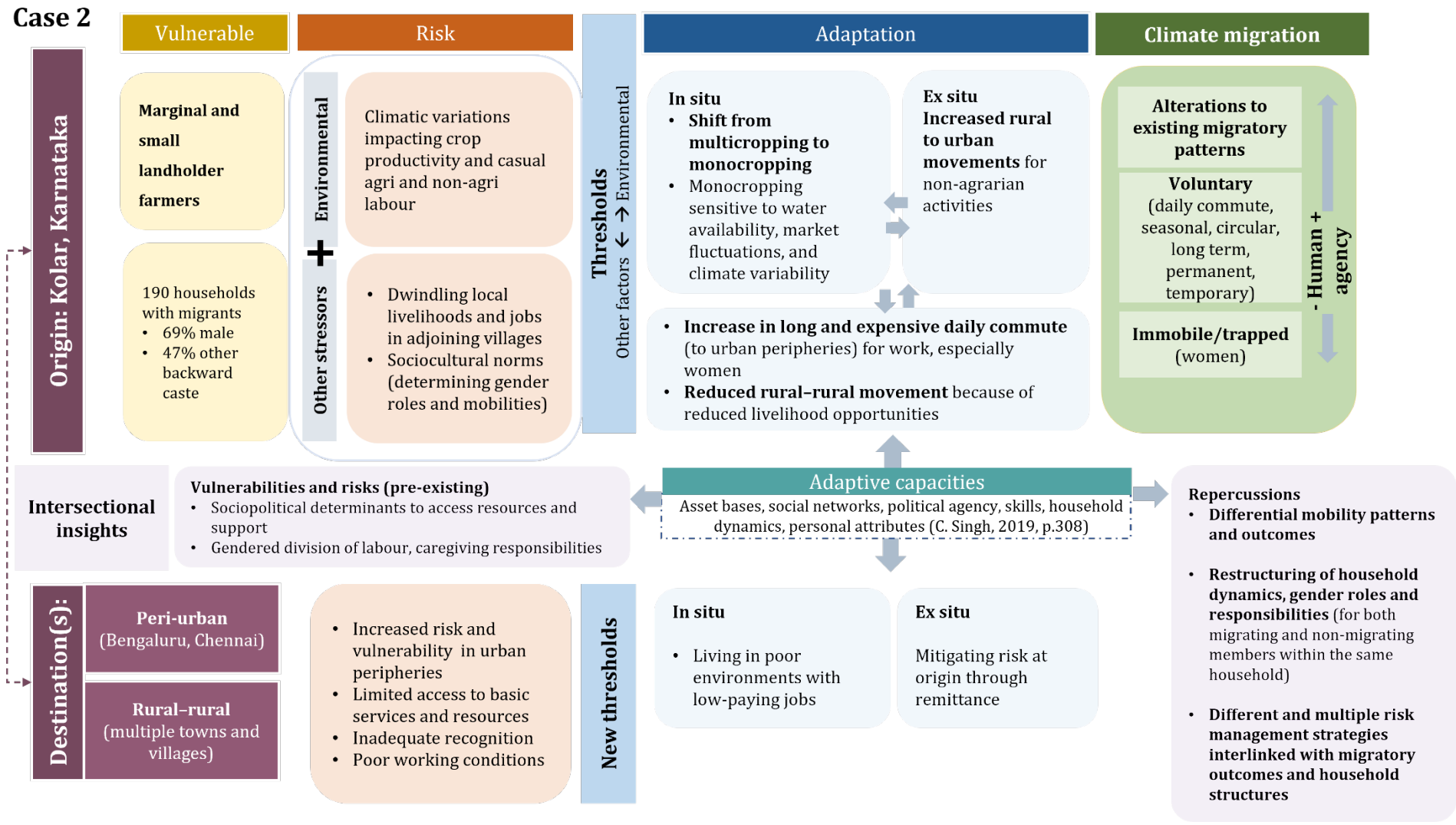

Figure 3: The case of Kolar, Karnataka (drawing from C. Singh, 2019)

Case 3: Drought-triggered migration in Odisha and West Bengal

Here we examine findings from three separate studies that discuss the various facets of drought-induced migration in Odisha and West Bengal. Jülich's (2011) study was in the rural village of Khaliakani in the state of Odisha—a hilly terrain in the southern highlands with low irrigation owing to poor canal networks. Panda's (2017) study was in the districts of Bolangir and Nuapada in Odisha, and Debnath and Nayak's (2022) study focused on the Bankura district (Kurul Pahari and Dhabani villages) in West Bengal. These three studies employed household surveys, and two of them had focus-group discussions (except Jülich, 2011) to study the interconnections between climate change and migration. Figure 4 captures some of the key findings and observations from the Khaliakani case.

Most of these regions were agriculture dependent. In the state of Odisha, agriculture and animal husbandry contributed to more than 15.6% of the gross state domestic product (GSDP) in 2012–2014 (at 2004–2005 prices) and employed more than half (61%) of the total workforce (either through direct or indirect agri-based activities) in 2011 (Odisha Economic Survey 2013–2014, as cited in Panda, 2017, p. 197). In West Bengal, agriculture and livestock rearing and remittances from migration were major sources of income, particularly for the migrant households that the authors surveyed. Another commonality across the three cases was that the regions were primarily relying on rainfall for their agricultural activities.

Within this context of variable monsoons and subsequent droughts impacting cultivation and livelihoods, temporary migration has been identified as an important adaptation and coping strategy and a major source of income (Jülich, 2011; Panda, 2017). Debnath and Nayak (2022) noted that drought-induced rural out-migration was a common seasonal livelihood strategy in West Bengal villages. However, all the cases noted that migration was pursued as a last resort when different adaptation strategies adopted throughout various stages of drought (over time) appeared inadequate or ineffective.

Migration only occurred when the household had the 'demographic, physical and social ability, as well as the necessary personal mobility, in order to have the ability to migrate' (Jülich, 2011, p. e196) and when thresholds to cope with risks in situ were surpassed significantly. For example, in West Bengal, the authors attributed limited work availability at the origin during periods of drought and repeated crop failures as some of the push factors that encouraged migration as it made it harder for the farmers to cope with recurring drought incidences.

Also, in Khaliakani (Odisha) and West Bengal, typically, the male head of the household migrated, sometimes with the grown-up son(s), while women, children, and the elderly stayed behind and continued to cope with the risks at the origin. The sociocultural constraints usually prevented the

independent migration of women; they only moved with their families (Jülich, 2011). Also, the destination of these migratory movements was strongly determined by the 'social networks between the villagers and the employers', which was passed on from generations and varied between families (Jülich, 2011, p. e194). Similarly, in the West Bengal case, social networks, informal connections (particularly friends), middlemen, and relatives were important sources of information (in that order) to help the migrants identify suitable destinations and routes for migration. Further, 'regularity and nature of work, remittances, farming seasons at native village etc.' determined the duration of the migration (Debnath & Nayak, 2022, p. 8). The small and marginal farmers often migrated temporarily to only return during the agricultural season (Debnath & Nayak, 2022; Jülich, 2011), while the landless migrated for longer durations—for over a year (Debnath & Nayak, 2022).

While specific drought outcomes (frequency, recurrence, intensity), climatic variabilities, and subsequent impacts varied based on the contextual conditions and vulnerabilities, the three sites discussed in this case study provide broad insights into how agriculture-dependent communities relying on rainfall cope with climatic variations differently. These climatic impacts further intensified depending on a household's access to alternative sources of water, the size of their landholdings, their primary occupation, access to credit and financial support from extended family, and levels of poverty, among other factors. In the sites where institutional support was available—such as low-interest agricultural loans, loan subsidies, and food security for all—as noted in West Bengal (Debnath & Nayak, 2022), communities could cope with livelihood vulnerabilities during droughts.

These three studies show that gender, age, and marital status (among other social categories) intersect with vulnerabilities, creating varying mobility outcomes for different individuals. For example, in West Bengal, the scheduled tribes and castes—who were comparatively more disadvantaged, marginalised, and typically landless—were more likely to migrate compared to others in their community.

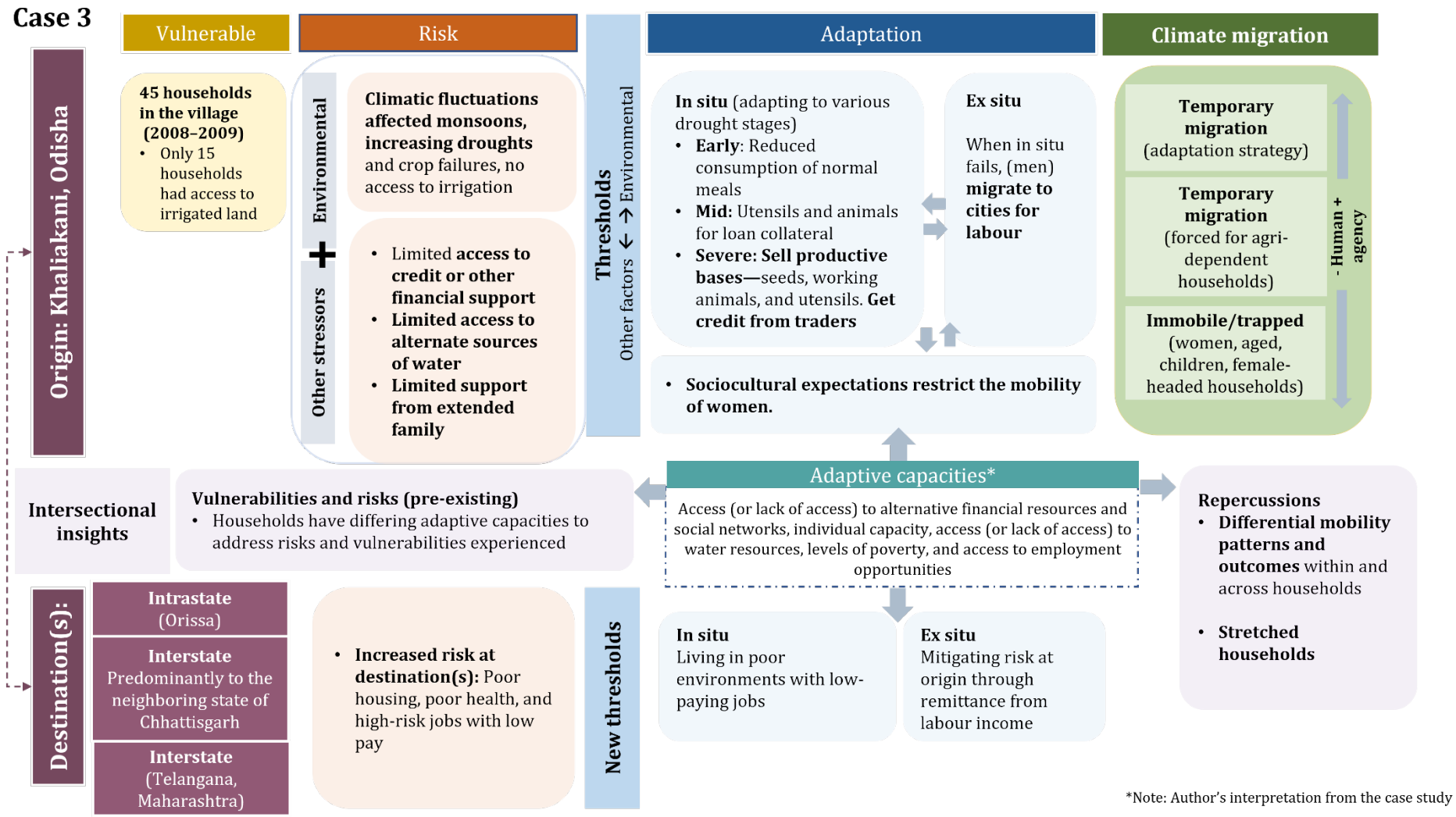

Figure 4: The Case of Khaliakani, Odisha (drawing from Jülich, 2011)

Case 4: Rural out-migration in the Himalayan region—the case of Uttarakhand

The Himalayan region is one of the most fragile ecosystems with a 'geographically, geologically and culturally unique landscape' (Tiwari & Joshi, 2015, p. 9). The region is experiencing higher mean annual temperature, melting glaciers and snow, changes in precipitation patterns, and disruptions in hydrology (through the decline in groundwater reserves, the drying of natural springs impacting water flow, reduced water discharge into streams, and the drying of streams) with more severe and frequently recurring climatic events including floods, droughts, slope failures, and landslides (Tiwari & Joshi, 2015). These climatic variations coupled with terrain constraints and limited availability of arable land have been impacting agriculture practices and crop productivity, thereby increasing livelihood vulnerability. These drivers have increased the overall vulnerability of the community, which in turn triggers male out-migration.

In this context, Tiwari and Joshi (2015) investigated the Ramgad Catchment in the lesser Himalayan ranges in the state of Uttarakhand. The population in the catchment area was predominantly engaged in cultivation (predominantly rainfed), horticulture, tourism, and grazing, which led to the over-utilisation of natural resources and impacted the mountain ecosystem. A declining trend in per capita food productivity was recorded because of population growth and decline in agricultural production, impacting marginal and small farmers and landless households. To cope with the low food productivity, the rural population resorted to intense cropping, which further depleted the natural resources required for agriculture.

This study shows (see Figure 5) that out-migration for alternative livelihood opportunities emerged as an adaptation strategy to deal with changing environmental conditions and cope with barriers impacting local subsistence economies. In particular, the remittances from migrating members provided cash relief and increased purchasing power. The emerging migratory patterns were observed to be temporary as well as permanent in nature, where both educated and uneducated male youth migrated. The authors added that 'the increasing trend of rural out-migration has great impact on community planning, sustainable resource development, disaster risk reduction programmes and climate change adaptation in the region' (Tiwari & Joshi, 2015, p. 20).

The observed out-migration resulted in the feminisation of mountain agriculture while altering the traditional knowledge and practices of the rural community. Women who bore the primary responsibility of gathering fuel wood and seeking potable water began traversing longer distances because of shrinking forests and drying water reserves. In the absence of a male member, women were burdened with agricultural tasks in addition to their caregiving

roles, similar to some of the other cases discussed previously. Despite their increased responsibility of managing and conserving natural resources, it was observed that women continued to have less access and control over these resources and remained marginalised and excluded from decision-making processes.

In another study (Tiwari & Joshi, 2017) of the upper catchment of Kosi in the state of Uttarakhand, the authors reported that male out-migration had simultaneously (but marginally) improved the socio-economic development of rural women. For example, the findings from the study showed a decline in female school dropout rates and an increase in primary education levels. These trends were attributed to the economic stability and security gained through remittances in migrant households. In some cases, women were able to influence the decision-making process, particularly in the 'selection of agricultural crops and sale of agricultural and livestock products at family level, and in determining village-level developmental priorities' (Tiwari & Joshi, 2017, p. 177). However, the impacts of climate change will continue to impact women differently, particularly because of the lack of preparedness, inaccessibility to information, and exposure to natural disasters.

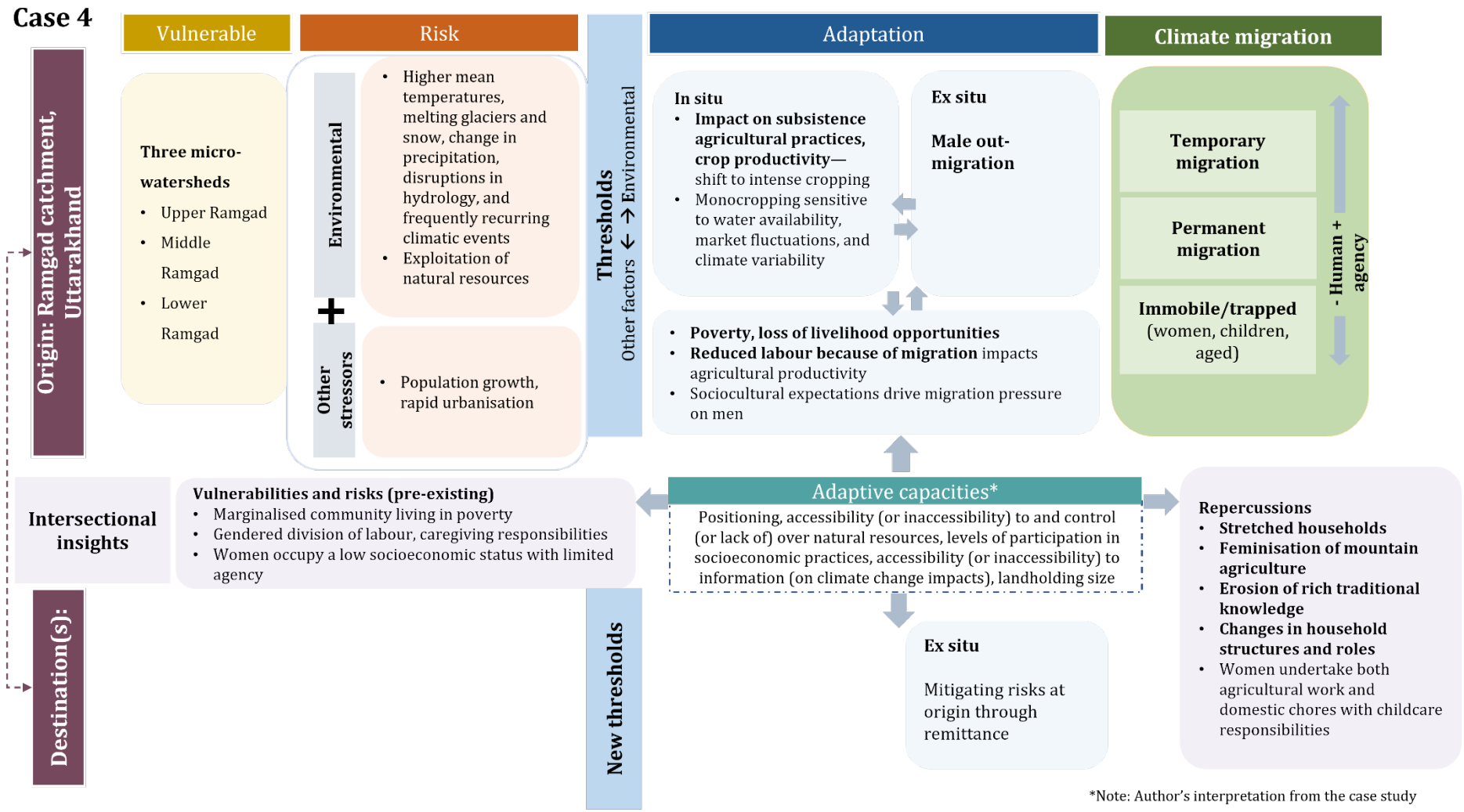

Figure 5: The Case of Ramgad Catchment, Uttarakhand Odisha (Drawing from Tiwari & Joshi, 2015)

Case 5: Migration triggered by recurrent and intense flooding in Bihar and Assam

This case draws from multiple studies discussing the impacts of flooding on migration in flood-prone areas in Bihar (Udas et al., 2021) and Assam (Manuvie, 2017, 2020). The discussion in this section aims to present the multiple facets of flood-impacted migration where differences in social positioning and access and availability of institutional support alter the impacts of climate change on different individuals.

Udas et al. (2021) studied the case of Diaras (see Figure 6)—a group of villages located in the embankments of the Gandak river basin in the West Champaran district, Bihar—facing multiple vulnerabilities including frequent flooding and poverty. Recurring floods alter livelihoods and impede the growth of the economy. The slow onset riverine type of floods in this region typically cause more damage to property than life, forcing people to relocate to higher areas, embankments, or rented land when the land remains inaccessible during monsoons (Udas et al., 2021). Unfortunately, the period after the monsoon is followed by periods of drought in winter months, thereby exacerbating the vulnerabilities of Diaras' inhabitants. Further, in West Champaran, issues of crime and bribery push individuals into cycles of poverty. Most of the inhabitants are small and marginal landholders (nearly 76%) with very few women owning land titles. Caste-based discrimination and sociocultural practices are also predominant, which lead to women having a low status and poor literacy rates.

The study tried to understand the complex intersecting factors impacting the vulnerabilities using focus group discussions and interviews, participant observations, and transect walks. Four different types of flooding contexts—including villages of frequent flooding (upstream Nautan block), new flood zone (Jogapatti block), those triggered by infrastructure development (downstream Nautan block), and those located faraway from government agencies (Piprasi block)—were analysed. In all the regions, farming was impacted because of flooding, causing land degradation and leading to varying adaptation outcomes. As a result, both men and women sought daily wage work. While the former migrated outside the village, the latter remained at the origin to fulfil their familial and childcare responsibilities (Udas et al., 2021, p. 46).

The findings from the study in Bihar showed that female-headed households, households with more daughters, and individuals with disability faced greater vulnerabilities because of the additional financial and social burdens. The lack of clean water and sanitation was a persistent problem, which worsened during floods, impacting women, children, and the disabled—especially when they were left behind. Also, as a way of reducing liabilities during

adversities created by flooding, many female children in the family were married off at a young age. On the other hand, adversities also created opportunities for women to seek alternative adaptation strategies, sometimes communally. For example, women from landless and marginalised families began engaging in shared animal care practices, which were comparatively easier to manage and less risky than farming. The cattle provided milk for the children of those households involved. For the men in the family, especially young boys, the gender expectations pressurised them to migrate for additional wages from as early as 11 years of age. This often led to finding work in unsafe environments with little health protection and benefits while significantly multiplying their exposure to risks.

Similar to Bihar, the state of Assam is highly susceptible to flooding in addition to earthquakes. Climate variability together with the increase in population growth, uneven development, and increased land-use pressure have exacerbated these adversities in the state (Manuvie, 2017). Another study in the upper Assam region of the eastern Brahmaputra sub-basin (EBSB) by Banerjee et al. (2017, p. 61) framed the problem in the following way:

> The physiography of the Brahmaputra basin, rise in population in flood-prone areas, the construction of new infrastructure and housing, expansion of economic activities, changes in land use, encroachment of wetland and low-lying areas, temporary flood control measures and poor maintenance of embankments contribute to drainage congestion and frequent occurrences of floods in this region. (TERI 2011, as cited in Banerjee et al., 2017, p. 63)

Also, the region is heavily reliant on agriculture and its allied sectors for livelihood. The population is primarily engaged in smallholding subsistence agricultural practices and as Manuvie (2017) explained, there is little or no inclusion of modern farming inputs to improve their farm yields. The juxtaposition of these factors results in multiple mobility outcomes: (1) temporary displacement because of annually recurring floods, (2) cyclic labour migration or voluntary adaptive migration, as reflected in the census data, (3) permanent (sometimes voluntary) relocation attributed to land erosion, and (4) migratory movements within the basin but across the Indian and Bangladesh border (Manuvie, 2020).

Manuvie (2017) elaborated that temporary migration typically occurred during the time of floods when humanitarian assistance was provided and relief operations were carried out by the state regularly to support those affected. Cyclic movements, on the other hand, are an adaptive strategy where interstate migration is undertaken typically by the youth to find work as semi-skilled labourers and offset some of the risks of flooding through the additional income gained through remittance.

Similar to the study in Bihar, Banerjee et al. (2017) noted that when floods impacted homes in Assam, people were forced to move to safer locations such as roads, embankments, and relief camps. Crops and livestock are impacted in the aftermath of floods, and the quality of the soil is affected by sedimentation and other deposits, impacting future farming. Long-term (or sometimes permanent) migrations occur because of these impacts and riverbank erosions, which have become adverse over the years (Manuvie, 2017).

Apart from migratory movements, immigration from Bangladesh has a deep-rooted history dating back to colonial times in Assam, which seeps into the way disaster management and adaptation strategies are implemented, managed, and translated to those who are *recognised* to be at risk. Manuvie (2021) explained in her study that the political climate restricted those identified as noncitizens to enjoy their rights as residents and prevented them from receiving care and benefits as victims of a disaster. This highlights that the lack of recognition and layered exclusion at the sociocultural, political, and economic levels (explained further in Section 5.3) deprive *outsiders* of basic human rights and expose them to 'extreme forms of vulnerability and structured violence' (Manuvie, 2020, Conclusions, para. 1).

This case study highlights the multiple forms of vulnerability experienced across the two states by victims of recurrent floods. While the experiences and impacts of floods are unique for different individuals based on their physical locations within the impacted region and positionality (within the socio-cultural-political structures), among other factors, climate change impact worsens when people experience statelessness and homelessness simultaneously.

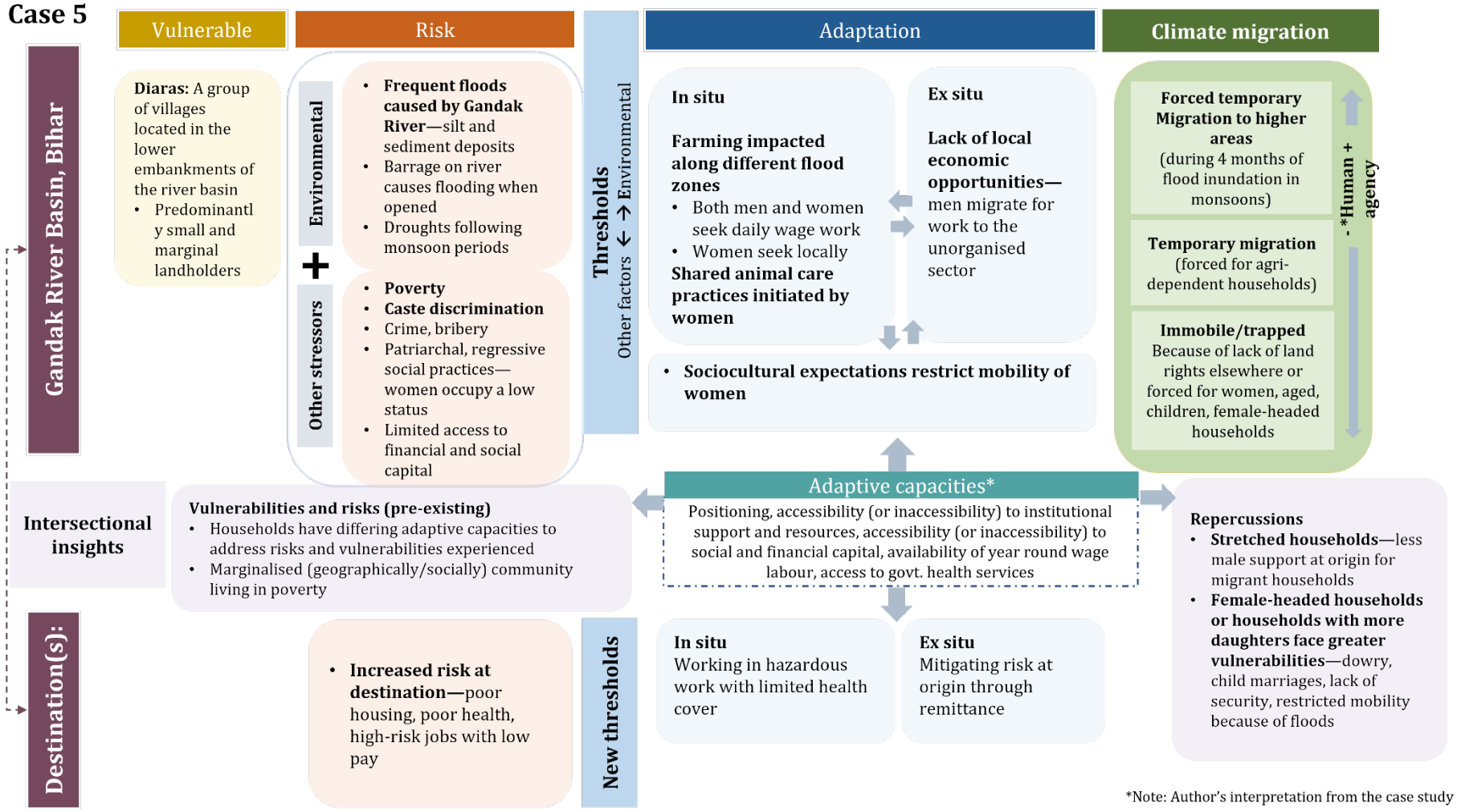

Figure 6: Migration caused by recurrent and intense flooding in Diaras in the Gandak river basin in Bihar (drawing from Udas et al., 2021)

5. Pluralities and Complexities of Climate Migration

Drawing from the case studies in Section 4, this section discusses the pluralities of climate migration with all its complexities and nuances. Section 5.1 considers the interplay of multiple stressors that define thresholds, leading to various adaptation strategies (including migratory and immobility outcomes) to cope with risks. Section 5.2 focuses on some of the repercussions of the various outcomes of climate migration across space and time. Section 5.3 discusses the adaptive capabilities of different individuals, both within and across households, that impact vulnerabilities and adaptation strategies (including decisions to migrate).

5.1. Thresholds and triggers

The climate migration discussed in the case studies was centred around the impacts of the slow- or rapid-onset of climatic hazards although the experiences of climate variations were unique and deeply embedded within the contextual conditions (such as sociocultural, economic, political, and environmental). Climatic factors were one of the main (but not always the predominant) determinants of various thresholds that triggered migration in different contexts. The thresholds themselves continually modified over time with evolving circumstances.

5.1.1. Revisiting thresholds

Panda's (2017) work on drought-triggered migration in Odisha is an appropriate example to understand the dynamic nature of adaption responses as it is connected with evolving thresholds for the same region. The author's study included historical narratives to uncover 'oral traditions referring to past climate and environmental changes' (Panda, 2017, p. 204). These narratives demonstrated the interrelationship between the slow onset of droughts (with its varying intensity and recurrence) and the varying thresholds experienced during each event, leading to differing outcomes over time.

During the first mega-drought (1965), farmers resorted to forest and buffer food stock at home for survival. During this time, migratory movements were primarily driven by economic factors to cope with low agricultural income and utilise remittances for asset building and purchasing agricultural lands. The next mega-drought (1974) led farmers to take extreme measures such as mortgaging and selling assets, thereby increasing poverty levels for small and marginal farmers. In the year 1985, despite a good harvest, migration intensified

as additional income went into coping with accumulated risks brought forward by previous droughts, leading to further economic deprivation.

In Odisha (Jülich, 2011), households impacted by drought coped by eating less initially. They then moved on to taking loans on animals and utensils, eventually selling livestock, utensils, or anything else that could provide them with a monetary cushion to cope with compounded risks before ultimately choosing to migrate.

McLeman's study (2018, pp. 322–323) discussed three types of initial thresholds in the context of climate change:

1) The first type of threshold is experienced, 'when a climatic event or condition stimulates or necessitates an adaptation response', typically in situ.
2) When the adaptation is no longer feasible, a second threshold is encountered.
3) Finally, the third level of threshold is realised 'when the nature of the human-environment relationship in a given situation undergoes a substantive change' causing undesirable disruptions or changes, particularly to land use or livelihoods.

Mcleman explained that usually migration occurs when the threshold to cope in situ is surpassed. Beyond this phase, the subsequent thresholds shape nonlinear migratory movements or cause nonlinear migration to cease altogether.

While thresholds are critical for understanding decisions on migration in the context of climate change, there is a need to pay attention to the multiple and multiscalar adaptation strategies that emerge, sometimes simultaneously, with modifying thresholds over time. These adaptation strategies are often interrelated and driven by the interplay of both climatic and non-climatic factors, leading to both mobility and immobility outcomes.

5.1.2. Determinants of mobility patterns

As discussed in the framework climate change and its impacts act as a risk modifier, and the response to perceivable climatic variations and intersecting contextual vulnerabilities could be diverse. Mobility was one of the many, and not always the first, adaption strategies, with varying temporal and spatial outcomes. Also, when mobility patterns emerged, they were usually driven by multiple factors, making it incredibly difficult to categorise these

movements, even for the same climatic event. For example, C. Singh and Basu, from their work in Kolar and Gulbarga in Karnataka (2020, p. 94), identified 'existing livelihoods; available assets; distance and connectivity; social networks to facilitate immersion in the city; job availability; educational prospects; and personal reasons such as marriage, family disputes, and individual aspirations' as factors that shape different migratory trajectories.

Some of these factors are linked to life-cycle changes (such as marriage), internal subjectivities (such as individual aspirations), or available assets and livelihoods, which could be in flux based on the changing circumstances in the individual's life as well as the varying impacts of climatic variations. Therefore, there are dynamic factors in play that continually mould decisions on who migrates, how, where, and for how long—both within and across households. The very same factors can also shape immobility outcomes, either forced or by choice. For example, as noted in Case 3, households with financial resources, or with access to those individuals or institutions that can provide the required additional resources when in need, were less likely to migrate. Land-owning households would also be less inclined towards permanent movements, and they typically seek alternative strategies at the origin to cope with the risks presented. On the other hand, in Case 5, drawing from the example of Diaras, despite the risks posed by constant erosion or flooding, some inhabitants could not move 'because it is impossible to claim land rights elsewhere, given the feudal social structure of Bihar where access to land is skewed' (Udas et al., 2021, p. 41).

Therefore, as Cattaneo and colleagues suggested (2019), the emphasis needs to be on factors that determine both mobility and immobility outcomes while conceptualising climate migration.

An emphasis on the complex processes that lead to multiple adaptation strategies, including migration outcomes, is key to understanding climate migration holistically.

5.1.3. Multiple and multiscalar adaptation responses

It is evident from the case studies that when decisions to migrate occur as an adaptation strategy or coping mechanism, it is not uniform across different members of the household. In cases where male members migrate to buffer risks and send home remittances, women, the elderly, children, individuals who are disabled, and others in the household who are left behind (either by choice or force) continue to cope with the risks at the origin. As noted in Case 2, when there were fewer opportunities to find work in agriculture and allied sectors at the origin, some women began commuting for work to neighbouring villages or nearby urban

peripheries to bring in additional income. Similarly, in Case 3, the women in Diaras, Bihar, opted for shared animal care, which was less risky than farming in the context of frequently recurring floods. In these examples, in-situ adaptation strategies were carried out simultaneously while male members migrated elsewhere for work (typically in low-skilled non-agriculture jobs) also as part of a risk management strategy.

As emphasised in the framework, there is a strong interconnection between in-situ and ex-situ (particularly migration) adaptation strategies even within the same household. Therefore, within the framework of climate migration, it becomes necessary to consider the constantly evolving multiple and multiscalar risk management and adaptation strategies in tandem with the modifying thresholds both at the origin and the destination based on how vulnerabilities and risks are shaped contextually.

5.2. Repercussions of migration

While it has been established that migration is one among many strategies to adapt to risks (emerging from both environmental and nonenvironmental factors), the decisions do not always lead to the intended outcome of risk reduction. Further, migration establishes a dynamic relationship between origin and destination(s), thereby creating a complex spatial and temporal dimension to how risks are mitigated, distributed, or sometimes compounded through this interconnection (as shown in all the cases, see Figures 2–6).

Drawing from the findings of the case studies, this section discusses some of the repercussions of various adaptation strategies, including migration, based on the contextual risks and vulnerabilities experienced while consciously considering the multispatial interconnections created in the process. The repercussions discussed in this section are not exhaustive and do not intend to generalise the outcomes or processes involved in climate migration across all contexts. The aim is to highlight some of the key aspects that have emerged from the use of the framework developed by us to understand migration as reported in the five case studies.

5.2.1. Remittances and impact on agriculture

People often pursue migration to generate additional income for their households by typically finding employment in non-agricultural sector jobs, which require low skills. Findings from

Case 2 reveal that while remittances generate additional income to offset some of the financial setbacks, such as loan repayment, they do not increase the adaptive capacities adequately enough to cope with climate risks (C. Singh & Basu, 2020). Similarly, findings from Case 3 reinforce that remittances are usually not enough to reduce the poverty levels experienced by households, particularly for the small and marginal farmers (in Odisha) facing recurring periods of drought that intensify over time. On the other hand, Tiwari and Joshi (2015, 2017) noted from their study in Uttarakhand that remittances have marginally improved the socio-economic development of rural women, as they observed trends of declining female school dropout rates and increasing primary education levels.

In cases where migration is pursued as a livelihood opportunity, Deshingkar (2012) noted that there is a loss of labour, especially if the individual of the household previously contributed to agricultural activities. However, large remittances received through long distances, typically international migration, help cope with labour loss over time and allow households to purchase necessary agricultural inputs. However, this intensification requires a 'favourable institutional, environmental and market context that supported agricultural development' (Deshingkar, 2012, p. 2). But in cases where the departing member of the household was not part of the agricultural activities, the outcomes could vary.

C. Singh (2019) noted that migrants who engage in daily commuting or temporary migration are not always able to accumulate assets over time (Case 2). Their remittances are often inadequate to overcome risks; they at best help cope with immediate financial liabilities or challenges. At times, deintensification of agriculture could occur or there could be a change in the choice of crops, or when the situation worsens, abandonment of the land altogether (Deshingkar, 2012).

Multiple outcomes, in terms of risk management strategies (in the context of environmental impacts on agriculture), are possible based on household structures and contextual factors.

5.2.2. Dislocated lives or stretched households and precarious living at destinations

Migration also often results in the stretching of households, which establishes an ongoing relationship between multiple places involved in the process. As C. Singh (2019, p. 313) noted, depending on the migration outcome (which is dynamic), the 'responses are neither urban nor rural but "beyond-local", traversing location and geographical boundaries' and depends on 'assets and agency in the rural and urban'.

As the author elaborated, when men migrate, irrespective of whether they engage in everyday commuting or seasonal migration for work, the burden of workload typically increases on the women (particularly agricultural labour) who remain behind while the men bear the brunt of commuting long hours or living in precarious circumstances, creating new risks—forcing households to cope with multiple risks, sometimes occurring simultaneously on multiple fronts. In the receiving cities, residing in slums and surviving on cheap locally available food cause malnutrition and bad health for these men (Jülich, 2011), which is yet another form of risk. When men work in dangerous circumstances with no health insurance, particularly in unorganised sectors such as construction and mechanised farming, it can lead to accidents, disabilities, or even death (Udas et al., 2021). The risk of injured men being forced to return home and the inadvertent increase in finances because of the healthcare burden are likely. In circumstances where alternative employment opportunities are scarce locally, any aberration in the planned or forced migration trajectory causes a negative outcome by further multiplying the vulnerabilities of those already at risk in their places of origin.

C. Singh (2019) explained that in cases when the entire family migrates, members share the risks of living in poor conditions in urban spaces while trying to send remittances back home. She added that in some cases, women who migrate permanently are able to take on new roles and seek paid work when they can access jobs through intermediaries. While in some other cases, women engaged in daily commuting for work in factories, which sometimes proved expensive in terms of money (to be paid to middlemen) as well as time (long commute).

There is an intricate relationship between household structures that function across time and space and their impact on mobility patterns, gendered division of labour, and risk management behaviour.

5.2.3. Gendered outcomes

When migration occurs, especially male out-migration, there is an impact on household structures, and responsibilities are redistributed. The sociocultural context in India typically sets expectations on the male head of the household or older sons to seek work outside in other locations, resulting in either temporary out-migration or everyday commute for work to nearby towns and cities. Women, the elderly, disabled, and children are usually the immobile population left to cope with risks at the place of origin. The impacts of risks are experienced differently even within the same household.

- Udas et al.'s (2021) study in Bihar reported that households with more daughters were the most vulnerable to flooding because of the limited social and financial capital of the households to cope with multiple risks (sociocultural, economic, and environmental) experienced. Further, these households were observed to take out more loans, often to pay for dowries. Similarly, female-headed households (particularly widows) and those households that have individuals with disabilities experienced intensified vulnerabilities. Also, in the aftermath of floods, these households found it harder to relocate by themselves to higher ground and often relied on male members of the community to help protect their belongings or aid in relocation.
- When men migrated, women sought alternative work opportunities and were often doubly burdened with responsibilities at home and work (C. Singh, 2019). Further, food security became a major challenge, which impacted the overall health and well-being of those who stayed behind, including women, children, and the aged.

Decisions and responses related to migration are further impacted by social identities (often intersecting and multiple), norms, and expectations. As C. Singh and Basu (2020, p. 98) explained,

> migration outcomes are highly differentiated across and within households, and often, causal patterns of vulnerability in rural areas are replicated in urban settlements. This reinforces class and caste inequities, continues exposure to environmental risks, and consolidates drivers of lower adaptive capacity such as poor bargaining power and limited asset ownership.

Migration also results in the renegotiation of sociocultural expectations across space. In some cases, women take up new roles as heads of households while struggling to find their voice in a patriarchal society. In some other cases, women are able to engage in income-generating activities at the destination (either by choice or by necessity) and redefine their positionality and agency.

Women are more likely to be immobile as normative expectations do not permit them independent mobility to seek work outside of their place of origin. Migration often results in a renegotiation of sociocultural norms and their agency within the power hierarchies at origin and destination.

5.2.4. Modifications to existing migratory patterns

Migrations, such as the one described in Case 1 of the Rebaris in Rajasthan, are a voluntary livelihood strategy. However, these movements are undergoing a transformation because of the marginalisation of communities within the sociocultural and political context at origins and destinations along migratory routes in addition to being impacted by climatic variations, scarce natural resources at origin, and reduced common property resources for grazing. These issues forced the Rebaris to proactively undertake long-term migration, given their reduced adaptive capacities and increased risks (both climatic and non-climatic) in their respective contexts—a case of modification of migratory routes and times and the juxtaposition of multiple stressors.

In rural Karnataka (Case 2), a shift in migratory patterns was reported because of decreased rainfall and repeated droughts, which in turn was impacting agricultural productivity and reducing local opportunities in agriculture and allied sectors. The rural–rural movements for agricultural wage labour, typically seasonal, have now transformed to rural–urban movements to seek jobs in non-agriculture sectors.

The patterns of rural–urban movements (daily commuting, temporary, or permanent) change, largely determined by the nature of work available, access and availability to cheap transportation options, or access to established networks that facilitate employment opportunities.

5.2.5. Resettlement colonies

In cases where migrants settle in resettlement colonies, the temporality of their stay has an impact on their everyday lives. For example, in the case of the inhabitants of Diaras, residents felt a sense of lack of ownership and it disincentivised them from improving their temporary homes to cope with future floods, thereby increasing the precarity of their living conditions (Udas et al., 2021).

5.2.6. Varying risks, vulnerabilities, and adaptation strategies

Each household copes differently with the risks presented depending on who migrates (and how) within the family and the amount of additional income they can generate through their migratory movements, which could include everyday commuting, seasonal migration, or permanent migration. While risks at the origin are spread across time and space through migration, new vulnerabilities are sometimes added on at the destination urban areas. For

instance, in Case 2 (C. Singh, 2019), typically when men migrated for shorter periods (either everyday commuting or seasonal migration), the additional income helped pay off existing liabilities or strengthen agricultural livelihoods through small investments, sometimes even for extended families. In these cases, women were usually left behind and continued to face existing risks, which were further exacerbated through gender role reorganisation and negotiations of sociocultural power relations. Alternatively, the author added that relatively longer migrations (over a year) generated adequate income to invest in risk management strategies and in building human capacities such as education for children. However, this happens when a male member migrates to urban centres for longer periods—increasing the capacity of households to accumulate assets and invest in short-term risk management strategies. Yet another dimension to migrations, noted in Case 2, was permanent family relocations to urban centres (as elaborated in previous sections), which increases the capacity of households to accumulate assets over time and invest in long-term risk management solutions. But the families end up braving through living in precarious spaces and engaging in risky livelihoods in the initial stages.

Therefore, migration does not necessarily mean a reduction of risk but an extensive reconstruction of existing household structures, which determine how risks are addressed across space and time. Further, these risk management strategies themselves change over time depending on how circumstances evolve, thereby continually altering household configurations and outcomes. Thus, the financial ability to offset compounded risks is only one aspect of the issue. It is the positionality of the migrants determined by social, cultural, and economic categories and their identification as *outsiders* with varying skills and education that greatly impacts adaptive capacities and risk management decisions. As Mcleman (2018, p. 331) said, 'the relationship between the financial, psychological, and social cost/benefits of migration fluctuates over time', and '[m]igration flows are also determined by how the benefits to cost changes over time'.

5.3. Adaptive capacities

The IPCC defines adaptive capacity as 'the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences' (IPCC, 2019, p.804). The IPCC also elaborates that there are two dimensions of adaptive capacity: one is generic indicators (such as education, income, and health) and the other dimension pertains specifically to climate change impacts and may relate to institutions, knowledge, and technology. Further, the fourth assessment report (IPCC) explained that adaptive capacity was also influenced by social factors such as human capital and governance and not just economic development and technology. The report added that

'there are many examples where social capital, social networks, values, perceptions, customs, traditions and levels of cognition affect the capability of communities to adapt to risks related to climate change' (IPCC, n.d.).

Focusing on the mobility dimensions, Koubi et al. (2022, p. 369) argued that to gain additional insights into the relationship between climate change and migration, it would be useful to examine the 'characteristics of a climate event that make adaptation more or less likely' and 'an individual's abilities to adapt to the impact of the particular climate event'. In their work, they considered both sudden onset and slow onset of climatic events where different adaptation strategies were undertaken by individuals. They added that the sudden onset of a climatic hazard rarely left any time or space for making adaptation strategies and often led to forced mobility. For factoring in individuals' capacity to adapt, the authors focussed on human and financial capital (particularly household wealth, profession, and education) as the main determinants in decision-making. Based on the intersections of these factors, conditions that shape mobility and immobility (both voluntary and involuntary) outcomes can be understood.

Findings from their study in Cambodia, Nicaragua, Uganda, and Vietnam (Koubi et al., 2022) showed that in general, those with lower education levels and those belonging to lower-income groups are less likely to migrate when there is a slow onset of climatic events compared to their counterparts with higher levels of education and financial resources. While understanding the role of adaptive capacity in shaping mobility and immobility outcomes in the context of slow or sudden onset of climatic events is important, factors determining adaptive capacity are likely to vary contextually. We examined these aspects in the two case studies presented in Section 4.

- In Case 2 (C. Singh, 2019, p. 308), 'asset bases, social networks, political agency, skills, household dynamics, and personal attributes' were factors determining the range of outcomes (differential) on household and individual well-being.
- In Case 3 (Jülich, 2011, p. e196), only when the household had 'demographic, physical and social ability, as well as the necessary personal mobility', did they have the ability to migrate. The migrant households needed the social capital to arrange for the journey and secure labour at the destination. Also, women rarely migrated independently because of societal constraints. Further, households with older, younger, or chronically ill or disabled populations typically did not have the adequate human capital to migrate.

Thus, migration decision-making is likely to be shaped by environmental changes perceived by individuals rather than the more objective scientific risk analysis conducted by experts to

define environmental change (Koubi et al., 2016). Here, environmental perception is 'the means by which individuals seek to understand their environment in order to arrive at a more effective response to environmental hazards' (Koubi et al., 2016, p. 138). These perceptions are shaped by both direct subjective experiences and external factors, including indirect information gathered from other sources (mass media, science, and other individuals). They are further 'mediated by individual values, roles and attitudes' (Koubi et al., 2016, p. 138) and their adaptive capabilities to cope with the environmental perceptions that may lead to decisions to migrate (or not).

Further, McLeman et al. (2021, p. 23) established an ongoing relationship between agency and migration outcomes by explaining that migration decisions made with a higher agency generally have a greater potential to achieve a positive outcome 'in terms of reducing vulnerability and risk, and for building adaptive capacity for migrants and for sending and receiving communities'. On the other hand, mobility (or immobility) outcomes resulting from a low agency, they added, led to lower adaptive capacity, resulting in increased vulnerability and greater exposure to future and ongoing risk. Thus, human agency influences where and how to migrate and for how long when migration occurs and determines immobility outcomes.

The discussion in this section attempts to present a broad overview of adaptive capacities while acknowledging the limited scope that prevents a deeper engagement with the vast literature relevant to climate migration. However, we aim to bring to attention the intricate dynamic relationship between risk, vulnerability levels, and adaptive capacities. First, we consider this interrelationship as critical to understanding decisions to migrate (or not to migrate) while continuously contextualising it. Second, we intend to highlight multiple factors, including risk perception and human agency, that can shape adaptive capacities at an individual or community level.

5.3.1. Individual capacities

Physical capabilities (able-bodied, disabled, age), social categories (gender, caste, religion, among others), marital status, access to and availability of financial resources, skill sets (including education levels), social networks, access to information, family assets (movable, immovable, livestock), social ties, occupation, and indebtedness comprise some of the factors that determine individual capacities (Debnath & Nayak, 2022; Jülich, 2011; C. Singh, 2019). Intersecting identities (for example, how gender interacts with other categories such as age, caste, and religion) complicate the social hierarchical ordering, leading to further marginalisation, and exacerbate experienced vulnerabilities.

5.3.2. Positionality

The spatialities and mobilities are continually shaped by and impact the uneven power relations between people and groups, which Massey (1994) referred to as power-geometry. In power-geometry,

> different social groups have distinct relationships to this anyway differentiated mobility: some people are more in charge of it than others; some initiate flows and movement, others don't; some are more on the receiving-end of it than others; some are effectively imprisoned by it. (Massey, 1994, p. 149)

Drawing on Massey, we focus on the social locations of migrants, which determine their levels of recognition, access to and availability of resources, and mobility patterns. In India, migration is often perceived as problematic and, therefore, there are efforts to regulate it without understanding the multiple drivers that set it into motion. Also, as discussed previously, the two primary data sources on migration, the Census of India and the National Sample Survey, do not adequately capture the complexities and pluralities of migration and record only a single reason (among limited choices, especially in the census) for migration—overlooking the distinctions between different migratory patterns.

As stated previously, sometimes, migrants live in precarious circumstances at the destination with poor housing conditions, lack of access to basic amenities, limited employment opportunities, and inaccessibility to social protection, among other forms of marginalisation. In addition to the inadequate recognition at an institutional level, migrants often experience sociopolitical marginalisation as outsiders. When migrants' identities intersect with other social markers such as caste, class, and gender, their positioning is altered and they experience layered and differential vulnerabilities.

For example, in the case of Assam (Case 5), the migrants (first- or second-generation, often refugees) were from Bangladesh and victims of flooding, which further complicated their social positioning. As Manuvie (2020, Introduction, para. 4) explained, in migratory movements from Bangladesh to Assam, 'the failure to recognise a victim as a "citizen"' is one of the biggest challenges that prevents the state from guaranteeing protection and rights. Manuvie (2020) highlighted the plight of 1.9 million people excluded from the National Citizenship Register in 2019—categorised as *outsiders*. They were displaced by floods and erosion from their original place of residence, leaving them with no documentation to prove their legitimacy in the state as citizens. Women comprised 69% of the doubtful voters[9] listed in the state of Assam. Manuvie (2020, The Bangladeshi Bogeyman or the Climate Migrant?,

[9] 'Doubtful voters' is a category of voters in Assam who are deprived of their right to vote until they can prove their status as citizens.

para. 8) added that the 'documentational poverty of women is the primary reason for exclusion from the Citizenship register'. Women's relatively poor education, migration because of marriage, and absence from public spaces, in addition to lack of citizenship documents, reduce their ability to exercise rights as both citizens and inhabitants, and they are often left with no voice.

This case demonstrates the varying impacts on different individuals because of their intersectional identities and how those identities are recognised and received. This positionality also has a temporal dimension that alters adaptive capacities. For example, in the case of Rebaris, changing migratory patterns requiring prolonged periods of absence from the place of origin made pastoralists an insignificant stakeholder at the origin and a nonparticipating member of their community. This further impacted their ability to vote in their constituency or gain access to social protection and other support systems because of the lack of residential proofs.

5.3.3. Institutional support: Recognition of diverse needs and access to and availability of resources and services

In this section, we discuss mainly two facets of institutional support. We first focus our discussion on understanding how the problems of climate change impacts and drivers of migration are framed. As Manuvie (2018) explained in his study, how the subnational or state governments perceive and frame climate migration is a crucial step in understanding how the nexus is addressed through various policy agendas. Second, we draw from some of the examples discussed to understand the translation of this framing into responses and policies that impact adaptive capacities.

In the Indian context, internal migration is viewed as a livelihood issue, especially those triggered by the slow onset of environmental stressors, whereas migration caused by the sudden onset of climatic hazards and disasters is understood as a humanitarian relief issue (Manuvie, 2018). While there are technical solutions offered by some state governments in the aftermath of a disaster, providing support for displaced populations or relocation support for affected individuals is yet to receive adequate attention in policies (Panda, 2020). At the national level, there are schemes such as the Mahatma Gandhi National Guarantee Act, the Disaster Management Act of 2005, and the Indira Awas Yojana (rural housing scheme, now known as Pradhan Mantri Gramin Awas Yojana) that are aimed at guaranteeing livelihood opportunities, mitigating and managing disasters, and providing affordable housing, respectively. However, none of these schemes directly mention or address climate migration, and the policies prioritise '"flood-victims", "erosion-affected families", "landless households"',

among others, in their administrative documentation and rules of procedure for implementation (Manuvie 2018, p.47).

While there is limited scope in this document to further elaborate on the benefits, access and reach of these policies, or their shortcomings in the context of climate migration, some of the case studies explain that migration can occur despite the availability of institutional support and benefits. For example, C. Singh and Basu (2020) explained that the monetary benefits of migration in terms of timeliness and income level often surpass benefits from the National Employment Guarantee Scheme (NREGS). On the other hand, in Case 3, Debnath and Nayak (2022) noted that the state of West Bengal's support through NREGA aided in reducing livelihood vulnerabilities in the region.

In Assam (see Case 5), the state's Disaster Management Authority conducts annual strategic needs assessment and procurement of relief and shelters at the district level, involving block development officers, village administrators, and village elder men (Manuvie, 2020). Relief provisions are provided for up to a week after flood incidents to shelters or air-dropped when flood-affected individuals are trapped. Flood relief compensation is also provided to those families who have lost lives, cattle, assets, and household items. Additionally, 'the state also utilizes programs such as National Rural Employment Guarantee Act, Rural Housing Scheme, and Women Welfare Schemes to prioritize people displaced due to floods as a internal rule of operation' (Manuvie, 2020, Web of Policies, para. 2). However, as discussed previously in Case 5, the onus of being able to receive these benefits from the state rests on victims who can clearly demonstrate their citizenship, land entitlements, and residency before receiving compensation.

In cases where post-disaster support is available, not everyone benefits equally. For example, for the flood-displaced *Diaras* inhabitants in Bihar, gaining access to safe drinking water, sanitation, and healthcare are critical during hazards (Udas et al., 2021). While health centres of the Government of Bihar provide free medication to flood-affected villagers, access to these centres is varied based on the location of victims in the flood-impacted basin. Women are further marginalised when sociocultural and patriarchal expectations leave them at home and restrict their mobility.

In eastern India and Bangladesh, the governments tend to focus more on disaster management to protect the coast from 'rapid-onset events' such as cyclones and storms rather than the slow onset of disasters or 'normalized, everyday deteriorations' (Harms, 2019, p. 76). Although the cumulative spatio-temporal impact of the slow onset of events is

substantial and adequate to warrant equal attention from the governments involved, it goes unaddressed.

The pre-emptive managed retreat of populations at risk in the coastal areas is yet to receive adequate attention. Odisha is one exception where the state started planning for a managed retreat in 2011 owing to the slow-shoreline erosion and coastal erosion experienced in the state. This initiative led to the announcement of the revenue and disaster management department's resettlement and rehabilitation policy in the same year. However, Panda (2020) explained that as the outcomes of the planned relocation are yet to be evaluated, the issues of providing fair compensation and post-resettlement livelihoods and achieving the intended number of resettlement houses through the policy are debatable. The challenges emanate from relocating communities in their entirety and the large scale of the projected displacement for the area, in addition to the difficulties of securing adequate funds.

Therefore, structural deficits can also act as drivers for migration, and there is a greater need for governments to understand the root causes of climate mobilities to adequately address them at the origin. This will ensure social protection support for those who migrate and help in planning for a managed retreat in areas such as the coastal region where slow-onset climatic processes are ongoing and disasters are inevitable.

5.3.4. Philanthropic, nongovernmental, and other available resources and support

Access and availability of philanthropic, nongovernmental, or other support can positively improve the adaptive capacities of both individuals and groups. For example, in the case of pastoralists (see Case 1), the Rebaris in Rajasthan altered their choice of livestock to cope with changing environmental, socio-economic, political, and market conditions. However, when pastoralists received adequate financial support from the government during extremities, they were able to maintain their big-sized cattle such as cows, buffaloes, and camels. There was no specific policy support for small-sized animals such as sheep and goats (Pineiro & Bhagat-Ganguly, 2022). The authors noted that depending on the emerging markets, pastoralists were able to alter their livestock. For example, philanthropic organisations such as Camel Charisma[10] work towards creating income opportunities for camel-herding communities in Rajasthan. The availability and access to these resources and new markets are likely to positively impact the choice of cattle and subsequently alter migratory patterns.

[10] Camel Charisma: https://www.camelcharisma.com/

5.3.5. Collective adaptation responses

Social capital is a critical component of adaptive capacity, which is linked to social networks and norms that allow the flow of information (and resources) for facilitating collective action at a societal level (Adger, 2003). These aspects of adaptive capacities are often not quantifiable although they are necessary to understand the culture- and place-specific characteristics of adaptive capacities and how these aspects come together and help in coping collectively with climate variabilities and hazards (Adger, 2003).

Jülich's (2011) study in Odisha (see Case 3) briefly elaborated on the benefits of social networks and the flow of information they generate. The author noted that the type of labour that migrants engage in post-migration was closely linked to the established social networks of their families. These channels differed for each family and were carefully guarded. These channels also meant that migrants were personally known to employers and, therefore, could undertake temporary migration regularly even during non-drought periods. Jülich added that most of the men who migrated from their households were engaged in skilled work such as working in sawmills, agricultural farms, or building construction as a result of these connections and received relatively higher wages in comparison to those who worked in unskilled jobs and for daily wages elsewhere and could not tap into these networks. Established employment connections meant that irrespective of the excess supply of labour (during/after a drought period), these migrants could secure a job and continue to receive higher wages, especially when needed and during times of economic scarcity.

On the flip side, in Case 2, C. Singh (2019, p. 313) observed that when households are stretched across space and time, it has an impact on community cohesion, which can potentially 'undermine social capital and safety nets in times of crisis'. The author further added that when kinship ties are altered, their terms of reciprocity, which help protect livelihoods, and a common pool of resources are subsequently weakened, especially for those who stay back at the origin. These changes impact collective risk management strategies and lower the adaptive capacities of individuals.

6. Conclusions: Temporalities of Climate Migration

The framework developed in this study encompasses the dynamic interrelationship between climate change and migration. It acknowledges the nexus that emerges as time- and context-specific and embedded within and continuously shaped by the interplay of multiple stressors acting at multiple scales—both at the origin and destination(s).

In reconceptualising climate migration, we first focus on the **interplay of complex contextual determinants** (economic, political, social, cultural, demographic, and other factors) that are often multiscalar and shape everyday vulnerabilities and adaptive capacities of different individuals and groups (McLeman et al., 2021) differently. We acknowledge that while climate change does play an important role in human mobility, it is not always the predominant factor. Also, immobility may occur based on the same factors that drive migration.

Second, **adaptive capacities** play a critical role in shaping the response to perceived and experienced risks to climatic variations and hazards. The factors determining adaptive capacities for both individuals and groups are multiple and contextually determined. As Smit and Wandel (2006, p. 289) iterated, 'while exposures, sensitivities and adaptive capacities are evident at community or local levels, they reflect broader forces, drivers or determinants that shape or influence local level vulnerabilities'.

Therefore, an understanding of the processes that shape adaptive capacities gives insights into the intersectional experiences of vulnerabilities of different individuals and the differential impact of climate change.

Third, **adaptation strategies as a** response to risk are often multiple and multiscalar. In our conceptualisation of climate migration, we emphasise the continually evolving **thresholds** that determine these various adaptation strategies as critical. Also, mobility decisions are one of the many adaptation strategies employed and not necessarily the first.

Fourth, when mobility outcomes occur as an adaptation and risk management response, they inevitably bring in the **multispatial dimension** of climate migration.

Finally, all the key components identified in our climate migration reconceptualisation have a temporal dimension. Some of the key determinants of these temporalities are the onset of climatic events or hazards (such as time, duration, and frequency that impact thresholds and adaptation responses), the continual modification of contextual stressors (dynamic interplay

of social, political, cultural, and other factors that shape vulnerabilities and risks), and life-cycle changes of different individuals and groups (both biological and key events in life history, determining internal subjectivities, values, and aspirations). The intersection of these different temporalities shapes lived experiences at both origin, destination, and beyond.

7. Limitations of This Study and the Way Forward

The framework was applied to some of the well-documented case studies in the Indian context to understand the interconnectedness of critical components (discussed in Section 6) that drive different adaptation strategies, including decisions to migrate, in the context of climate change. This exercise has been theoretical at this stage, but it offers opportunities for further exploration when translated to the field.

What has emerged from the application of the framework to the various case studies is the need to employ mixed methods offering macro-, meso-, and micro-level perspectives to link the scientific articulation of climate change and its impacts with everyday lived experiences and perceptions of climate variabilities.

Our proposed framework aims to function **as a holistic system mapping tool** for studying climate migration, which allows the identification of worrisome zones where proactive responses can be tailored based on the scale and location of these potential grey areas. While we do not prescribe any specific methodology of study, we do believe that the framework can be explored and expanded for different project objectives. Further, the conceptualisation of vulnerabilities and adaptive capacities within this framework brings in intersectional perspectives.

However, we acknowledge that translating intersectionality can be challenging and would require contextually determined parameters and further research for application.

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