

THE LINKS BETWEEN CLIMATE CHANGE, DISASTERS, MIGRATION, AND SOCIAL RESILIENCE IN ASIA: A LITERATURE REVIEW

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The Links between Climate Change, Disasters, Migration, and Social Resilience in Asia: A Literature Review

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ABSTRACT

This working paper was written as input for the *Asian Development Outlook 2019*. It reviews the literature at the intersection of disasters and migration in Asia and details the story of how disasters may affect mobility, from displacement to voluntary migration to “trapped populations.” It also provides an overview of the “migration as adaptation” literature, which shows that planned and sustained movement may help individuals weather shocks and diversify income in the face of disaster, as well as the uneven outcomes of disaster-related remittances in Asia. In addition, it gives insight into predicted impacts on mobility because of climate-related disasters and delves into the likely trends. Ultimately, it aims to show the diverse ways in which disaster-related migration may affect economic growth and social resilience in Asia.

Keywords: climate change, disasters, migration, remittances, resilience

JEL codes: J60, O15, Q54

I. INTRODUCTION

A more mobile world. Today's world is increasingly mobile, with an estimated 244 million international migrants (UNDESA 2015) and between 740 million and 763 million internal migrants globally (UNDP 2009, Bell and Charles-Edwards 2013). Asia is no exception: UNDESA (2015) estimates that more than 30% of all international migration occurred in Asia and nearly 50% of international migrants came from Asia, particularly Afghanistan, Bangladesh, India, Pakistan, and the People's Republic of China (IOM 2018). While internal migrant numbers are harder to specify, the People's Republic of China alone is estimated to have more than 150 million rural-urban migrants (Chan 2013). Most internal and international migration is voluntary and in search of better economic opportunities, while also comprising an essential part of rural livelihoods in this part of the world (Adger et al. 2002; Deshingkar 2012; Rigg, Promphaking, and Le Mare 2014; Rigg, Nguyen, and Luong 2014; Rigg and Salamanca 2011, 2009).

Slow- and rapid-onset disasters. Disasters affect the movement of people in other ways.¹ In general, sudden-onset events, which include tropical storms (hurricanes, cyclones, typhoons); flooding; and earthquakes, often lead to displacement (see Box to understand definitions of human mobility in more detail); whereas slow-onset events give communities and households more time to make voluntary migration decisions, although whether they see the need to migrate or relocate varies (Koubi et al. 2016). Asia, one of the most vulnerable regions in the world to sudden-onset events (WorldRiskReport 2017), has experienced several displacement-inducing disasters. In 2017, more than 18.8 million people were displaced by sudden-onset disasters worldwide, with East Asia and South Asia accounting for 11.4 million, or more than 60%, of that total (IDMC 2018).² At the same time, there is increasing concern over slow-onset disasters, especially as they relate to climate change. By 2050, the World Bank predicts there will be about 140 million internal climate migrants, 60 million in South Asia alone, because of water scarcity, crop failure, sea level rise, and storm surges (Rigaud et al. 2018).

From numbers to nuances. Net numbers, however, tell us little about how disasters impact the movement of people in Asia, and the extent to which they affect people's ability to overcome poverty and build resilience. Thus, this paper seeks to move from numbers to nuances: What role do disasters play in making the decision to move? In what ways do disasters determine where, when, and how people move? How do disasters affect this movement across differentiated segments of society, including socioeconomic status, gender, and age? And, in what ways does migration affect vulnerability and resilience in the face of disaster?

¹ Disasters are defined here as "serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (UNDRR 2018).

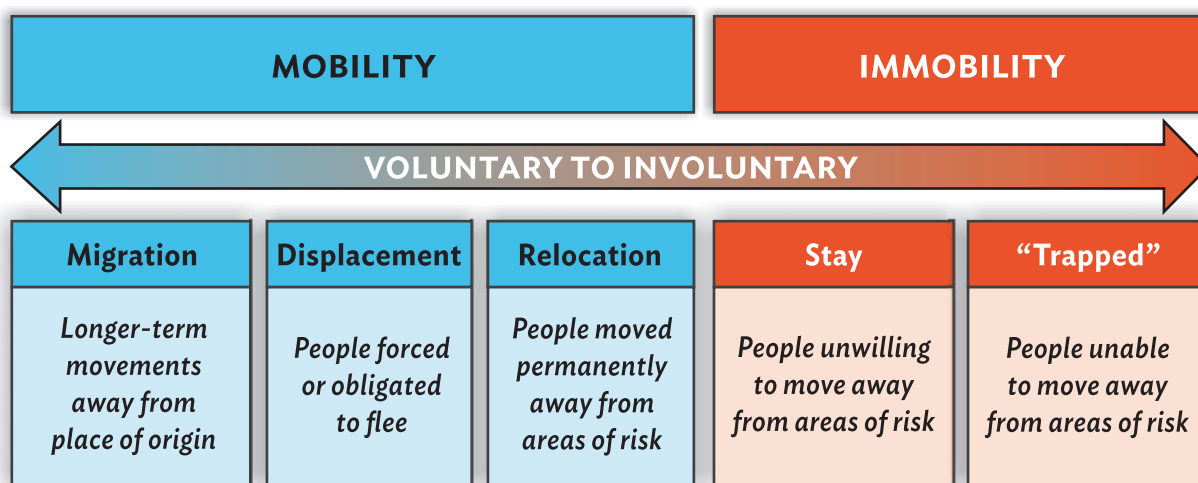
² The IDMC counts storms, floods, wildfires, wet mass movements, earthquakes, volcanic eruptions, extreme temperature, and dry mass movements in their estimates of sudden-onset disasters. Floods and storms account for approximately two-thirds of all displacements (IDMC 2015. <http://www.internal-displacement.org/publications/global-estimates-2015-people-displaced-by-disasters>).

What Is Human Mobility?

Human mobility is an umbrella term for diverse sorts of movements of people. Importantly, it is meant to provide a holistic representation of movements that occur that may be voluntary, involuntary, or somewhere in between (see figure). These movements may be short or long term, and may occur over short or long distances, and within countries or across borders. They may involve one individual, a household, or even whole communities. The reasons behind these movements may also be diverse.

This working paper focuses largely on migration, which implies longer-term movements of people away from their places of origin, usually beyond subnational administrative units, and is normally voluntary in nature; and “displacement,” or forced, sudden movements in the face of a risk or hazard. It is most interested in how these two sorts of movements relate to and are affected by disasters. At the same time, it recognizes that most movement postdisaster may be a combination of the two or a shift between one form and the other.

The Human Mobility Spectrum



Source: Adapted from Rigaud et al. (2018).

II. HOW DISASTERS AFFECT HUMAN MOBILITY IN ASIA

A. Background

Factors in migration decision-making. The factors influencing migration decisions are multifaceted and complex. The often-cited push-pull theory (Lee 1966) suggests that factors in sending area (e.g., poverty, lack of opportunities) and destination area (e.g., jobs, social services, family members, social networks), as well as intervening obstacles (e.g., travel costs or border controls), and personal factors (e.g., age, gender, ethnicity) may influence migration decisions. However, in most cases, the drivers behind migration decisions are more ambiguous, and the resulting migration itself may be more complex than “going” or “staying.” As the New Economics of Labor Migration theory finds, migration decisions are often taken as part of a household’s collective strategy to diversify income sources and reduce exposure to risk (Stark and Bloom 1985, Scoones 1998). In most instances, this migration may be cyclical, where migrants leave during the dry season to bolster income as seasonal agricultural

laborers or in the service industry in cities, for example. In other cases, household members may migrate permanently, but retain strong ties back home and remittance obligations (Mazzucato 2011).

Additional factors that influence migration decisions at the household level relate to the size of the household and the age and gender configuration of its members. A household with many members may be better able to spare the labor lost when a migrant departs than a household with fewer members (Gray and Mueller 2012a, Warner and Afifi 2014). The likelihood of any household member migrating is often closely linked to the age and life-course stage of household members, with young, unmarried adults being the most likely to contemplate migration (Plane 1993). In some societies, cultural barriers restrict the mobility of women, whereby men migrate most and are expected to be the breadwinners. This may result in households headed by women or the elderly, who may be in charge of rearing children alone or as a stand-in caretaker for the labor migrants of the household (Rigg and Salamanca 2015; Rigg, Promphaking, and Le Mare 2014; Rigg, Salamanca, and Parnwell 2012). While these households may become more vulnerable in some ways, other households that do not have the capital or capacity to migrate may be worse off, becoming “trapped” (Black et al. 2011).³

Unique mobility responses. The ways in which migration decisions play out in the face of a disaster are different than in other, less pressing circumstances, such as the search for economic opportunities. During sudden-onset disasters, people often make decisions quickly and under duress (World Bank 2016), typically moving as part of a large, networked group responding to an exogenous push (Drabek and Boggs 1968). Because of this, these sorts of movements are often categorized as displacement rather than migration, although it is generally acknowledged that these mobility responses exist on a spectrum and often overlap (Box). The scale and scope of displacement is largely determined by the underlying vulnerability of people and communities to shocks or stresses, the magnitude and frequency of the hazard event at hand, and the ability to cope with such events (IDMC 2015). The circumstances and contexts of communities and households are important factors in understanding the resulting displacement (Hunter 2005), including the speed of onset of the disaster (both in terms of its rate of onset and the ability of those affected to perceive the risk and adapt in anticipatory fashion) (Renaud et al. 2011, Koubi et al. 2016); the household’s assets; access to land and natural resources; community assistance; social networks (McLeman and Smit 2006, Warner 2012); aid response; and likelihood of recurrence (Naik 2009). Thus, people displaced by disasters are often among the most vulnerable (Ginnetti and Lavell 2015, Rigaud et al. 2018).

The scale of the resulting movement may be large or small depending on the type of disaster (Blaikie et al. 1994; Brock and Paul 2003; Cannon 1994; Lavell 1994; Parker, Islam, and Chen 1997; Smith and Ward 1998). For example, sudden-onset hazards tend to generate different sorts of mobility, often resulting in migration “churns”—a mix of short-term and longer-term out-migration and, at times, sudden influxes of migrants into affected areas to help rebuild (Curtis, Fussell, and DeWaard 2015; DeWaard, Curtis, and Fussell 2016). Slow-onset events on the other hand normally do not generate immediate changes in existing migration patterns (McLeman 2014).

Both slow- and sudden-onset disasters largely result in internal, localized (Smith and McCarty 1996), and short-term movements (Hugo 1996; Hugo 2006; Massey, Axinn, and Ghimire 2007). Several qualitative studies bear this out, showing that flooding or coastal storms induce mostly short-term and temporary movement (Findlay and Geddes 2011; Kartiki 2011; Mallick, Ahmed, and Vogt

³ “Trapped” populations, as defined by Black et al. (2011), are people who will be unable to move away from locations in which they are extremely vulnerable to environmental change due to their limited capital and capacities, despite wanting and needing to do so.

2017; Mallick and Vogt 2014; Paul 2005; Paul and Routray 2010; Penning-Rowsell, Sultana, and Thompson 2013; Rahman et al. 2015). This trend holds even in the face of larger-scale disasters: For example, after Hurricane Andrew in 1992, 80% of evacuees returned within a month (Smith and McCarty 1996). Similarly, more than 50% of migrants returned to New Orleans within 7 months after Hurricane Katrina, although the rate of return varied according to socioeconomic status and race, with white residents returning sooner than black ones (Fussell, Sastry, and VanLandingham 2010).

The spatial distribution of postdisaster movement depends on preexisting migrant networks and other forms of capital (Hugo 1996, McLeman and Smit 2006). Frequently, displacement occurs at the nearest safe point (Raleigh, Jordan, and Salehyan 2008). However, other calculations are made, including using existing social networks to determine “locations that match their needs for place-based resources such as disaster assistance, affordable housing, employment opportunities, neighborhood amenities, and public services” (Fussell, Sastry, and VanLandingham 2010). In addition, in developing country contexts, especially in rural areas, affected populations tend to migrate to large cities in search of opportunities to recover economically from the impact (Lein 2000, Lewis 1999).

B. Disasters in Asia

Risk distribution uneven. The risk of disaster-induced displacement is unevenly distributed around the world and within Asia in particular. Displacement risk is unevenly distributed among countries within Asia because of differences such as population size, exposure to different types of hazards, and preexisting vulnerabilities and resilience (Ginetti and Lavell 2015). For example, according to the IDMC (2015), 1 million people in India risk displacement for every one person in the Maldives. However, when population size is accounted for, they find that individual people in the Maldives are 3 times as likely to be displaced as people in India. Similarly, Asia has a large and growing number of coastal megacities, significantly increasing the population exposed to displacement risks posed by sudden-onset events (ADB 2012).

Disaster type and scale impact movements. The ways in which disasters affect mobility in Asia follow some instructive trends echoed in the general literature. Firstly, the type of disaster and its relative scale will impact resulting movements. Sudden-onset events, such as tropical storms, typically cause significant displacement throughout Asia (Nansen Initiative 2014). For example, in 2011, monsoon rains and multiple tropical storms in Southeast Asia resulted in some of the region’s worst flooding in 50 years, affecting Cambodia, the Lao People’s Democratic Republic, Myanmar, Thailand, and Viet Nam. The Government of Thailand evacuated 1.5 million people from Bangkok (Yonetani 2012), and in Cambodia, about 214,000 people were displaced (FAO and WFP 2012). However, the magnitude of sudden-onset events will also determine the intensity of resulting movement. For instance, in November 2013, Typhoon Haiyan—one of the most powerful storms ever recorded—hit the Philippines, displacing 4 million people. Similarly, Cyclone Nargis struck Myanmar’s Irrawaddy Delta in May 2008, displacing about 1.6 million people.

At the same time, recurring slow-onset hazards, such as the annual flooding in the Mekong and Irrawaddy Deltas, produce less dramatic patterns of movement. Since many rural communities are used to coping with and even depend upon these seasonal inundations, they tend to induce only moderate mobility (see Chun 2014, for Viet Nam; Gray and Mueller 2012b, for Bangladesh; Mueller, Gray, and Kosec 2014, for Pakistan). However, if these recurring slow-onset events are exacerbated by other disasters, such as cyclones, movement may be amplified (Gray and Mueller 2012b). Likewise, if the impacted population has to deal with slow-onset events outside of the norm, such as temperature

extremes in Pakistan (Mueller, Gray, and Kosec 2014) or repeated drought in Bangladesh (Gray and Mueller 2012b), then out-migration increases. Most of this movement would be categorized as migration, although on a sliding scale of voluntary and involuntary, rather than displacement.

Movement predominantly local. Secondly, the nature of the movement tends to be local, or in some cases rural–urban. In the event of sudden-onset disasters, such as cyclones or earthquakes, people tend to move into surrounding areas (see Wilson et al. 2016 in Nepal; or Lu et al. 2016a, 2016b in Bangladesh). Existing social networks and support systems as well as emergency preparedness and early warning systems influence this spatial distribution (Lu et al. 2016b, Mallick 2014). In South Asia, in particular, rural–urban movement in the face of slow or sudden-onset disaster is commonplace (Bryan, Chowdhury, and Mobarak 2014; Deshingkar 2012; Gioli et al. 2014). For example, Mallick (2014) finds that almost 25% of households affected by Cyclone Aila moved toward neighboring cities immediately after emergency relief works were phased out. Most (78%) moved to big cities, including Satkhira, Khulna, and Bagerhat, where they sought jobs in the service industry (Mallick 2014).

Duration typically temporary. Thirdly, the duration of the movement is often temporary, barring extraordinary cases. While people tend to flee immediately in the face of sudden-onset disasters, they also tend to attempt to return as soon as possible. For example, Wilson et al. (2016) find that while an earthquake in Nepal displaced 390,000 people, most of those affected returned within 2 or 3 months. Even more surprising, Lu et al. (2016a, 2016b), using a novel retroactive large-scale mobile phone tracking system, find that during Cyclone Mahasen in 2013 in Bangladesh, most evacuees returned within 2 days. However, they note that Cyclone Mahasen was weak compared with other storms and these findings may not necessarily be replicated in the face of a larger storm or different sorts of hazards. Similar patterns were observed in Bangladesh following Cyclone Aila in 2009 (Mallick and Vogt 2012), but because of the scale of the event, the terms and rates of return were differentiated depending on the livelihood of impacted households. For example, because of postcyclone saline water intrusion on rice paddy fields, some rice farmers had to wait at least 2 years to make use of them. In the meantime, they chose to migrate to the city to find alternative work (Mallick, Ahmed, and Vogt 2017). Meanwhile, while a sudden-onset event, such as flooding, may induce migration and immediate return, slow-onset events, such as repeat high temperatures, have sustained effects on migration, which may persist for a year or 2 (Call et al. 2017).

Influence of socioeconomic status, gender, and education. The ability to weather a disaster shock and movements related to their impacts is often determined along socioeconomic, gender, and educational divides. The decision to move, how, when, where, and many other relevant outcomes are determined by the vulnerability or resilience of each household and the assets they have to make such decisions (Black et al. 2011, Ginnetti and Lavell 2015, Rigaud et al. 2018). On average, the poor are most likely to migrate when confronted with a sudden- or slow-onset event (Chun 2014; Gray and Mueller 2012a; Mallick 2014; Mallick and Vogt 2012; Mallick, Ahmed, and Vogt 2017; Mueller, Gray, and Kosec 2014; Tunas and Peresthu 2010). This is the case for various reasons, but most likely because of immediate and debilitating income shocks that need to be overcome through labor migration (Gray and Mueller 2012; Mallick 2014; Mallick, Ahmed, and Vogt 2017). At the same time, households with more assets, including housing, land, and education (Chun 2014; Gray et al. 2014; Mueller, Gray, and Kosec 2014), have a higher capacity to cope with or adapt to these shocks and are motivated to stay to safeguard these assets.

Socioeconomic factors may also determine the timing of the resulting movement. For example, Mallick (2014) finds that after Cyclone Aila in 2009, lower-income groups (those earning less than

\$30 per month) started to move earlier (within 4 weeks after the event) and tried to settle in neighboring cities, whereas middle- and higher-income groups waited a little longer (at least 4 weeks after the event) before moving. However, it should also be noted that the poorest of the poor may be unable to migrate at all because they do not have the necessary income and assets to finance such a move (Bryan, Chowdhury, and Mobarak 2014; Mueller Gray, and Kosec 2014), leaving them trapped (Black et al. 2011).

Occupation also has an effect on timing and duration of movement. As highlighted earlier, during Cyclone Aila in 2009, waterlogging and saline intrusion rendered rice paddy fields unusable for cultivation for at least 2 years. As a result, most farmers dependent on them for their main source of income moved to cities or turned to fishing to supplement their income (Mallick, Ahmed, and Vogt 2017). However, results are not always consistent. Gray et al. (2014) find that farming households in Indonesia were less likely to move than nonfarming households after the tsunami. This may be because shocks to crop resources had decreased the resources necessary to make the move (Mueller, Gray, and Kosec 2014).

In Asia, and especially in South Asia, gender and attendant social norms significantly influence disaster-induced mobility. The type of disaster also determines the resulting movement along gender lines. For example, sudden-onset events, such as cyclones, may trap men and women differently. Ikeda (1995) finds that women's social norms and role behaviors, including restrictive clothing, limited education, and expectation to stay in the house of their family or kin, may limit mobility (and increase mortality) during cyclones in Bangladesh. Lu et al. (2016b) surmise that men in the Barisal Division may have stayed behind to protect their homes and assets from thieves during Cyclone Mahasen. At the same time, men are on average more likely to migrate following a disaster as part of their role as breadwinners for the household. For slow-onset events, such as increasing rainfall and temperature extremes, men are especially expected to migrate (Call et al. 2017; Mueller, Gray, and Kosec 2014). Call et al. (2017) find that high rainfall increases demand for farm labor and thus men's migration; while an increase in temperature increases men's probability of migration while simultaneously decreasing the probability for women. They also find that migration is more likely to occur for those between 15 and 35 years old, which follows the general literature in Asia where young, able-bodied cohorts are most likely to engage in labor migration (Rigg and Salamanca 2015; Rigg, Promphaking, and Le Mare 2014; Rigg, Nguyen, and Luong 2014; Rigg, Salamanca, and Parnwell 2012).

III. HOW HUMAN MOBILITY IMPACTS VULNERABILITY AND RESILIENCE TO DISASTERS

Migration as an adaptive response. There is an increasing preoccupation with disaster displacement, but mobility equally may bolster or hamper the ability to respond to disasters and influence longer-term effects. Both preexisting mobility patterns and postdisaster movement can be necessary and considered an appropriate adaptive response for individuals and households (Black et al. 2011, Ober 2014, Sakdapolrak et al. 2016). For example, the term “migration as adaptation” sees migration as a way for households to diversify their income (Black et al. 2011; Scheffran, Marmar, and Sow 2012; Tacoli 2011) and spread risk (Afifi et al. 2015). This is especially true for small farmers who rely on rainfed agriculture for their livelihood (Deshingkar 2012), where environmental shocks are commonplace and a lean season is typical (Bryan, Chowdhury, and Mobarak 2014).

Remittances as disaster mitigation. Remittances act as a coping mechanism through consumption-smoothing effects and investment in housing and communication equipment to increase preparedness and to mitigate the impact of disasters (Ebeke and Combes 2013; Gubert 2002; Halliday 2006; Mohapatra, Joseph, and Ratha 2012; Quartey and Blankson 2004). In general, remittances can be transferred more rapidly and efficiently than relief efforts, allowing households to recover faster, as was found in Pakistan after the 2005 earthquake (Suleri and Savage 2006); in Samoa after the 2009 tsunami and 2012 cyclone (Le Dé, Gaillard, and Friesen 2015); and in Indonesia (Wu 2006) and Sri Lanka (Deshingkar and Aheeyar 2006) after the 2004 tsunami. Some of these recovery gains can be substantial: Yang and Choi (2007) find that financial remittances help to compensate for nearly 65% of the income lost because of rainfall shocks in the Philippines. Migration can also generate “social remittances” (Levitt 1998), increasing knowledge, capacity, and networks (Adger et al. 2003; Barnett and Webber 2010; Scheffran, Marmer, and Sow 2012) to build resilience to future disasters. At the same time, evidence of this type of remittance is sparse and inevitably context based (Kagan 2016).

Remittances and inequality. Some studies find remittances can increase inequality during disasters and extreme events, as most remittances reach those already privileged within a community and are often spent insularly to protect individual households (Adger et al. 2002, Le Dé et al. 2015). The poorest and most excluded can become even worse off after an event (Deshingkar and Aheeyar 2006, Le Dé et al. 2015). For example, in Nepal, remittance-receiving households allocated about 20% of their remittance income on construction following the earthquake; meanwhile, for households that did not receive remittances, the intent to build a new home was significantly less (NRRC 2014). Similarly, remittances are not evenly spread across those most in need. In the Philippines, Licuanan, Toman, and Steinmayr (2012) find that donations mainly flow to provinces with high emigration rates, therefore not reaching the less developed provinces.

Determinants of resilient outcomes. Resilient outcomes from financial and/or social remittances depend on a complex set of inputs, trajectories, and histories. How, when, and why migrants send back remittances, what households decide to spend remittances on, whether migrants transfer social remittances, and how remittances are used all depend on the context and background in which the decisions take place. The reason behind remittance amount and timing depends on existing or enduring social relationships, such as kinship, as shown in Polynesian migrants (Brown, Connell, and Jimenez-Soto 2014); or a sense of obligation to family or religious values instilled by the community, as shown in Samoa (Le Dé, Gaillard, and Friesen 2015). When these ties decline, normally as migrants stay away from their hometowns and form new family or networks in their places of destination (Harper and Zubida 2017), so too does the amount of the remittances sent, as was found in Bangladesh and Viet Nam (Szabo, Adger, and Matthews 2018).

However, financial transfers from the larger diaspora can be essential postdisaster. If active diaspora institutions exist, they can facilitate these transfers more efficiently and effectively than social ties alone (Aldrich 2011). Likewise, the use of remittances may vary based on different characteristics or expectations of the household. For example, Kurien (2008) finds that in three Indian villages she studied, migrants from the Muslim village distributed money to a large circle of community members; Hindus spent large sums on life-cycle rituals; and in the Christian village, remittances supported family expenses, including dowries and education.

Impact of postdisaster remittances on resilience. Financial and social remittances postdisaster also have impacts over time and space that may increase or decrease long-term resilience.

The feedback processes of migration on the places of origin of migrants have an impact on the environment (Davis and Lopez-Carr 2010, Greiner 2011, Greiner and Sakdapolrak 2013, Sakdapolrak et al. 2016) and on how people deal with environmental risks (Deshingkar 2012, Sakdapolrak et al. 2016), which in turn has implications for migration decisions and the ability to prepare for future disasters. The transfer of finances and ideas, as well as the return of migrants themselves (equipped with knowledge, capital, and aspirations) can contribute to agricultural innovation (Rockenbauch and Sakdapolrak 2017) through the introduction of new crops, technologies, and business models, which entail profound changes for local socioecological systems. For example, in Thailand, the increasing investment in sugar cane, rubber trees, or vegetables, and the introduction of new businesses such as chicken farming in the northeast of the country, often made possible by the financial and/or social remittances of return migrants (Rockenbauch and Sakdapolrak 2019, Peth and Sakdapolrak under review), has led to increasing use of fertilizers and pesticides, and to land degradation.

IV. FUTURE TRENDS IN CLIMATE-RELATED DISASTER-INDUCED MOBILITY

Future trends likely to follow past patterns. Past patterns of mobility and outcomes can be instructive for future climate-related trends. Migration is not a stand-alone process, but rather occurs along social networks established by earlier generations of migrants (Bardsley and Hugo 2010, Massey et al. 1993). Even in extreme cases, most human movement resulting from climate change impacts is likely to follow or reinforce established channels of movement or at least depend upon established networks and relationships (Bardsley and Hugo 2010, Rigaud et al. 2018). Thus, most movement will occur internally within countries (ADB 2012, Hugo 1996, Rigaud et al. 2018).

The climate change wild card. However, climate change will influence disasters in drastic ways and the way in which humans have been able to manage disasters in the past may also change radically. While lessons learned are instructive, they do not prepare us for the abrupt, nonlinear changes to be expected under different climate change scenarios (Streets and Glantz 2000, Schneider 2004). Locations that already experience extreme storm events, especially in mid-latitudes and the wet tropics, should expect to experience disaster events of similar or greater frequency, with the potential for more high-intensity events through 2050 (IPCC 2013). The intensity of extreme storms is also likely to increase, heightening the risks of flooding and damage to homes and coastal infrastructure (Chan et al. 2012). The greater prevalence of extreme events will affect rural and urban communities, particularly on sloping lands and in coastal regions. Low-lying deltaic countries, such as Bangladesh, and small island developing states face some of the highest levels of exposure and vulnerability to extreme storm events (World Bank 2013).

Expected direct and indirect livelihood impacts. Other ways in which climate change can be expected to affect livelihoods and, as a consequence, patterns of mobility, include through direct impacts on the quality, quantity, and/or accessibility of ecosystem goods and services in particular locations; and through indirect effects on households' access to and reserves of other forms of capital. Direct and indirect impacts can be experienced concurrently. For example, the growing dryness, risk of extreme heat events, and changing precipitation patterns associated with climate change are expected to significantly reduce crop yields in less developed countries over coming decades. At the same time, the combined effects of a growing global population, increased demand for food, and a global food supply constrained by climate change are expected to make global food prices more volatile and negatively affect rural incomes (Mendelsohn et al. 2007). The direct impacts of lower crop yields and the indirect impacts of food price instability can together be

expected to place considerable pressure on rural livelihoods, a dynamic sometimes described as “double exposure” (O’Brien and Leichenko 2000).

Scale of climate-induced migration. The estimates of climate-related migration in Asia are diverse, with one study projecting up to 60 million migrants in South Asia alone by 2050 (Rigaud et al. 2018). The spatial distribution of these migrants is uneven across the region. Since climate-related out-migrations occur in areas of deteriorating water availability and crop productivity, hotspots include the northern part of the Gangetic Plain and parts of the broader Gangetic Plain and the Delhi–Lahore corridor. Sea level rise and storm surge impacts will dampen growth in major coastal metropolitan areas such as Chennai, Chittagong, Dhaka, and Mumbai. For example, Mumbai, a low-lying city vulnerable to cyclones and severe flooding, may become less hospitable, especially under a high-emissions pathway, which projects a sea level rise of 2 meters by 2050. However, declining crop productivity raises the high likelihood of movement toward sources of income that are not dependent on climate in cities such as Hyderabad and Karachi, amplifying already existing patterns of rural–urban migration. Climate impacts are also especially dire for low-lying deltaic countries, such as Bangladesh, where the same study projects 13 million internal climate migrants by 2050 (Rigaud et al. 2018).

Determinants of movement outcomes. Despite the scale of movement, who moves and how they do so are more important in determining the outcomes of disaster-related movement. Studies of climate-related slow-onset events find that they influence both short- and long-distance movement (Call et al. 2017, Gray et al. 2014, Gray and Mueller 2012b, Jennings and Gray 2017) but can also decrease movement for some segments of each population based on gender, education, and/or wealth constraints (Call et al. 2017; Mueller, Gray, and Kosec 2014). The ability or capacity to move can be a positive outcome if the disaster in question severely limits livelihood options. As Rigaud et al. (2018) also emphasize, climate-related migration does not necessarily signal a failure to adapt or mean moving under duress. Depending on the institutional and policy context, some migration may result in positive and nonmaladaptive outcomes, with consequences for long-term, future development (Black et al. 2011, Geddes and Jordan 2012).

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The Links between Climate Change, Disasters, Migration, and Social Resilience in Asia: A Literature Review

Disasters are increasingly causing mass movements of people all over the world, but especially in Asia. While sheer numbers are important, they tell us little about how disasters impact the movement of people in Asia, and to what extent they affect people's ability to overcome poverty and build their resilience. This paper seeks to move from numbers to nuances. In what ways do disasters determine where, when, and how people move? How do disasters affect this movement across differentiated segments of society, including socioeconomic status, gender, and age? In what ways does migration affect vulnerability and resilience in the face of disaster?

About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

