

Environmental non-migration: Analysis of drivers, factors, and their significance

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ABSTRACT

This study explains environmental non-migration, and considers an inverse relationship between the factors related to environmental migration. Results are based on an empirical study conducted in southwestern Bangladesh in March and April 2018. The results show that place attachment and future non-migration decisions are not significantly associated with the cases of sudden onset environmental events. However, most respondents with better relationships with their neighbors and extended family members had chosen to stay put. Other factors that influence environmental non-migration intention are (i) access to credit and economic opportunities, (ii) residing in a religious majority community, (iii) harmony in the community, (iv) lesser consequences of environmental hazards on home, livelihood, and community, and (v) perception of risk and risk-taking ability. All of these factors that influence non-migration decisions also help explain migration decisions. However, it is not entirely conclusive that all the factors that drive environmental migration will also explain non-migration despite risk or vice-versa. Thus, this study suggests investigating more thorough insights into environmental non-migrants so that more comprehensive risk and resilience programs can be arranged for those at risk. At the same time, it is essential to avoid treating non-migration and migration as exclusive categories and, perhaps to a certain extent, consider them as dynamic and intertwined processes.

1. Introduction

At the outset, it is essential to know what environmental non-migration means. We are still in doubt about environmental migration; so far, it has not been possible to establish any specifics. The International Organization for Migration (IOM) defines those who change their place of residence due to various environmental disasters as environmental migrants (Renaud et al., 2011). However, not every-one affected by a disaster is migrating (Mallick & Schanze, 2020). Those who stay despite environmental risks are called environmental non-migrants, and their decision-making process is environmental non-migration. Recent research (Rigaud et al., 2018; McLeman, 2017; Black et al., 2011) and policy dialogues (COP21) highlight that those who do not have the means to migrate are the most vulnerable to climate change. However, the motivations for non-migration in the face of environmental risks go beyond resource constraints and are an understudied yet integral aspect of migration decisions. The current state-of-the-art describes that demographic, social, economic, political, and

environmental factors are crucial to migration decisions (Mallick et al., 2021; Black et al., 2011). But we do not know the extent to which the factors that affect migration decisions also affect non-migration. Instead, the current understanding of complex environmental migration processes cannot directly explain this 'voluntary non-migration.' It depends presumably on the people's perceptions of environmental, economic, and political changes, their everyday experience, their social and cultural embeddedness, and their ability or lack thereof to seek and take on livelihood opportunities at multiple places.

Therefore, this study argues that specific variables within the broad list of factors relate to migration, and possibly a different set of particular variables may relate to non-migration. Thus, *it is not straightforward to claim to what extent the factors associated with migration are also relevant for non-migration in the context of environmental risks.* Instead, it is more evocative to study environmental non-migration based on these factors and to consider the reasoning from different angles of individual, household, community, and regional scales.

In doing so, this study investigates the inverse relationship between

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the factors that drive the decisions to migrate or stay put based on the empirical data collected from five vulnerable coastal communities in southwest Bangladesh. This empirical study consists of the household's information related to their social, economic, political, cultural, infrastructural, and behavioral characteristics. These characteristics have been used to decipher their association and influences on non-migration and migration decisions of the household at risks.

Section two explains the rationale of this study based on a rigorous review of the existing environmental migration literature and develops the hypothesis for assessing the inverse relationship between environmental migration and non-migration. Section three describes the methodology, whereas section four presents the results from an indicative assessment. And finally, section five discusses the results and contribution to the existing knowledge gap and directs the future research endeavor.

2. Literature review

2.1. Drivers of environmental migration and non-migration

Environmental migration currently gains substantial attention because frequent storms, floods, and droughts, especially in the coastal areas of the world, have made maintenance of people's livelihoods very difficult. People in coastal areas are slowly moving towards the city. Various studies have accurately described this migration of people as one of the ways to avoid these dire consequences of climate change, establishing migration as an adaptation strategy. However, among those who stay, some people may be 'trapped' and unable to move (Ayebe-Karlsson, Smith & Kniveton, 2018; Kabir & Kamruzzaman, 2022); their immobility may be a form of displacement in situ (Lubkemann, 2008), as they have the need and desire to move, but lack the capability, e.g. economic or social ability (Black et al., 2011; Foresight, 2011; Black & Collyer, 2014; Schewel, 2019). Climate change and environmental degradation will not necessarily result in migration; to some degree, it can even limit mobility options (Nawrotzki et al., 2015; Nawrotzki & DeWaard, 2018; Abel et al., 2019).

Non-migration can be distinguished from migration based on factors such as place satisfaction (Adams, 2016) [where satisfaction, in this case, is understood as 'no reason to migrate'] and individual capabilities/capital (human, social, political, cultural (Zickgraf, 2019; Logan, Issar, & Xu, 2016; Black & Collyer, 2014). Moreover, there is also a fundamental flaw in Malmberg's proposition, which states that to migrate means to uproot oneself from one's home (Malmberg, 1997: 21): this proposition does not consider translocality, in which one may, in a sense, 'remain at home' even when going abroad (Etzold et al., 2016). Additionally, people can stay behind because others migrate (Bennet et al., 2019). In this sense, migration results in non-migration, enabling people to remain under challenging circumstances. However, in the context of climate change, research should not believe too simplistic – and possibly naturally deterministic – accounts of 'voluntary non-migrants,' who have not migrated despite natural hazards and deteriorating environmental conditions. The Foresight (2011) study describes five broad categories of the drivers of environmental migration: social, economic, political, demographic, and environmental (see Fig. 1), and proposes an inverse relationship between migration and non-migration decisions. Environmental change has different degrees of influence on these drivers that may influence the outcome of migration and non-migration choices due to the impact on individual characteristics, such as well-being or resources. However, much less is known about how those drivers amplify, sustain, and instigate non-migration decisions in rural communities. Based on an extensive literature review, Table 1 lists some factors considered to assess migration and non-migration motivation.

Social drivers include access to family, or other relatives' networks and the place-attachment attributes that facilitate the decision of migration or non-migration. A sense of belonging to the community

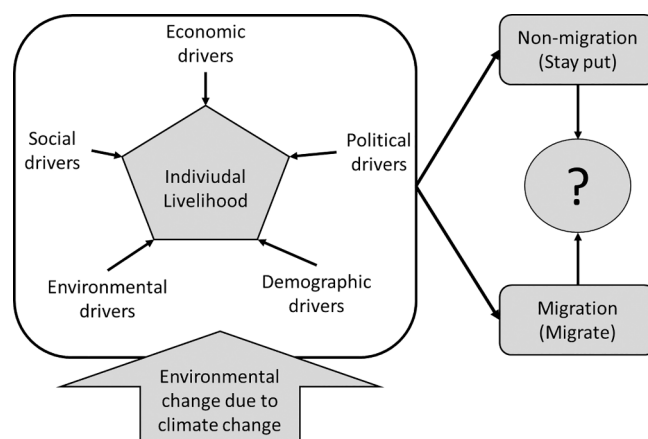


Fig. 1. Drivers of Migration and non-migration in the face of environmental change (Adapted from Black et al., 2011).

Table 1

List of key drivers and related factors of environmental migration/ non-migration.

Key Drivers	Factors/Variables	References
Social	Community cohesion, access to family or social networks, access to education	Irwin et al. (2004), Hunter, Luna and Norton, (2015)
Economic	Income and expenditure, individual cost-benefit analysis, labor markets, and wage difference at the macro level	Harris and Todaro (1970); Bijker, Haartsen and Strijker (2012); De Haas (2011)
Political	Governance structure, trust in governance, the emergence of violence and conflict, discrimination, marginalization	Lubkemann (2008); Van der Geest (2011)
Demographic	Age, population density, gender, ethnicity, level of education	Flahaux and De Haas (2016), Czaika (2013); Ortega (2005); Hatton and Williamson (2009)
Environmental	Sea level rise, changes in ecosystem services, rapid onset environmental events, slow-onset environmental change	Hinkel et al. (2015); Foresights (2011); Black et al. (2011)

Source: Author's illustration.

plays a vital role in future mobility (Irwin et al., 2004). Similarly, building trust requires communicating the value and limitations of risk assessment in the community (Hinkel et al., 2015). In addition, the social network variable includes the opportunity to receive practical help from neighbors, such as whether the household had asked for monetary, material, or emotional support from their neighbors (Hunter, Luna, & Norton, 2015). It also includes variables related to the household's dependency on extended family members and migration experiences.

Economic drivers include basic income and expenditure (Harris & Todaro, 1970) and vary according to the scale of analysis; for instance, the individual-level factors refer to access to credit sources, including both formal and informal credit sources, food scarcity, and per capita expenditure (Bijker, Haartsen, & Strijker, 2012; De Haas, 2011). These factors have impacts on migration decisions. Literature shows that the family has enough wealth, land, and income opportunities to cope with anticipated risks. The family has access to formal and informal credit sources and is comparatively less motivated to migrate (De Haas, 2011).

In the modern era, there is hardly any discussion where political factors have not been considered. Similarly, in the context of environmental migration or non-migration, *political drivers* have the potential to influence the decision in multiple ways. Lubkemann (2008) argues that conflict in the community is not only a cause of migration, but in some conditions, conflict and political instability may prevent people from

migrating and encourage non-migration. This factor is relevant in the case of internal migration or emigration across a particular border of a country. Besides these, other factors pertinent to social marginalization may influence human mobility decisions (Van Hear, Bakewell, & Long, 2018).

Literature on traditional migration theories claims that ‘population pressure’ is a significant determinant or even a ‘root cause’ of human movement. However, *demographic drivers* are more likely to influence mobility decisions in interaction with other drivers (Flahaux & De Haas, 2016). Among them, the age-sex structure, education, health conditions, and religion play a significant role in migration decisions (Carling, 2002; Ortega, 2005; Hatton & Williamson, 2009; Czaika, 2013). Notably, the directionality and scale of movement are not always straightforward.

The *environmental drivers* include rising sea levels, changes in ecosystem service, rapid onset, and slow-onset changes in the environment. These factors change ecosystem services and directly affect the well-being of the people that influence human migration (Foresight, 2011). Climate change also significantly contributes to such changes in ecosystem services through the sudden and slow onset events (IPCC et al., 2014).

Thus, coupled with the stress and shock of environmental change, political and social instability in the Global South further increase the precarity of rural livelihoods that influence non-migration decisions. To generate policy responsive to environmental non-migration, it is also essential to understand the forces shaping immobility. A lack of movement may reflect households becoming “trapped” in environmental-stressed locales due to a lack of resources required to relocate (Mallick & Schanze, 2020; Nawrotzki & DeWaard, 2018). Authors have also highlighted the importance of human agency in migratory choice, with the such agency being influenced by social structures and power relations (e.g., gender dynamics) (Adams, 2016; Farbotko & McMichael, 2019). Related to agency, non-migration may be voluntary, such as individuals in the Pacific Islands who express disinterest in relocation even in the face of sea level rise (Dastagir, 2015). Cultural connections to the land and ancestors represent strong ties to place (Sherry et al., 2018). Similar forms of attachment and satisfaction with locale have been expressed by rural Peruvians (Adams, 2016) and Tajiks (Blondin, 2021). Based on empirical data from coastal communities in Bangladesh, this research investigates these drivers and related factors of migration and non-migration in the face of environmental change.

2.2. Individual and household level factors of non-migration and migration

In almost all contexts, either environmental disasters or conflict and civil war, the primary goal of an individual’s migration is to diversify income and employment opportunities and to secure livelihoods. Thus, a family with enough wealth, income opportunities, and access to both formal and informal credit services may decide to stay put. Besides, profound differences in the income levels between households may reduce migration, while the level of education influences individual migration decisions (Carling, 2002). Mostly, educated people find jobs outside their community, and therefore, they migrate (with or without dependents). It is, therefore, comparatively less-educated families who opt to stay put. Again, literature shows that a female-headed family faces several challenges during disasters and opts to stay put (Troisi, 2001; Alam & Collins, 2010; Mallick & Vogt, 2012). Further, the individual’s aspiration to migrate differs based on the capability to migrate, and capability is the various combinations of functionings (beings or doings) that the person can achieve (Sen, 1992: 40) based on their local political and economic context. However, the aspiration of non-migration is rooted not only in the local political economy and environmental landscape but also in the risk-taking ability of the people at risk, i.e., their behavioral choices (Mallick et al., 2021). Risk-taking ability plays a significant role in determining the likelihood of continuing the livelihood in the vulnerable community (Obokata, Veronis, & McLeman,

2014). The relationship between perceived risks and risk-taking ability determines the ability to handle future risks and is significantly associated with future migration decisions. Critical to this, environmental non-migration is not uniformly engaged by households, nor is it uniformly beneficial. Characteristics of the environment interact with livelihood assets to influence livelihood vulnerability, while relational power (e.g., gender) shapes different options for individuals and households (e.g., Evertsen & van der Geest, 2020).

2.3. Community-level factors of non-migration and migration

People generally do not want to migrate if their community supports them in crisis. For instance, local institutions and support services can assist those who do not migrate, enhancing the sense of belonging to their community (attraction to the place) and their social capital (networks and associations) play a vital role in their migration decision (Adams, 2016). A study shows that living in a religious majority community increases the likelihood of receiving adequate relief and rehabilitation support in the aftermath of a disaster (Mahmud & Prowse, 2012). Consequently, it results in fewer out-migration aftermath of the cyclone (Mallick & Vogt, 2014). Hence, environmental hazards impact the constructed environment and institutions, and it is essential to consider the role of infrastructural and institutional supports on human mobility. It is evident that risk-minimizing infrastructural and institutional supports reduce mobility in the aftermath of a hazardous event (Gaillard, 2007; MoFDM, 2008; Abedien et al., 2010; Alam & Collins, 2010; Sherrieb, Norris, & Galea, 2010; Mallick, 2011; Renaud et al., 2011). For instance, access to refugee shelters helps residents to stay put in the community (Evertsen & van der Geest, 2020); thus, adequate infrastructural and institutional support at the community level may increase the tendency of non-migration decisions. Moreover, the level of conflict in the community impacts the migration decision. In their study, Ackerly et al. (2015) show that people prefer to stay in their majority religious community to avoid conflicts. Besides, resilient infrastructure plays a vital role in effective disaster response, i.e. staying put. Study shows households whose homes were not damaged by the storm were less likely to migrate (Mallick & Vogt, 2014; Ahsan & Khatun, 2020). Besides, the family lives in good quality houses, i.e., cyclone tolerant, and is close to emergency infrastructural and institutional support, e.g., the family has easy access to cyclone shelters in the community, did not migrate despite the incremental environmental risks (Ahsan & Khatun, 2020). In fact, the government ensures these facilities for the people. In the communities where these facilities are available, there is less rivalry and strife between people, so people do not want to migrate from there. Thus, the level of trust in the governance systems and the conflict situation in the community influence migration decisions.

2.4. Analytical concept

Based on the reviews presented in the earlier sections, an analytical framework is proposed in Fig. 2. This analytical concept is divided into two interrelated contexts of analysis: *living environment* (i.e. community level) and *behavioral response* (i.e. individual level). Generally, the ‘living environment’ is influenced by social, economic, political, demographic and environmental drivers (like Foresight’s analysis of 2011) at the community level, whereas the ‘behavioural response’ is an individual activity that is primarily derived from the ‘living environment’ of the respective individual. In this context, migration or non-migration decision is seen as a personal behavioral response stimulated by ‘risk perception’ and ‘risk tolerance’ (i.e. ability to handle the risk). So, all drivers at the community level have an impact on people’s living environment, which determine the behavioral response at the individual level. Notably, personal risk perception and risk tolerance are also stimulated by living conditions as well, and thus influence behavioral response. However, the behavioral response to risk results from the individual’s aspiration and capability, and it finally evaluates the

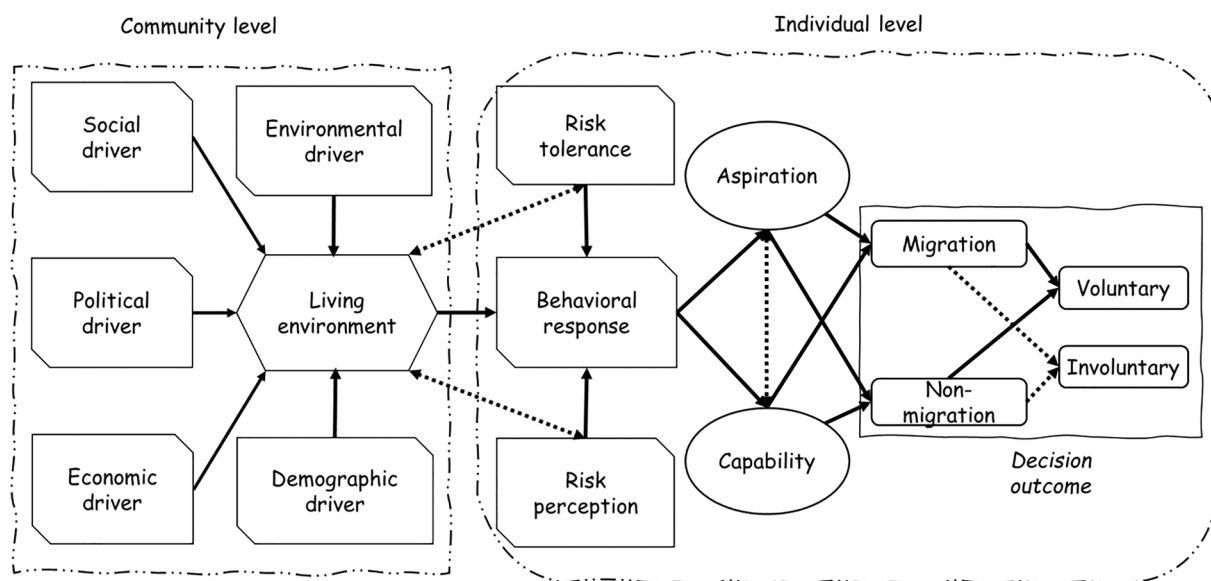


Fig. 2. Community and individual-level factors explain the inverse relationship between migration and non-migration.

voluntary or involuntary nature of the migration and non-migration decisions. Overall, Fig. 2 includes the context that serves as the logical background for conducting empirical analysis and contributes to this research's overarching aim: the inverse relationship between the factors that influence migration and non-migration decisions of people at risk. By analyzing a comprehensive set of economic, social, environmental, political, infrastructural, and demographic factors, this paper addresses why people at risk *would not like to migrate*.

Accordingly, this study operationalizes the concept presented in Fig. 2 by employing the community and individual-level elements collected through an empirical survey. The empirical research was conducted in the coastal communities of Southwest Bangladesh, which has a long history of people living in challenging environmental conditions (IPCC et al., 2014; Harmeling & Eckstein 2013; Dasgupta et al., 2010; Gunter et al., 2008; MoEF, 2008; Chowdhury, 2000).

3. Methodology

3.1. Study area and its relevance

Bangladesh ranked as the fifth-most climate-vulnerable country in the world. At least one climatic event hits the country annually and displaces a lot of people, most of whom live in coastal areas. The Internal Displacement Monitoring Center (IDMC) has estimated that 4.7 million people were displaced due to national disasters in Bangladesh between 2008 and 2014 (Bennet et al., 2017). According to the IPCC's current projection, almost a quarter of Bangladesh will be inundated, and more than 50 million people will be displaced by the end of this century. Concerning the people who decide not to migrate, especially in the coastal areas, the crucial questions are: what happens to these people, how do they survive, what are the strategic reasons behind their decision not to migrate, and whether they lack the necessary resources to relocate?

The disaster management bureau of Bangladesh's government has categorized the coastal villages into three categories of exposure level to cyclone hazards: high, moderate and low (Ahsan et al., 2022). Usually, the northern villages from the coasts are less exposed (MoEF, 2008). People living close to the coast are more vulnerable due to cyclone hazards; therefore, distance from the coast is an essential aspect of livelihood vulnerability (Lahiri-Dutt & Samanta, 2013). We consider the zoning of 'severity to cyclone hazard' provided by the government of Bangladesh as one of the major selection criteria for study villages. A

field study was conducted in five communities in the southwest coastal region (Table 2), considering their exposure to cyclone hazards. Amongst these five communities (presented in Fig. 3): two highly exposed (i.e. Padmapukur village in the Uttarbedkashi union, Khulna district and Chakdah village in the Mathureshpur union, Satkhira district), two moderately exposed (Shovna village in the Shovna union, Khulna district and Vabanipur village in the Islamkati union, Satkhira district) and one less exposed community (Panchkori village in the Nehalpur union, Jessore district). Besides, while selecting the study community we consider the environmental conditions that influence livelihood conditions. For instance, proximity to the river impacts household vulnerability (Ahsan & Khatun, 2020) in a poldered community (Auerbach et al., 2015). Soil salinity impacts agricultural production, influence household income (Chen & Mueller, 2018), and land-use change (Parvin et al., 2017).

Table 2 shows that the selected villages are of different scales regarding the total population. Chakdah is a tiny village near the border with India; it has the smallest number of households (49), whereas Shovna village contains the highest number of families (2,024). The average household size is 4.12, almost similar to the national one (4.06). Islam is the majority religion in four villages (between 53 % and 62 %), but Vabanipur is a Hindu-majority village (92 % Hindu). There is no significant variation in literacy rates across the villages.

3.2. Survey

During March – April 2018, an empirical study was conducted in the selected villages. The structured questionnaire mainly focused on the socio-economic characteristics of the respondents (e.g. religion, age, gender, education, current health status, occupation, income, expenditure, and debt); housing conditions; family characteristics (household size, male–female ratio); migration and non-migration factors (place attachment, social networks, and interdependencies, associations, roles and politics); environmental attributes (frequency of cyclone hazards, salinity, siltation, erosion); institutional attributes (cyclone shelter, credit institutions); and behavioral characteristics (perception of risks and risk-taking ability).

Five research assistants, trained and guided by the author of this paper, conducted the interviews in Bengali, using the Kobocollect toolbox on Android mobile phones. Respondents were selected randomly in the villages, and the survey work was completed with the verbal consent of the respondent. Before issuing the survey, respondents were

Table 2
Socio-demographic characteristics of the villages studied.

District	Upazila	Union	Village	Number of households	Sample (#, female, male)	Average household size	Muslim religion (%)	Literacy rate	Cyclone risk
Khulna	Koyra	Uttar Bedkashi	Padmapukur	327	66 (16, 50)	3.9	55.07	43.9	High
		Shovna	Nathpara	224	27 (4, 23)	4.0	61.51	53.3	Moderate
Satkhira	Kaliganj	Mathureshpur	Chakdah	49	29 (12,17)	4.6	59.11	56.4	High
		Islamkati	Vabanipur	128	31 (6, 25)	3.9	9.83	52.0	Moderate
Jessore	Monirampur	Nehalpur	Panchkori	1137	42 (7, 35)	4.2	53.08	45.1	Low

Source: BBS (2012).

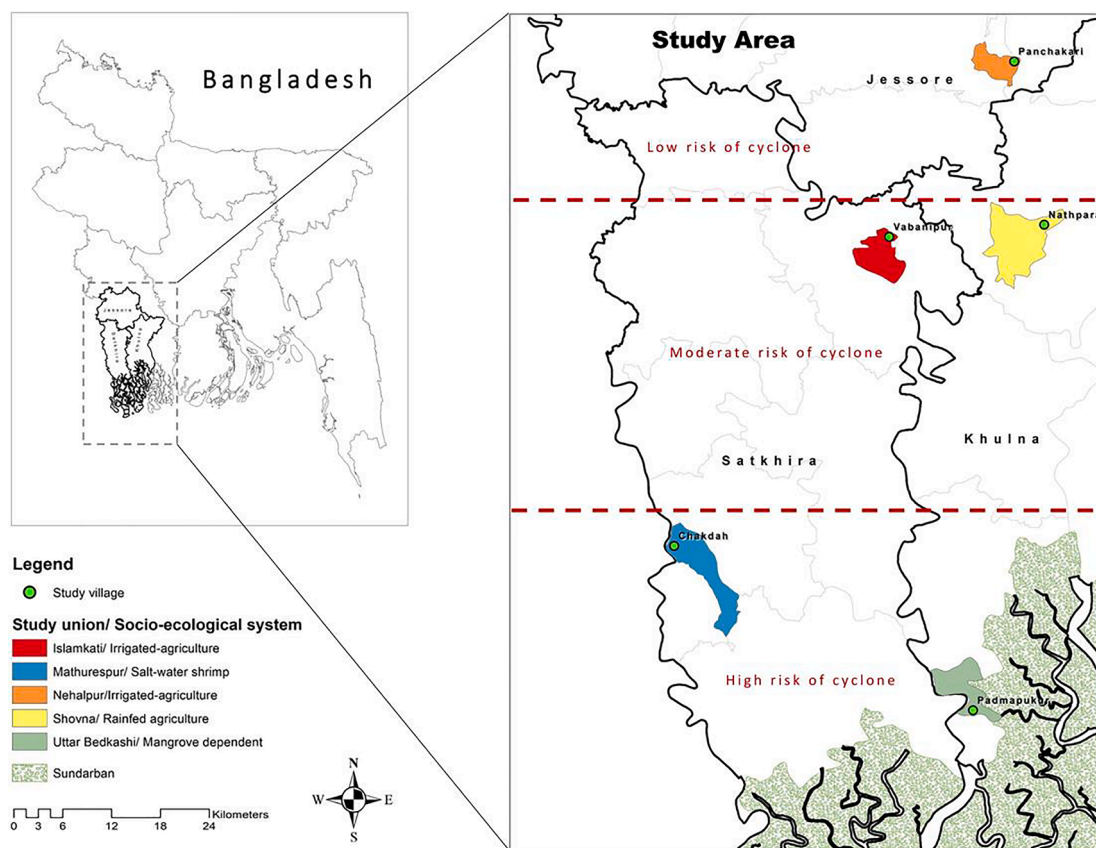


Fig. 3. Study villages in Bangladesh.

described the study and informed they would not be given any financial compensation for participation. Inclusion criteria for the interview were as follows: (1) at least 18 years of age and (2) able to answer questions about the problems of the local community. The interviews lasted between 40 min and an hour each. A total of 195 household heads (or, in their absence, their spouse) were interviewed using a structured questionnaire, and later on, data was imported to R and analyzed accordingly. Ethics approval was obtained from the Dhaka University of Bangladesh.

3.3. Operationalization of analytical concept: drivers and factors

The analysis is mainly based on two steps: (i) investigating the individual and community level factors affecting migration and non-migration decisions; (ii) assessing the associations between the factors by employing the chi-squared test and 2-tailed t-Test. In doing so, this study first selects the factors and their relation to the behavioral responses. The literature review presented in section 2 and the analytical concept (Fig. 2) are the key sources to developing Table 3, which details the variables corresponding to the drivers that affect the living

environment and behavioral response (to migrate or to stay) of the respondents in the studied communities.

Thus, from the *social driver* context, this study assesses if the strong sense of belonging to the community, possession of a strong social network, and incoming relatives in the community influence their staying motivation despite environmental risks. As the *economic drivers* vary according to the scale of analysis, this study considered both the individual household and community-level impacts of economic drivers on future mobility decisions. The individual-level factors refer to access to credit sources, including formal and informal credit sources and per capita expenditure. However, infrastructural facilities play vital role. For instance, this study considers that the family lives in good quality houses, i.e., cyclone tolerant, and is close to emergency infrastructural and institutional support, e.g., the family has easy access to cyclone shelters in the community, would like to stay put despite the environmental risks. Besides, individual characteristics, like age, education, gender, religion, and household size, are employed as *demographic factors*.

However, this study considered three intervening *political drivers*: (i) *trust in governance*, (ii) *system support*, and finally, (iii) *community*

Table 3
Drivers, factors, and their influence on the behavioral response.

Attributes	Factors	Expected behavioral response (migration or non-migration)
Social driver	Place attachment (Irwin et al. 2004; Adams 2016), social relations (neighbours, relatives, extended family members) (Hunter, Luna and Norton 2015), migration experiences (Carrico & Donato 2019)	(i) A family who has a long-standing sense of belonging to the community would prefer to stay put; A family who has a strong social network in the community would prefer to stay put, and A family whose relatives have migrated into their community or have migration experience would prefer to stay put
Economic driver	Access to credit (Bijker et al. 2012), per capita income & expenditure (Harris & Todaro 1970), quality of housing (Ahsan & Khatun, 2020)	(ii) the family who has enough wealth, land, and income opportunities to cope with anticipated risks would prefer to stay put; the family who has access to formal and informal credit sources would prefer to stay put the family who resides in good quality houses, e.g. cyclone tolerant, would prefer to stay put.
Demographic driver	Age, education, gender, household size, religion (Carling 2002; Ortega 2005; Hatton and Williamson 2009; Czaika 2013; Ackerly et al. 2015)	(iii) A family that has fewer educated people would prefer to stay within their community; Female-headed households prefer to stay put; A family that belongs to the majority religion in the community would not like to migrate Younger people do not prefer to stay
Political driver	Trust in governance (Ackerly et al. 2015) system support (Van Hear et al. 2018), community cohesion (Lubkemann 2008), accessibility to a refugee shelter (Mallick & Vogt, 2014; Ahsan & Khatun, 2020)	(iv) the family who believes that their political system treats them well would prefer to stay put; the family who believes that their fundamental rights are well-protected would prefer to stay put; the family who trusts in the existing governance system (national and local government) would prefer to stay put; and the family who believes that their community has comparatively less conflict (more community peace) than the neighboring community would prefer to stay put the family with easy access (in terms of travel duration) to cyclone shelters would prefer to stay put.
Environmental driver	Experience of hazards (Foresight, 2011; IPCC et al., 2014; Mallick et al., 2021)	(v) A family who faces frequent occurrences of hazardous environmental events would prefer to migrate; A family who experiences extensive loss and damage due to extreme events would like to migrate.

Table 3 (continued)

Attributes	Factors	Expected behavioral response (migration or non-migration)
Behavioral response	Risk perception, risk tolerance (Obokata, Veronis, & Mcleman 2014)	(vi) the family capable of perceiving and taking both short-term and long-term risks would prefer to stay.

cohesion. And it assesses when they decide to stay: if the family believes that their political system treats them well and their fundamental rights are well-protected, trusts the existing governance system (national, local, and NGOs), and their community has comparatively less conflict than the neighboring community. However, it is not easy to depict the *environmental* drivers; therefore, the total number of hazards that have affected the respondents' homes, livelihoods, and communities in the last five years is considered one of the significant environmental drivers. A hazard refers to cyclones, floods, erosion, waterlogging, and siltation. After all, the *behavioral response* describes the individual household's risk perception and risk-taking ability in the context of future climate change and associated livelihood risks. This study considered the respondents' ability to perceive and willingness to take both short-term and long-term risks at the individual household level and assess its relationship with *migration and non-migration decision*.

Thus, the many forms of the factors related to social, economic, political, and demographic drivers impacted by environmental change affect future migration decisions. Understanding how these different drivers act and interact to affect migration or non-migration decisions at the individual household level is a necessary first step. The analysis is based on future migration intentions (i.e., *whether the respondent would like to migrate soon*) as the dependent variable to assess the inverse relationship between migration and non-migration.

4. Results:

4.1. Measurements of factors and their relationship to the future migration decision

The dependent variable of this study is the future migration motive. To capture this, we use the question: "Would you like to migrate from here in next five years?" This question has two response options: 'no', and 'yes', which have been replaced by 'like to stay', and 'like to migrate', respectively. Thus, we employ the chi-squared test and 2-tailed t-Test. Result shows that only one-fourth of the respondents (24 %) *liked to migrate* from their original location, whereas the rest *liked to stay*. Table 4 and the following sub-sections describe the factors and assess their relationship to future migration motives.

4.2. Social drivers

The hypotheses related to social drivers are: (i) *the family who has a long-standing sense of belonging to the community would prefer to stay put*; (ii) *the family who has a strong social network in the community would prefer to stay put*, and (iii) *the family whose relatives have migrated into their community or have migration experience would prefer to stay put*.

This study does not find any significant relationship between the attachment to the community and future migration decisions at the individual household level ($\chi^2 = 0.67118$, $p < 0.88$). However, trust in the community and its social networks is significantly relevant to future mobility decisions ($\chi^2 = 18.179$, $p < 2.011e-05$); this trust is mostly built on long-term association in the community. The analysis shows that those who received assistance from and were supported by their neighbors would not like to migrate from their community in the future. In contrast to this, the household's dependency on their extended family members is not significantly relevant to their decision of future mobility; the migration experience of those relatives, however, is significantly

Table 4
Different factors and their relationship to future migration decisions (to migrate or to stay).

Variables	Question asked	Measurement	Test statistics (p-value)
<i>Social:</i> Place-attachment to the community	When did your people first come to this village?	1. Self-movement; 2. since parent; 3. Since grandfather; 4. since before grandfather	0.67118a (p = 0.88)
<i>Social:</i> Relationship with neighbors	If suddenly a family needed a small amount of money, enough to pay for expenses for a household for one week, would the neighbor provide this money?	0 = No, 1 = Yes	18.179a (p = 2.011e-05)
<i>Social:</i> Dependency on extended family members	If suddenly a household head had to go away for a day or two, would members of his/her extended family/relatives take care of his/her children?	0 = No, 1 = Yes	0.031442a (p = 0.8593)
<i>Social:</i> Migration experience of the relatives	Have any relatives temporarily moved to another place within the same community due to extreme environmental events?	0 = No, 1 = Yes	18.17a (p = 2.02e-05)
	Have any relatives temporarily moved to another nearby village due to extreme environmental events?	0 = No, 1 = Yes	15.586a (p = 7.884e-05)
	Have any relatives permanently moved to this village due to extreme environmental events?	0 = No, 1 = Yes	0.42852a (p = 0.5127)
	Have any relatives permanently moved to other places because they could not make their livelihood here?	0 = No, 1 = Yes	3.3386a (p = 0.06767)
<i>Economic:</i> Access to credit	Has credit been taken from NGOs?	0 = No, 1 = Yes	2.7134a (p = 0.09951)
	Has credit been taken from local money lenders (Mahajan)?	0 = No, 1 = Yes	3.2186a (p = 0.07281)
<i>Economic:</i> Per capita expenditure	What are the per capita expenditure in a year?	Per capita expenditure in year	-59.096 (p = 0.000)
<i>Economic:</i> Land ownership	Amount of agricultural land do you own?	In decimal	(t = 49.044, p < 0.04)
<i>Economic:</i>	Number of income opportunities do you have?	In numbers	(t = 56.078, p < 0.032)
<i>Economic:</i> Housing	How many residential houses are owned?	# of residential houses	-1.6947b (p = 0.09071)
	What is the construction material used for walls?	1. Mud, 2. Bamboo, 3. Tin, 4. Tally, 5. Brick, 6. Wood, 7. Thatch, 8. Brick, 9. Goalpata, 10. Concrete	8.7005a (p = 0.4649)
	What is the construction material used for the roof?		16.224a (p = 0.133)

Table 4 (continued)

Variables	Question asked	Measurement	Test statistics (p-value)
<i>Demographic:</i> Age	What is the age of the respondent?	In years	-1.0582b (p = 0.2906)
<i>Demographic:</i> Education	How many years of schooling did the household head complete?	In years	4.477a (p = 0.7235)
<i>Demographic:</i> Household size	How many members are in the family?	Number	0.19632a (p = 0.674)
<i>Demographic:</i> Gender	How many of the household members are female?	1 = Male, 2 = Female	0.13932a (p = 0.709)
<i>Demographic:</i> Religion	What is the household religion?	% of Muslim in the community	0.4367b (p = 0.6625)
<i>Political:</i> Trust on governance	What is your level of trust in the national government?	1. very high, 2. high, 3. medium, 4. low, and 5. not at all	5.8978a (p = 0.01516)
	What is your level of trust in the local government?		9.8978a (p = 0.01116)
<i>Political:</i> System supports	To what extent do you think that the political system protects citizens' basic rights?	1. Not at all, a little, 3. Somewhat, 4. A lot, 5. A great deal	20.841a (p = 0.0003404)
	To what extent do you feel proud of living under the political system?		13.482a (p = 0.009145)
<i>Political:</i> Community cohesion	Is there harmony in this village?	1. Very much, 2. Somewhat, 3. Not at all	1.0038a (p = 0.6054)
<i>Political:</i> Refugee shelter	What is the distance to the nearest cyclone shelter from the household's location?	Mean distance in minutes	-0.72173b (p = 0.4709)
		Mean distance in kilometer	-0.49487b (p = 0.6209)
<i>Environmental:</i> Hazards	How many hazards have affected the home in the last 5 years?	# of hazards affected home in the past 5 years	-3.9362b (p = 9.367e-05)
	How many hazards have affected your livelihood in the last 5 years?	# of hazards affected livelihood last 5 years	-3.3528b (p = 0.0008528)
	How many hazards have affected the community in the last 5 years?	# of hazards affected community last 5 years	-4.0298b (p = 6.407e-05)
	Has a flood affected your home, livelihood, and community in the last 5 years?	0 = No, 1 = Yes	13.145a (p = 0.0002882)
<i>Behavioral:</i> Perception of the ability to take short-term risks	How easy or difficult is it to take short-term risks?	0 = No, 1 = Yes	2.0254a (p = 0.1547)
<i>Behavioral:</i> Perception of the ability to take long-term risks	How easy or difficult is it to take long-term risks?	1. Very easy, 2. Somewhat easy, 3. Neither easy nor difficult; 4. Somewhat difficult; 5. Very difficult	5.3731a (p = 0.02045)
			9.3731a (p = 0.01045)

Source: Field survey 2018.

associated with future mobility decisions. The analysis shows that the incidence of the relatives' temporary relocation to another place within the community due to an extreme event ($\chi^2 = 18.17$, $p < 2.02e-05$), or temporary relocation to another community ($\chi^2 = 15.586$, $p <$

7.88e-05) has a significant association with future mobility decisions. This shows that the respondents whose relatives had experienced such mobility due to an extreme event could opt for non-migration in the future. But the permanent in-migration of the relatives in own community due to extreme events has no significant influence on mobility decision.

4.3. Economic drivers

The hypotheses related to economic drivers are: (i) *the family who has enough wealth, land, and income opportunities to cope with anticipated risks would prefer to stay put*; (ii) *the family who has access to formal and informal credit sources would prefer to stay put*; and (iii) *the family who resides in good quality houses, e.g. cyclone tolerant, would prefer to stay put*.

The analysis shows that the total amount of credit taken by the individual household from different formal credit sources (government banks, private banks or non-government organizations) is negatively associated with future migration decisions ($\chi^2 = -2.0383$, $p < 0.04627$); that means the individual households who have taken more credit from different formal credit sources would like to migrate in future. It is noticeable that the amount of credit taken from informal sources (moneylenders, shopkeepers, dealers, or large-farmers/traders) does not have any significant association with future mobility ($\chi^2 = 1.3024$, $p < 0.1962$). The expenditure and income of the household are one of the most critical factors that drive the mobility decision. Results show that the yearly expenditure of a household (including costs related to food, clothes, medicine, education, and others) has a significant negative association with the future mobility decision ($t = -59.096$, $p < 0.000$). Besides, owning more agricultural lands ($t = 49.044$, $p < 0.04$), and having more than two earning opportunities ($t = 56.078$, $p < 0.032$) influence immobility. Again, results show no significant association between the quality of housing and future mobility decisions; individual mobility decisions are not impacted by whether the respondent has the best quality residential house, i.e. a cyclone or flood-resistant house (for roof material, $\chi^2 = 8.7055$, $p < 0.4649$; for wall material, $\chi^2 = 16.224$, $p < 0.133$). Therefore, not all the economic drivers have an especially significant influence on future immobility decisions; other factors are more influential on the decision of immobility.

4.4. Demographic drivers

The hypotheses related to demographic drivers are: (i) *the family who has fewer educated people would prefer to stay within their community*; (ii) *female-headed households prefer to stay put*; and (iii) *the family who belongs to the majority religion in the community would not like to migrate*.

This study does not find any significant association between demographic factors and future mobility decisions. It considered age and education level of the household head, gender of the respondent, and the percentage of the community which is Muslim (i.e. the majority religion) as demographic factors. Besides these factors, it created an indicator of the household health condition (based on absence from work and extra expenses due to ill health of any family member) in the last 12 months. However, none of these factors show any significant association with future mobility decisions, but older people usually tends to stay put compare to younger generations.

4.5. Political drivers

The hypotheses related to political drivers are: (i) *the family who believes that their political system treats them well would prefer to stay put*; (ii) *the family who believes that their fundamental rights are well-protected would prefer to stay put*; (iii) *the family who trusts in the existing governance system (national and local government) would prefer to stay put*; and (iv) *the family who believes that their community has comparatively less conflict (more community peace) than the neighboring community would prefer to stay put*; and (v) *the family who has easy access (in terms of travel*

duration) to cyclone shelters would prefer to stay put.

The findings show that the respondents who trust the existing governance system of the country would not like to migrate in the future ($\chi^2 = 5.8978$, $p < 0.01516$). Similarly, respondents who think that the citizen's fundamental rights are well protected in the country ($\chi^2 = 20.841$, $p < 0.0003404$) and who feel proud of living under the existing political system ($\chi^2 = 13.482$, $p < 0.009145$) would also not like to migrate from their community in the future. However, the community peace variable does not have a significant relationship with future migration decisions. This result contradicts the arguments promoted by Irwin and colleagues (2004) but slightly supports the findings of Lubkemann (2008). Again, the community level infrastructural supports, i.e. the proximity to a cyclone shelter, also does not affect their decision of future mobility. For example, neither the duration to reach to the cyclone shelter ($t = -0.72173$, $p < 0.4709$) nor the travel distance in kilometer ($t = -0.49487$, $p < 0.6209$) has any significant association with the future mobility decision.

4.6. Environmental drivers

The hypotheses related to environmental drivers are: (i) *the family who faces frequent occurrences of hazardous environmental events would prefer to migrate*; (ii) *the family who experiences extensive loss and damage due to extreme events would like to migrate*.

Results show a significant negative association between future non-migration and the total number of hazards that affected the respondents' home ($\chi^2 = -3.9362$, $p < 9.367e-05$), livelihood ($\chi^2 = -3.3528$, $p < 0.0008528$) and community ($\chi^2 = -4.0298$, $p < 6.407e-05$) in last 5 years. It shows a correlation between the number of times the respondents' home, livelihood, and community were affected by hazards and the respondents' willingness to migrate from their community. Because these environmental hazards directly impact other relevant drivers of human mobility, these findings support the assumption that global environmental change will influence human mobility outcomes by affecting various drivers of migration. There is no significant association between future non-mobility decisions and situations in which a cyclone affected the home, livelihood, or community ($\chi^2 = 1.1763$, $p < 0.2403$), whereas the association is significant in the case of those affected by a flood ($\chi^2 = 13.145$, $p < 0.0002882$). This is because the damages and losses caused by floods are often much greater and longer lasting than those of cyclones alone, such as the case of the flood induced by cyclone Aila in 2009.

4.7. Behavioral response

The hypothesis related to behavioral drivers is: *the family who is capable of perceiving and taking both short-term and long-term risks would prefer to stay*.

Results show that individual households which were able to perceive risks and to accept taking both short-term and long-term risks do not opt for future migration from their community ($\chi^2 = 5.3731$, $p < 0.02045$). Here, the short-term risks refer to borrowing money to grow crops or shrimp, planting a crop that was never grown before, or opting for seasonal agriculture in a place in which it has not been used before. The long-term risks refer to investing inland in a pre-urban place, migrating to a new place, or sending their sons or daughters away for education or work elsewhere. However, this analysis does not confirm how this behavioral driver regarding the household's perception of risk and risk-taking ability for livelihood purposes interacts with other social and economic drivers of migration. And even it does not consider the perceived risk at destination places.

5. Discussion and conclusion

5.1. Reflections on the assumptions and contributions to the state-of-the-art

The respondents whose families were living in their communities for more than two generations comprised the largest portion of respondents who wanted to stay put; however, this study does not find any significant association between place attachment and future non-migration decisions. This finding contradicts with the rural Peruvians' immobility reasons, where place attachment and satisfaction play the major role (Adams, 2016). Similarly, most of the respondents who possessed a better relationship with their neighbors and extended family members had chosen to stay put. Even most of the respondents whose relatives had experiences of displacement within or outside the community due to an environmental event did not want to migrate. Interestingly, this finding supports the importance of social networks for non-migrants, i.e. staying at a place requires societal connectedness and cohesion amongst the neighbours (Ackerly et al., 2015). The majority of the respondents who had taken credit (either formal or informal) chose to stay put, although there is evidence that failure to credit repays causes forced displacement (Ahsan & Khatun, 2020). Also, a majority of the respondents who were living in a community where his/her religion was the majority preferred to stay put. Similarly, most of the respondents who believed there was a higher level of harmony in their community than others opted to stay put. Thus, this finding also supports the inverse relationship between migration, for instance, people living in a conflict-prone community tend to migrate compared to people living in a peaceful neighborhood. As expected, the severity of damages and losses of respondents' homes, livelihoods, and communities due to environmental hazards (particularly floods and cyclones) impact the migration decision. The test statistics show that most of the respondents whose homes, livelihoods, and community were affected by cyclones and floods in the last five years opted to migrate outside their community. However, the majority of respondents who were considering taking risks (either short-term or long-term) to improve their currently difficult livelihoods opted to stay put. The quality of residential housing (in terms of construction materials) for the group who opted to stay put is more significant than for those who opted to migrate, whereas there was no significant difference in mean travel distance to a cyclone shelter for both categories of respondents. This indicates the importance of individual assets and resources in future migration decisions rather than community supports. However, the decision of future migration is more a personal choice, so by its nature, it is more dependent on the behavioral determinant of risk-taking ability and risk perception.

As presented in Table 4, from the five categories of drivers, the social, economic, and political factors are perceived as having the most significant effect on future non-migration, though the interactions between these drivers might be equally important in determining mobility decisions (Foresights, 2011). Importantly, this study suggests few crucial factors that support the inverse relationship between environmental migration and non-migration: social network, community cohesion, access to credit, quality of housing, alternative income opportunities, land ownership, access to infrastructural and institutional supports (i.e. access to cyclone shelter, relief and rehabilitation services). From previous understanding, people living in places that are chronically exposed to environmental and disaster-related risks are often expected to migrate to other places where those risks are less prevalent. The analytical framework employed in this research (Fig. 2) could benefit future research in a similar context.

Reports before Foresight (2011) also show how poverty limits migration options in the face of slow and sudden-onset disasters. An example of this is the response in North Central Kenya in the 1980s, when the poorest remained but the rich or middle-income communities migrated (either temporarily or permanently); this is the capability question (Carling, 2002; Carling & Schewel, 2018). In this situation, the

poor were 'trapped' or so-called stayers; however, not all stayers are trapped. Proper distinction between these groups is necessary for climate adaptation policies to consider their needs adequately. Likewise, policies tackling climate adaptation that only consider migration overlook the needs and potentials of the remaining citizens and their inter-exchange with migrants (Lahiri-Dutt & Samanta, 2013).

Naturally, research on migration decisions often considers migration together with the inverse of not migrating. Despite this, systematic differentiation between voluntary non-migrants, trapped people (involuntary non-migrants) and migrants, as well as a detailed explanation of voluntary non-migration decisions, does not exist yet. This has some implications for research and policy. A research focus on migration alone does not cover the real-world complexity of people's decision making on migration and non-migration. Moreover, the treatment of voluntary non-migration as a 'reversal' of migration, in the sense of binary stereotypes such as sedentism (immobility) and nomadism (mobility), is expected to be an unsuitable simplification of the decision space. Thus, it is crucial to deepen the understanding of how and to what extent voluntary non-migrants differ from 'trapped' populations in the face of climate risks.

Limited to the less number of respondents (195 sample), these findings cannot conclude the robustness of the inverse relationship between migration and non-migration, however, it has identified factors that needed to be considered for future assessment with larger datasets employing multi-scalar and hierarchical statistical modelling, and qualitative evidences. This paper also does not include the challenges related to 'aspire to migrate', for instance, we do not ask the question whether people worry about the quality of life, security, health, education, or other related livelihood challenges at the destination if they migrate.

5.2. Conclusion

This paper identifies the factors supporting the inverse relationship between migration and non-migration in environmental risks. Most recent empirical findings indicate that not all those who stay despite climate risks are trapped. Some intend to stay for various reasons, and their decisions are voluntary. So far, this phenomenon is only mentioned by a very few authors who point in a similar direction (Suliman et al., 2019; Kabir & Kamruzzaman, 2022) but do not address 'voluntary non-migration' as a distinct issue. Understanding the subjectivity of 'voluntary non-migration' in the face of climate change is empirically challenging. Thus, the conceptual and methodological research needs to focus on the (i) terminological clarification, (ii) conceptual frameworks (e.g. distinction of root factors; intrinsic relevance of gender aspects (differentials); localities; rights- and justice-based perspectives), (iii) methodological particularities (e.g. tailored empirical designs, agent-based models), and (iv) comparative analysis of global and local cases. In this way, it can extend our knowledge on 'voluntary non-migration,' and its apparent interrelation with migration, even within temporal trajectories of individuals, households, and families. And the following questions are needed to be investigated: (i) how do factors of migration impact voluntary non-migration of people at environmental risks? (ii) what adaptive capacities (individual and community levels) can reduce environmental migration? (iii) how does voluntary environmental non-migration impact adaptive capacity? and (iv) what are potential entry points to design more integrated interventions that support voluntary non-migration in the face of environmental risk?

Overall, researchers in the field of climate adaptation and development, demography and environmental sciences need to pay more attention to the population that does not want to move, the voluntary non-migrants. An in-depth and better understanding is necessary to foster their resilience and provide a means of maintaining their cultures, landscapes, environments, and livelihoods in the face of climate risks. The potential ramifications of multi-dimensional ethical, political, and social factors should be considered rather than neglected to increase

their benefits.

6. Data availability statement

The data will be readily shared upon request.

7. Ethical compliance

In this study, the steps/procedures for data collection, treatment and analysis have been provided. Equally, the free prior informed consent of all participants was sought before data collection.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- Abel, G. J., Brottrager, M., Cuaresma, J. C., & Muttarak, R. (2019). Climate conflict and forced migration. *Global Environmental Change*, *54*, 239–249.
- Abedien, M. Z. et al. (2010). *Elements of disaster resilience: lessons from Bangladesh*.
- Adams, H. (2016). 'Why populations persist: Mobility, place attachment and climate change. *Population and Environment Springer, Netherlands*, *37*(4), 429–448. <https://doi.org/10.1007/s11111-015-0246-3>
- Ackerly, B. A., Anam, M. M., & Gilligan, J. (2015). Environment, political economies and livelihood change. In B. Mallick & B. Etzold (Eds.), *Environment, Migration and Adaptation: Evidence and Politics of Climate Change in Bangladesh*. AH Development Publishing House (AHDPPH). <http://eprints.qut.edu.au/84192/>.
- Ahsan, M. N., & Khatun, A. (2020). Fostering disaster preparedness through community radio in cyclone-prone coastal Bangladesh. *International journal of disaster risk reduction*, *49*, Article 101752.
- Ahsan, M., Khatun, F., Kumar, P., Dasgupta, R., Johnson, B. A., & Shaw, R. (2022). Promise, premise, and reality: The case of voluntary environmental non-migration despite climate risks in coastal Bangladesh. *Regional Environmental Change*, *22*(1), 1–15.
- Alam, E., & Collins, A. E. (2010). Cyclone disaster vulnerability and response experiences in coastal Bangladesh. *Disasters*, *34*(4), 931–954. <https://doi.org/10.1111/j.1467-7717.2010.01176.x>
- Auerbach, L. W., Goodbred, S. L., Jr, Mondal, D. R., Wilson, C. A., Ahmed, K. R., Roy, K., et al. (2015). Flood risk of natural and embanked landscapes on the Ganges-Brahmaputra tidal delta plain. *Nature Climate Change*, *5*(2), 153–157.
- Ayeb-Karlsson, S., Smith, C. D., & Kniveton, D. (2018). 'A discursive review of the textual use of "trapped" in environmental migration studies: The conceptual birth and troubled teenage years of trapped populations', *Ambio. Springer, Netherlands*, *47*(5), 557–573. <https://doi.org/10.1007/s13280-017-1007-6>
- Bbs. (2012). *Statistical Year Book 2011*. Dhaka, Bangladesh: Bangladesh Bureau of Statistics, Government of Bangladesh.
- Bennet, K. et al. (2017) *Global Report on Internal Displacement*.
- Bennet, K., et al. (2019). 'The "Stayers": Dynamics of Lifelong Sedentary Behaviour in an Urban Context', *Population, Space and Place. Springer, Netherlands*, *8*(5), 1–17. <https://doi.org/10.1007/s11111-015-0246-3>
- Bijker, R. A., Haartsen, T., & Strijker, D. (2012). Migration to less-popular rural areas in the Netherlands: Exploring the motivations. *Journal of Rural Studies. Elsevier Ltd*, *28* (4), 490–498. <https://doi.org/10.1016/j.jrurstud.2012.07.003>
- Black, R., et al. (2011). Migration as adaptation. *Nature*, *478*(7370), 447–449. <https://doi.org/10.1038/478477a>
- Black, R., & Collyer, M. (2014). "Trapped" populations: Limits on mobility at times of crisis. In S. F. Martin, S. Weerasinghe, & A. Taylor (Eds.), *Humanitarian crises and migration* (pp. 287–305). London: Routledge.
- Blondin, S. (2021). Staying despite disaster risks: Place attachment, voluntary immobility and adaptation in Tajikistan's Pamir Mountains. *Geoforum*, *126*, 290–301. <https://doi.org/10.1016/j.geoforum.2021.08.009>
- Carling, J. (2002). Migration in the age of involuntary immobility: Theoretical reflections and Cape Verdean experiences. *Journal of Ethnic and Migration Studies*, *28* (1), 5–42. <https://doi.org/10.1080/13691830120103912>
- Carling, J., & Schewel, K. (2018). 'Revisiting aspiration and ability in international migration. *Journal of Ethnic and Migration Studies Taylor & Francis*, *44*(6), 945–963. <https://doi.org/10.1080/1369183X.2017.1384146>
- Carrico, A. R., & Donato, K. (2019). Extreme weather and migration: Evidence from Bangladesh. *Population and Environment*, *41*(1), 1–31. <https://doi.org/10.1007/s11111-019-00322-9>
- Chen, J., & Mueller, V. (2018). Coastal climate change, soil salinity and human migration in Bangladesh. *Nature climate change*, *8*(11), 981–985.
- Chowdhury, A. (2000). Disasters: Issues and responses. In P. Gain (Ed.), *Bangladesh Environment: Facing 21st Century* (2nd ed., pp. 203–220). Dhaka, Bangladesh: Society for Environment and Human Development.
- Czaika, M. (2013). Are unequal societies more migratory? *Comparative Migration Studies*, *1*(1), 97–122. <https://doi.org/10.5117/CMS2013.1.CZAI>
- Dasgupta, S., et al. (2010). Vulnerability of Bangladesh to Cyclones in a Changing Climate: Potential Damages and Adaptation Cost. *World Bank Policy Research Working Paper*, *5280*.
- Dastagir, M. R. (2015). Modeling recent climate change induced extreme events in Bangladesh: A review. *Weather and Climate Extremes*, *7*, 49–60. <https://doi.org/10.1016/j.wace.2014.10.003>
- De Haas, H. (2011). Mediterranean migration futures: Patterns, drivers and scenarios. *Global Environmental Change. Elsevier Ltd*, *21*(SUPPL. 1), S59–S69. <https://doi.org/10.1016/j.gloenvcha.2011.09.003>
- Etzold, B., & Mallick, B. (2016). Moving beyond the focus on environmental migration towards recognizing the normality of translocal lives: Insights from Bangladesh. In A. Milan (Ed.), *Migration, Risk Management and Climate Change: Evidence and Policy Responses* (1st ed., pp. 105–130). Geneva: Springer International Publishing.
- Evertsen, K. F., & van der Geest, K. (2020). Gender, environment and migration in Bangladesh. *Climate and Development*, *12*(1), 12–22. <https://doi.org/10.1080/17565529.2019.1596059>
- Farbotko, C., & McMichael, C. (2019). Voluntary immobility and existential security in a changing climate in the Pacific. *Asia Pacific Viewpoint*, *60*(2), 148–162. <https://doi.org/10.1111/apv.12231>
- Flahaux, M. L., & De Haas, H. (2016). 'African Migration: Trends, patterns, drivers', *Comparative Migration Studies*, *4*(1). <https://doi.org/10.1186/s40878-015-0015-6>
- Foresight (2011) *Migration and Global Environmental Change: Future Challenges and Opportunities*. London.
- Gaillard, J. (2007). Resilience of traditional societies in facing natural hazards. *Disaster Prevention and Management*, *16*(4), 522–544. <https://doi.org/10.1108/09653560710817011>
- Gunter, B. G., Rahman, A. and Rahman, A. F. M. A. (2008) *How Vulnerable are Bangladesh's Indigenous People to Climate Change?* BDRWPS 1.
- Harmeling, S. and Eckstein, D. (2013) Global Climate Risk Index 2013 Who suffers most from extreme weather events? Weather-related loss events in 2011 and 1992 to 2011. Bonn.
- Harris, J., & Todaro, M. (1970). Migration, unemployment and development: A two-sector analysis. *American Economic Review*, *60*(1), 126–142.
- Hatton, T. J. and Williamson, J. G. (2009) *Vanishing Third World Emigrants*. 14785. Cambridge, MA.
- Hinkel, J., et al. (2015). Sea-level rise scenarios and coastal risk management. *Nature Climate Change. Nature Publishing Group*, *5*(3), 188–190. <https://doi.org/10.1038/nclimate2505>
- Hunter, L. M., Luna, J. K., & Norton, R. M. (2015). Environmental Dimensions of Migration. *Annual Review of Sociology*, *41*(1), 377–397. <https://doi.org/10.1146/annurev-soc-073014-112223>
- Ippc. (2014). Summary for policymakers. In C. B. Field (Ed.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the 5th Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 1–32). Cambridge, UK and New York, NY, USA: Cambridge University Press.
- Irwin, M., et al. (2004). Why People Stay: The Impact of Community Context on Nonmigration in the USA. *Population (English Edition)*, *5*, 567–591.
- Kabir, M. E., & Kamruzzaman, P. (2022). Exploring the drivers of vulnerability among disadvantaged internal migrants in Riverbank Erosion Prone Areas in North-West Bangladesh. *Journal of South Asian Development*, *17*(1), 57–83. <https://doi.org/10.1117/09731741221078741>
- Lahiri-Dutt, K., & Samanta, G. (2013). Introducing chars: Where lands float on water. In *Dancing with the River: People and Life on the Chars of South Asia* (pp. 1–30). Yale University Press.
- Logan, J. R., Issar, S., & Xu, Z. (2016). Trapped in Place? Segmented Resilience to Hurricanes in the Gulf Coast, 1970–2005. *Demography*, *53*(5), 1511–1534. <https://doi.org/10.1016/j.physbeh.2017.03.040>
- Lubkemann, S. C. (2008). Involuntary Immobility: On a Theoretical Invisibility in Forced Migration Studies. *Journal of Refugee Studies*, *21*(4), 454–475.
- Mahmud, T., & Prowse, M. (2012). Corruption in cyclone preparedness and relief efforts in coastal Bangladesh: Lessons for climate adaptation? *Global Environmental Change. Elsevier Ltd*, *22*(4), 933–943. <https://doi.org/10.1016/j.gloenvcha.2012.07.003>
- Mallick, B. (2011). Migration as an adaptation strategy and its consequences on coastal society: Experience from Bangladesh. In J. Schade, & T. Faist (Eds.), *Environmental Change and Migration: From Vulnerabilities to Capabilities* (p. 24). COMCAD Arbeitspapiere: Bad Salzuffeln, Germany.
- Mallick, B., & Vogt, J. (2012). 'Cyclone, coastal society and migration: Empirical evidence from Bangladesh. *International Development Planning Review Liverpool University Press*, *34*(3), 217–240. <https://doi.org/10.3828/idpr.2012.16>
- Mallick, B., & Vogt, J. (2014). Population displacement after cyclone and its consequences: Empirical evidences from coastal Bangladesh. *Natural Hazards*, *73*, 191. <https://doi.org/10.1007/s11069-013-0803-y>
- Mallick, B., Rogers, K. G., & Sultana, Z. (2021). In harm's way: Non-migration decisions of people at risk of slow-onset coastal hazards in Bangladesh. *Ambio*. <https://doi.org/10.1007/s13280-021-01552-8>

- Mallick, B., & Schanze, J. (2020). Trapped or Voluntary? Non-migration despite climate risks. *Sustainability*, 12(11), 4718. <https://doi.org/10.3390/su12114718>
- Malmberg, G. (1997). Time and Space in International Migration. In T. Hammar, G. Brochmann, K. Tamas, & T. Faist (Eds.), *International Migration, Immobility and Development* (pp. 21–48). Berg: Multidisciplinary Perspectives, Oxford.
- McLeman, R. (2017). Thresholds in climate migration. *Population and Environment*. <https://doi.org/10.1007/s11111-017-0290-2>
- MoEF (2008) *Bangladesh Climate Change Strategy and Action Plan 2008, Strategy*. Dhaka, Bangladesh: Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.
- MoFDM (2008) *Super Cyclone Sidr 2007 - Impacts and Strategies for Interventions*, Report.
- Nawrotzki, R. J., et al. (2015). Climate change as a migration driver from rural to urban Mexico. *Environmental Research Letters*. IOP Publishing, 10(11), Article 114023. <https://doi.org/10.1088/1748-9326/10/11/114023>
- Nawrotzki, R. J., & DeWaard, J. (2018). Putting trapped populations into place: Climate change and inter-district migration flows in Zambia. *Regional Environmental Change*. *Regional Environmental Change*, 18(2), 533–546. <https://doi.org/10.1007/s10113-017-1224-3>
- Obokata, R., Veronis, L., & McLeman, R. (2014). Empirical research on international environmental migration: A systematic review. *Population and Environment*. Kluwer Academic Publishers, 36(1), 111–135. <https://doi.org/10.1007/s11111-014-0210-7>
- Ortega, J. A. (2005). 'What are the Implications of the Demographic Transitions Process for 21st Century European Population?', in Eurostat/UNECE Work Session on Demographic Projection. Vienna: Eurostat/UNECE.
- Parvin, G. A., Ali, M. H., Fujita, K., Abedin, M. A., Habiba, U., & Shaw, R. (2017). Land Use Change in Southwestern Coastal Bangladesh: Consequence to Food and Water Supply. In M. Banba, & R. Shaw (Eds.), *Land Use Management in Disaster Risk Reduction*. Disaster Risk Reduction. Tokyo: Springer. https://doi.org/10.1007/978-4-431-56442-3_20.
- Renaud, F. G., et al. (2011). A Decision Framework for Environmentally Induced Migration. *International Migration*, 49(SUPPL.1), e5–e29. <https://doi.org/10.1111/j.1468-2435.2010.00678.x>
- Rigaud, K. K. et al. (2018) Groundswell : Preparing for Internal Climate Migration - Academic Commons. Washington, DC. Available at: <https://academiccommons.columbia.edu/catalog/ac:7pvmcvdnfl>.
- Schewel, K. (2019). Understanding immobility: Moving beyond the mobility bias in Migration Studies. *International Migration Review*, 1–28. <https://doi.org/10.1177/0197918319831952>
- Sen, A. (1992). *Inequality Re-Examined*. Oxford: Clarendon Press.
- Sherrieb, K., Norris, F. H., & Galea, S. (2010). Measuring capacities for community resilience. *Social Indicators Research*, 99(2), 227–247. <https://doi.org/10.1007/s11205-010-9576-9>
- Sherry, J., Curtis, A., Mendham, E., & Toman, E. (2018). Cultural landscapes at risk: Exploring the meaning of place in a sacred valley of Nepal. *Global Environmental Change*, 52, 190–200. <https://doi.org/10.1016/j.gloenvcha.2018.07.007>
- Suliman, S., et al. (2019). Indigenous (im)mobilities in the Anthropocene. *Mobilities*. Routledge, 00(00), 1–21. <https://doi.org/10.1080/17450101.2019.1601828>
- Troisi, a (2001) 'Gender differences in vulnerability to social stress: a Darwinian perspective.', *Physiology & behavior*, 73(3), pp. 443–9.
- Van der Geest, K. (2011). North-South Migration in Ghana: What Role for the Environment? *International Migration*, 49(SUPPL.1), e69–e94. <https://doi.org/10.1111/j.1468-2435.2010.00645.x>
- Van Hear, N., Bakewell, O., & Long, K. (2018). Push-pull plus: Reconsidering the drivers of migration. *Journal of Ethnic and Migration Studies*, 44(6), 927–944. <https://doi.org/10.1080/1369183X.2017.1384135>
- Zickgraf (2019) 'Keeping People in Place: Political Factors of (Im)mobility and Climate Change', *Social Sciences*, 8(8), p. 228. 10.3390/socsci8080228.