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In search of climate migrants: a journey from crisis to opportunity

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ABSTRACT

Hydrometeorological disasters alone do not explain human migration; rather, migration is a multifaceted and complex phenomenon shaped by a person's geographical, social, economic, demographic, cultural, and institutional conditions, all of which influence the decision to move or stay. There is also ongoing academic debate over whether migration can be regarded as an effective adaptation strategy. To address these research gaps, this study develops a novel theoretical and methodological framework for identifying and distinguishing climate migrants and climate non-migrants, and for comparing their wealth quintiles and standard of living. Bangladesh, one of the most climate-vulnerable countries in the world, was selected as the case study. This empirical and quantitative analysis uses national-scale population and housing sample survey data. Geospatial and statistical data were combined for multi-hazard risk mapping, wealth quintile analysis, and the development of a weight-based standard of living index. The results show that most climate migrants belong to the richest wealth quintile, suggesting that migration has enabled better economic opportunities, housing, and access to services. In contrast, climate non-migrants experience more uniform but generally lower living standards in rural, climate-affected areas. This study provides new evidence that challenges the conventional assumption that climate migrants are uniformly poor and vulnerable.

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1. Introduction

Human-caused greenhouse gas (GHG) emissions and climate change are already increasing the frequency and intensity of certain weather and climate events, with profound impacts on human societies, ecosystems, and critical infrastructure (Otto et al., 2024). Examples of such extreme events include heavy precipitation and pluvial floods, heatwaves, river floods, droughts, cold spells, tropical cyclones, glacier outbursts, wildfires, and other compound or concurrent climate events (Seneviratne et al., 2023). By analysing 29 of the most extreme climate-fuelled weather events out of 219 in 2024, the World Weather Attribution report linked these events to the deaths of thousands and the displacement of millions (Otto et al., 2024). This clearly shows that the impacts of human-induced climate change are a present reality, not just a future threat (Maslin, 2014). Climate change both directly and indirectly influences human migration patterns (Foresight, 2011), and this link is now well-recognized in both physical and social sciences, with growing attention in the current literature (Ahmed & Mallick, 2026). For instance, in South America, increased water-related hazards and water scarcity have influenced migration decisions (Silva Rodríguez de San Miguel et al., 2021). Similarly, in hyper-arid and arid regions of Africa, the Middle East, South Asia, South America, and Southern Europe, climate-induced internal migration has occurred due to more frequent and severe droughts and aridity (Hoffmann et al., 2024). In Bangladesh, resource loss and floods have driven people to migrate (Petrova, 2021). On a global scale, Salerno et al. (2024) found that smallholder farmers often move to urban areas for labour work due to loss of crop production, soil degradation, and salinity intrusion caused by climate change.

As the interdisciplinary field of research 'climate (im)mobility' is emerging, efforts to estimate the number of climate migrants are becoming more common, despite major methodological caveats and the risk of producing highly uncertain figures (Foresight, 2011; Kelman, 2019). One widely cited estimate from the World Bank suggests that by 2050, around 216 million people globally could migrate internally because of the impacts of slow-onset climate change (Clement et al., 2021). Another prediction shows that only in the global south, around 143 million people will migrate voluntarily or forcefully by 2050 due to climate change (Almulhim et al., 2024).

The World Meteorological Organization (WMO) reports an alarming trend: GHGs have accumulated by more than 10% in the atmosphere within only two decades, faster than at any previous point in human history (WMO, 2024). Such continuous increase in GHG emissions will result in increased climate extremes, thus on the one hand, increasing exposure to risk, reducing resilience and limiting human adaptation options (UNDRR, 2024), and on the other hand, increasing climate-induced forced migration (EPRS, 2023). Consequently, climate-induced migration is increasingly recognized as a major development challenge (IOM, 2024), and its consequences warrant deeper investigation.

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1.1. Theoretical framework

There is still no universally accepted definition of climate migrants, as scholars and practitioners continue to debate the exact status of migration linked to climate extremes (Chazalnoël & Ionesco, 2016). However, the International Organization for Migration (IOM) designated this specific type of migration as 'climate migration' and defines it as: "The movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence, or choose to do so, either temporarily or permanently, within a State or across an international border" (IOM, 2019). This definition covers multiple forms of migration, including internal (within the state), cross-border (outside the state), and temporary or permanent migration related to climate extremes. Such migration can occur due to the effects of slow-onset or rapid-onset or combined extreme climate events (Zaman, 2026).

The core theoretical framework of this study relies on the concept that anthropogenic climate change or rising global temperatures, currently 1.55 ± 0.13 °C warmer than the pre-industrial (1850-1900) average, have contributed to more frequent and severe extreme weather events (WMO, 2025). As a consequence, Bangladesh is experiencing a gradual rise in sea level, changes in monsoon precipitation, floods, cyclones, river-bank erosion, droughts, declining crop yields, and water scarcity (BDP, 2018). The increased number of sudden onset disasters and extreme climatic events successively in multiple years and slow-onset impacts of climate change are exacerbating disaster risks (IPCC, 2023). The rural communities residing in major climatic hotspots, many of whom live below the poverty line and depend on climate-sensitive livelihoods, are increasingly unable to cope with the changing nature of environmental hazards when combined with their pre-existing social vulnerabilities and limited resources. The majority of them stay in the harsh environment and continue their traditional livelihood activities under distress conditions (Thalheimer et al., 2025), while a fraction of them permanently migrates to urban areas in search of better living opportunities (Figure 1).

The second theoretical framework is linked to identifying and integrating the root causes of disaster vulnerability (Wisner et al., 2004) in order to characterize climate migrants and distinguish them from other types of migrants, such as purely economic migrants, which remains a major gap in climate mobility research (Boas et al., 2019). We acknowledge that human migration decisions are not linearly linked to climate change alone; rather they depend on a household's aspirations and capabilities (Schewel, 2020) and its geographical, social, economic, cultural, environmental, and institutional aspects (Ahmed, 2018). In most cases, the vulnerability dimensions remain the same, but the micro-level factors are highly contextualized and should be identified accordingly. A list of comprehensive vulnerability dimensions of a typical rural household located in extreme climate hotspots in Bangladesh is illustrated in Figure 2, which will be considered for further data analysis. Figure 2 presents six dimensions that shape household-level vulnerability to disasters, and together these interconnected factors influence whether households stay, move voluntarily, or are forcibly displaced due to climate-related risks. The framework therefore emphasizes that climate mobility outcomes arise from the interaction of multiple household and contextual conditions rather than from hazard exposure alone. It also provides the conceptual basis for selecting and organizing the variables used in the subsequent empirical analysis. The present study analyses the most recent publicly available comprehensive national census data available in Bangladesh (2011), which provides the large-scale sample necessary to distinguish climate migrants from other migrant types and to establish baseline patterns of climate mobility.

The climate (im)mobility domain can be broadly categorized into migrants and non-migrants with four possible scenarios (Foresight, 2011; Mallick & Schanze, 2020):

(a) Voluntary migrants: These people have both the desire and capacity to leave hazard-prone areas (migration).
(b) Forced or involuntary migrants: These people do not want to move from their place of birth but are literally forced to migrate (displacement) despite having low capacities.
(c) Voluntary non-migrants: These people choose to stay in climate hotspots as they have strong capabilities (immobile) and are characterized by having other components such as place attachments, climate-resilient livelihoods, and power dynamics.
(d) Involuntary non-migrants or trapped populations: These are trapped populations who strongly aspire to move from their place of birth, which is usually categorized as extreme climate hotspots, but are unable to leave and seriously lack capacities to do so.

Traditionally, climate migration is viewed as an adaptation or survival strategy and a way of improving socio-economic well-being by gaining access to better livelihood opportunities and enhanced standard of living (Brottrager et al., 2023). For example, Jha et al. (2018) found that climate migrants in rural India had better adaptive capacity compared to non-migrating households, such as diversifying and maximizing income sources, and accessing climate extension sources (e.g. mobile, internet, radio, and television). However, the effects of migration are not straightforward. In many cases, climate migrants face increased vulnerabilities such as poor housing conditions, urban hazards and pollution, exploitation, unhealthy living environment and deteriorating health, and lack of social protection (Gemenne & Blocher, 2017; Sakdapolrak et al., 2024). For instance, in the Sub-Saharan country in Burkina Faso, migration to deal with decreased precipitation and increased dry spells and heatwaves was found to be improving livelihood opportunities. But overall, migration was not regarded as beneficial because of adverse effects on migrants' health, worsened food security, and an erosive coping strategy (Vinke et al., 2022). In Kenya and Vietnam, migration due to extreme climatic conditions was well-accepted by city dwellers in destination locations, but climate migrants were not seen as more deserving than traditional economic migrants (Spilker et al., 2020).

On the other hand, climate non-migrants may also face difficulties such as extreme poverty, loss of traditional

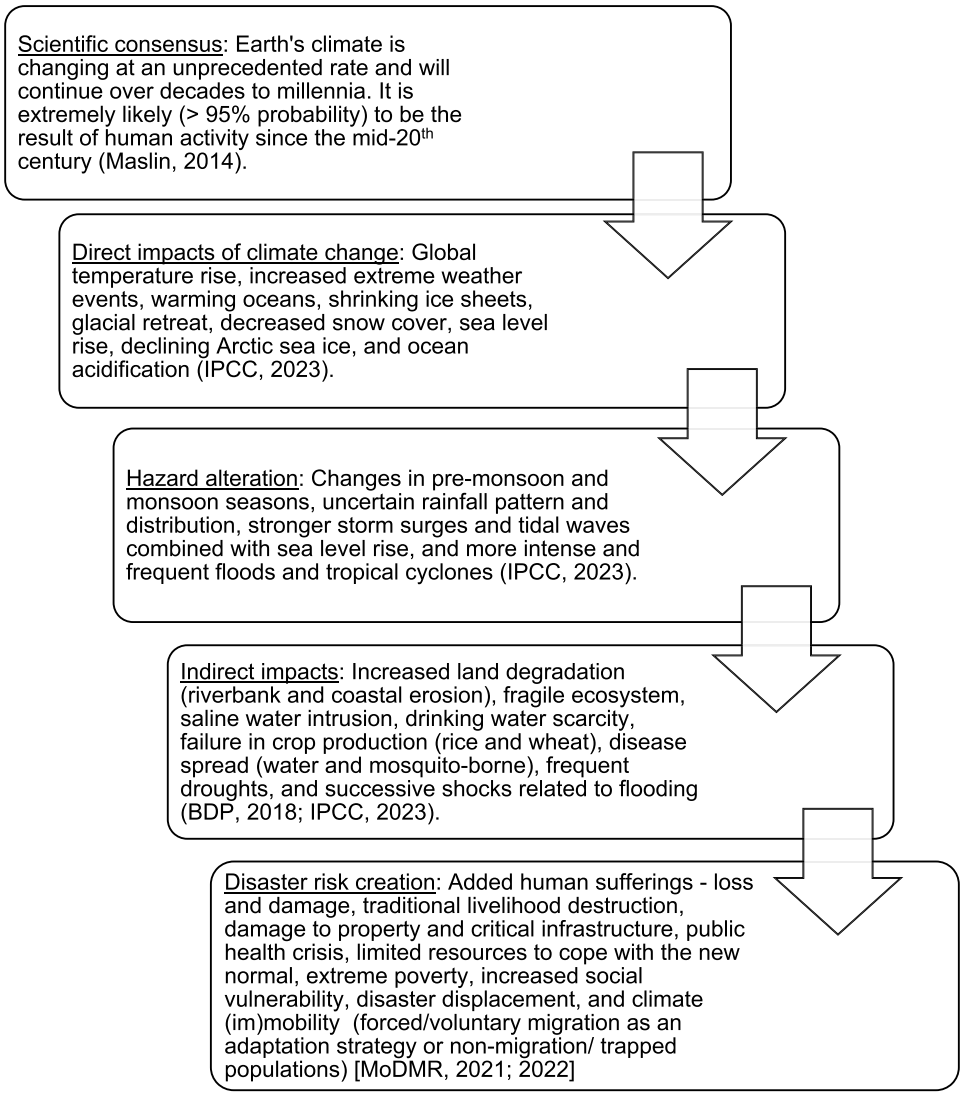

Figure 1. The conceptual framework showing interlinkages between disasters in the context of anthropogenic climate change and human mobility. Source: The authors, 2026.

livelihood due to frequent disasters, mental health issues, and lack of access to critical infrastructure, technologies and community facilities. For example, climate non-migrants or those who stay behind in the Indian Himalaya Region of Uttarakhand, conveyed mixed feelings about migration (Upadhyay, 2024). While remittances were perceived as a positive impact, they were primarily spent for daily needs rather than on activities related to climate change adaptation. The negative impacts were dominant, such as extra burden on women, broken families, mental health struggles, fewer workers for farming, and dealing with changing patterns of weather and associated agricultural shifts (Upadhyay, 2024). In the context of coastal Bangladesh, Ahsan et al. (2022) revealed that while living in the same level of climate hazard and exposure, voluntary non-migrants were more privileged and enjoyed higher socio-economic benefits compared to involuntary non-migrants.

The decision to migrate is not straightforward; rather, it is a complex blending between an individual's aspirations (e.g. demands, hopes) and capabilities/capacities (e.g. skills, social networks and financial resources). However, the majority of the people choose to remain in extreme climate hotspots due to their deep-rooted place attachments, lived experience, intergenerational knowledge within communities, livelihoods, institutions and cultural norms (Mallick et al., 2025). In contemporary literature, a paradigm shift is visible from migration as an adaptive strategy to the increasing evidence of non-migration as an adaptive response to climate change and other socio-economic vulnerabilities (Mallick, 2025; Schewel, 2020).

In summary, the actual impact of climate migration on livelihoods, human well-being, and overall standard of living varies. Any sort of migration has both positive and negative consequences, and there is ongoing debate on whether migration should be promoted as an effective tool for climate change adaptation (Mallick et al., 2023). As such, it is vital to compare the effectiveness of migration experiences by comparing these two groups of people (climate migrants vs climate non-migrants) in terms of their adaptive capacities and standard of living parameters. In this study, we have broadly categorized the forced and voluntary migrants as climate migrants, and trapped populations and voluntary non-migrants as climate non-migrants.

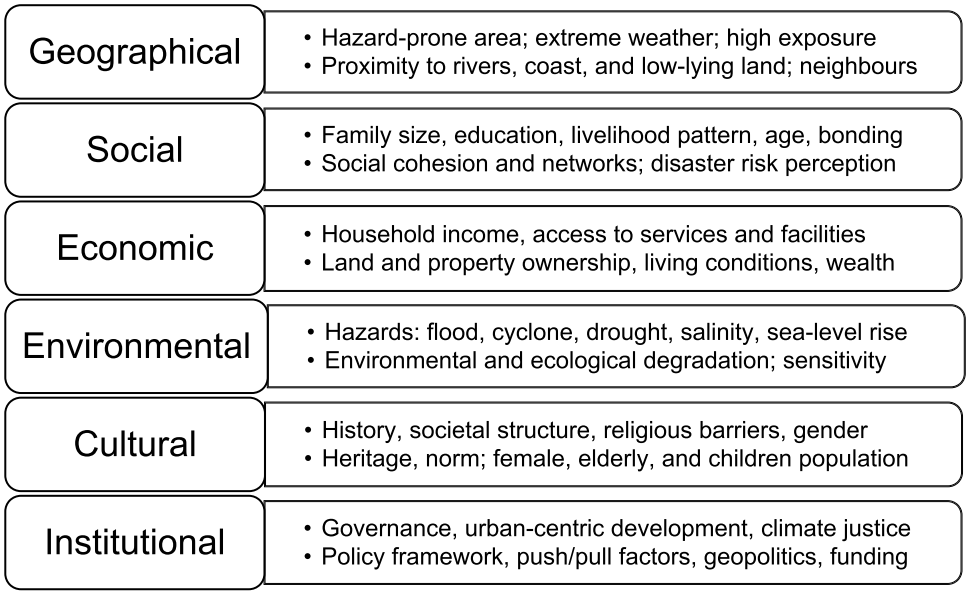

Figure 2. Household-level vulnerability dimensions linked to disasters and climate migration in Bangladesh. Source: The authors, 2026.

1.2. Considerations of standard of living

Standard of living has been considered for comparing climate migrants and non-migrants because it captures multiple dimensions of vulnerability, including housing quality, asset ownership, access to services, and economic security. By examining these differences, the underlying structural conditions and root causes that shape migration or non-migration decisions can be more clearly understood.

Here, we have adopted the framework proposed by Amartya Sen (1984) to define the standard of living. Sen (1984) argues that standard of living should not be defined solely by tangible materials, income, and economic welfare. Instead, he proposed a novel "capability approach" by criticizing both utility-based and opulence-based approaches that fail to capture other important aspects of human well-being such as education, health, mobility, and freedom. This approach values the ability to live well, focusing on the capabilities related to economic aspects of life (Sen, 1984). In fact, standard of living is highly subjective and contextual, as both material and abstract elements can be integrated to provide a more holistic approach. Sen's (1984) "capabilities approach" was later adopted by De Haas (2021) to introduce a novel framework for migration that defines mobility as people's capability to choose where to live, including the option to stay. The theory defines (im)mobility as a function of aspirations and capabilities (De Haas, 2021; Schewel, 2020), where people need access to social, economic, cultural, and institutional or structural resources to decide (see Figure 2). In the context of climate im(mobility), such capabilities can be categorized as adaptive, social, institutional, economic, and technological (IPCC, 2022). Examples of capabilities include age, sex, education, skills, governance, wealth, social networks, marital status, community cohesion, local knowledge, regulatory frameworks, resilient infrastructure, ethnicity, language, early warning systems, religion, recovery mechanism, and support systems (IPCC, 2022).

1.3. Research gaps, aim, and novelty

Current research on the climate migration domain has several important gaps. First, it should be acknowledged that human migration in the context of climate change, environmental degradation, and disasters is not a binary process; rather, it is a multifaceted phenomenon (Foresight, 2011; Mallick & Schanze, 2020). There are both direct (e.g. weather events) and indirect (e.g. socio-economic factors) climate-induced stressors leading people to migrate internally (Xiao et al., 2022). In fact, the association between climate change and human migration is not linear, and the tendency to migrate from climate hotspots is linked to a person's geographic, social, economic, cultural, environmental, demographic, institutional and political vulnerabilities or drivers (Foresight, 2011; Mallick & Schanze, 2020). It means climate change is not the only driver for human (im)mobility, but it amplifies socio-economic vulnerabilities, particularly economic drivers by damaging traditional climate-sensitive livelihood opportunities and human habitat (Clement et al., 2021). Therefore, any methodology attempting to estimate the number of migrants and distinguish between climate and economic migrants, or climate migrants and climate non-migrants should consider other intervening factors that influence the climate-environment-migration nexus.

Second, it is apparent that both climate migrants and non-migrants necessitate distinct sets of elements and personal and household characteristics in their decision making process. Furthermore, given the increasing trends of GHG emissions, human-induced warming and climate-intensified extreme weather events (Otto et al., 2024; Seneviratne et al., 2023), the climate non-migrants, who are deemed to be somewhat resilient now, are at greater risk of being displaced (Mallick & Schanze, 2020). It means today's resilient individual or household might end up transforming into a vulnerable state due to intensified climate change. Under such circumstances, a robust conceptual framework should be developed to

understand the interconnections between aspirations and capacities among climate migrants and non-migrants (Mallick & Schanze, 2020).

Third, research on comparing climate migrants' and non-migrants' standard of living is limited. This kind of comparison is essential so that policymakers can identify specific parameters (Oakes et al., 2023) contributing towards vulnerabilities, assess adaptation and survival needs, and design targeted interventions to support both those who migrate to a new destination and those who remain in climate hotspots.

Although climate migration research has expanded considerably (Ahmed & Mallick, 2026), robust national-scale empirical methods for distinguishing climate migrants from other migrant groups remain limited (Bhattacharjee et al., 2026), particularly in highly vulnerable least developed countries such as Bangladesh. In addition, relatively little attention has been given to comparing the socio-economic conditions, wider disaster vulnerabilities and standard of living of climate migrants and climate non-migrants using large and comprehensive national-scale datasets. To address these research gaps, this article develops a novel data-driven and reproducible methodological framework for identifying climate migrants and climate non-migrants and applies it to the largest national-scale dataset yet used for this purpose in Bangladesh. By further comparing wealth quintiles and standard of living indicators between these two groups, the study also challenges the conventional assumption that climate migrants are uniformly poor and vulnerable. Instead, it provides a more evidence-based understanding with direct relevance for academic debate and policy design.

2. Methodology

This is an empirical and quantitative study based on secondary datasets such as geographic information systems (GIS) shapefiles from various sources, national population sample survey data, and technical reports and scholarly articles. We have used SPSS, ArcGIS Pro, Excel, and Origin Pro software for data analysis.

2.1. Working definitions

In this study, a climate migrant is defined as a person who originates from an extreme climate hotspot and migrates permanently within a country in search of better living standards. In recent years, climate migrants are being primarily labelled as internally displaced populations, to further avoid debates on climate refugees (Ahmed, 2018) and sensitivities associated with cross-border migration geopolitics (IOM, 2024). In contrast, a climate non-migrant is defined as a person who stays voluntarily or involuntarily in their place of birth despite recurrently facing extreme climate-related disaster risk.

Climate migrants are a subset of environmental migrants who migrate within countries from extreme climatic hotspots largely for reasons of sudden or progressive change in the environment due to climate change and its impact on livelihoods (MoDMR, 2021; Rigaud et al., 2018). The general consensus in climate migration studies is that, although the primary goal for migrants is to seek better income and standard of living, migration effectively becomes a means of adaptation to environmental challenges. It is also acknowledged that increasing climatic stresses and shocks as a result of more frequent and intense extreme weather events in climate-vulnerable areas are pushing the frontline communities to diversify their livelihood strategies through migration to economically stable areas (IPCC, 2023; Martin et al., 2014). Other findings conclude that sudden-onset disasters lead to population displacements, whereas, slow-onset climatic disasters are primarily responsible for gradual degradation of environment, ecosystem services, and local livelihoods, thus exacerbating poverty and prompting a sequence of economic migration followed by permanent relocation (Islam & Shamsuddoha, 2017). However, some rapid-onset events such as tropical cyclones, monsoon and flash floods, landslides and hilly flash floods, and associated riverbank erosion are also getting more extreme and frequent in Bangladesh due to anthropogenic climate change (Fahad et al., 2024; Khan et al., 2020; Rahman et al., 2023). Consequently, these natural hazards should be taken into consideration for climate migration estimation.

2.2. Study area description

As the case study, Bangladesh, a country in South Asia was selected (Figure 3, and Appendix-I). Bangladesh is one of the largest deltaic and most climate-vulnerable countries in the world because of its complex geographical location, flat topography, low elevation, high population density (1,119 people per square kilometre) with a total population of about 170 million (BBS, 2023), and tropical monsoon climate (BDP, 2018). Bangladesh always ranks high in the world disaster risk index, for instance, ranked 9th in 2024 among 193 countries worldwide (WorldRiskReport, 2024). About 80% of its land is floodplains covered by several major transboundary river systems. The monsoon is responsible for 70% of rainfall from June to September and climate change contributes to an increase in extreme rainfall events (Fahad et al., 2024). All these characteristics make this country an ideal place for several climate-induced hazards and associated disasters such as river flooding, flash floods, tropical cyclones, storm surges, salinity intrusion, rainfall-induced landslides, riverbank and coastal erosion, water-borne (e.g. diarrhoea) and vector-borne diseases (e.g. dengue fever, and malaria), extreme heat waves, water scarcity and droughts (Huq et al., 2024; MoEF, 2018; Paszkowski et al., 2025; Rudolph et al., 2025).

Apart from the direct impacts (death, injury, and damages), these climate-induced disasters contribute to long-term effects like loss of livelihoods, decline in agricultural productivity, reduced soil fertility, groundwater depletion, pollution, diseases, psychological problems, and internal displacement (Gray & Mueller, 2012; MoDMR, 2021; MoEF, 2018). For example, climate-related events impacted over 49.4 million people in Bangladesh in 2024 (OCHA, 2024). A recent report published by the International Organization for Migration (IOM) estimated that there are over 4.9 million IDPs in Bangladesh due to natural disasters (IOM, 2025). The Internal Displacement Monitoring Centre (IDMC) recorded about 18.8

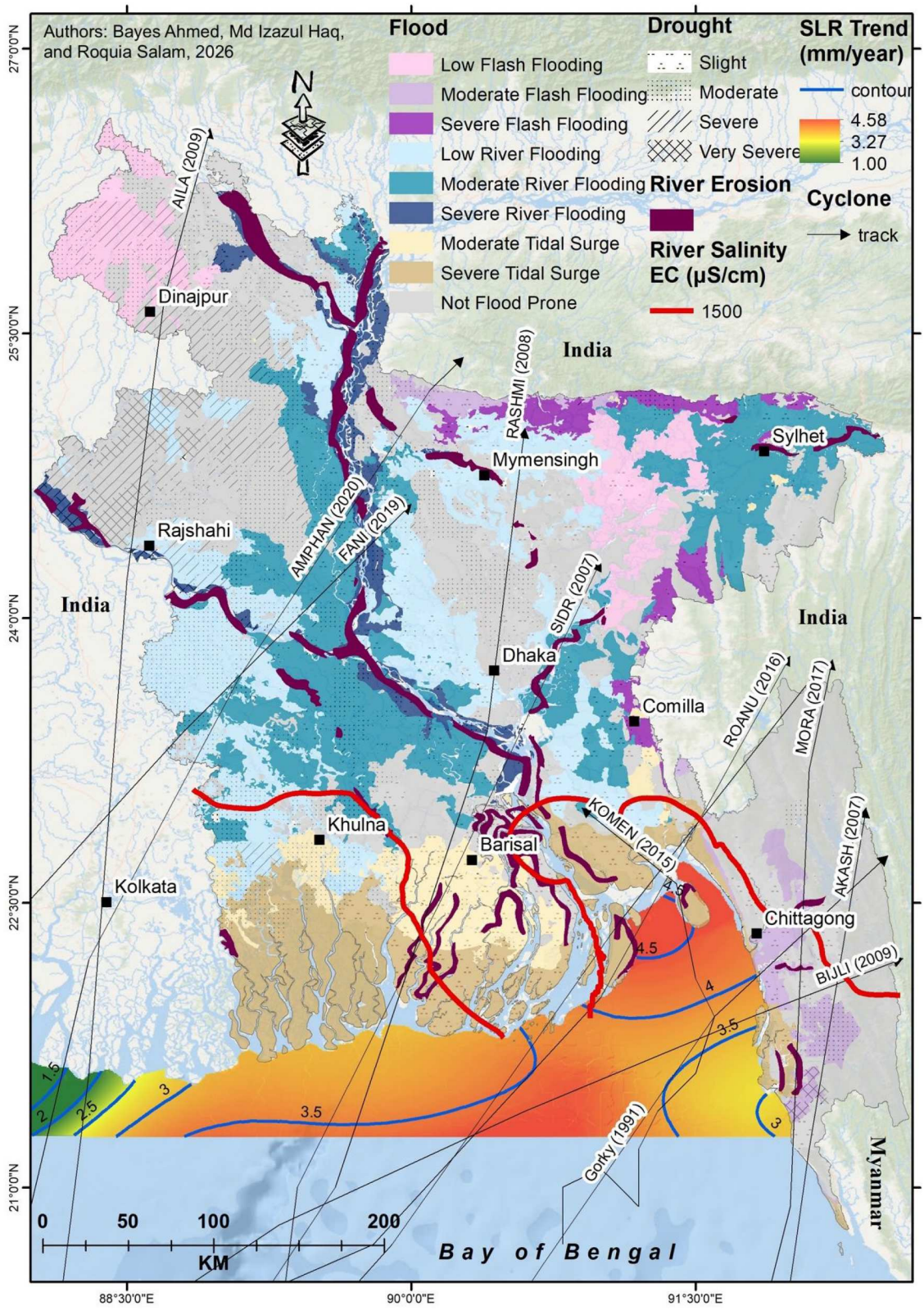

Figure 3. Hydrometeorological multi-hazard risk map of Bangladesh. Source: The authors, 2026.

million internal displacements in Bangladesh between 2008–2023 primarily due to weather-related disasters such as storm and floods (IDMC, 2023). In a worst-case scenario, Bangladesh is projected to have up to 19.9 million internal climate migrants (13.3 million for a pessimistic scenario), making up nearly half of South Asia's total (Rigaud et al., 2018). These numbers are staggering, proving that climate migration and disaster displacement are a reality for Bangladesh. This

complex diversity of climate vulnerabilities makes Bangladesh an ideal case study for exploring the outcomes as well as the drawbacks of both the decision to migrate or not.

2.3. Multi-Hazard climate hotspot mapping

At first, we prepared a multi-hazard risk map of Bangladesh by considering all the major hydrometeorological and hydrogeomorphic hazards (Figure 3), using a GIS-based overlay approach. Hazard layers were compiled from secondary sources, including flood, drought, and river erosion datasets produced by the Bangladesh Agricultural Research Council (BARC) using data from the Bangladesh Space Research and Remote Sensing Organization (SPARRSO) data, obtained from the Humanitarian Data Exchange (HDX) platform (HDX, 2017). Trends in sea-level rise (SLR), presented as both shaded and contoured surfaces, and long-term mean river salinity, represented using electrical conductivity (EC) contours (1,500 µS/cm) for 2000–2017, were adopted from Haq et al. (2024). The SLR trend data (1993–2021) were based on AVISO + satellite altimetry data (AVISO+, 2024) and observed salinity measurements from the Bangladesh Water Development Board (BWDB). Cyclone track data were derived from the Joint Typhoon Warning Center (JTWC) Best Track dataset, representing major landfalling cyclones between 1990 and 2020 (JTWC, 2026).

All hazard layers were standardized and overlaid to produce a composite representation of climate-related risks across Bangladesh. This integrated analysis enabled the identification of spatial hazard hotspots and the delineation of climate-vulnerable regions. Based on the composite hazard overlay, 281 climate-vulnerable sub-districts (Upazilas) were identified out of 495 Upazilas across 64 districts (Appendix-III; Steps 6b and 6c). The results were validated using official reports published by the Government of Bangladesh (GoB) (e.g. MoEF, 2018, pp. 143–164) and the local knowledge of the researchers.

2.4. Migration data collection

We collated the sample socio-economic and demographic survey data from the Bangladesh Bureau of Statistics (BBS). The sample census was conducted between 15–25 October 2011 with a long questionnaire to supplement the fifth Population and Housing Census 2011 of Bangladesh (BBS, 2012). The sample survey covered 6,720 enumeration areas (EAs) and 168,000 households (BBS, 2012, pp. 13–14) representing 2.29% of EAs and 0.52% of households from the main census (see Appendix-II). The questionnaire (BBS, 2012, pp. 343–346) had 81 questions and ten modules on individual and household information, economic activities, migration pattern, housing, and other important aspects (BBS, 2012, p. 2). In total, 737,711 individual responses were collected.

Importantly, the sample census is based on statistically representative sampling design, and the data are accompanied by appropriate expansion weights that allow the sample observations to be scaled to population-level estimates. These weights are derived from the full census (short questionnaire), which provides complete counts of the population and households across Bangladesh. Consequently, the long questionnaire data enable the estimation of national and sub-national indicators (BBS, 2012), such as migration, by applying weighted projections rather than relying on raw sample counts. This integration of full census enumeration with sample-based detailed information ensures both accuracy in total population counts and depth in socio-economic analysis. As such, the BBS sample census constitutes one of the most authoritative and methodologically robust data sources for analysing population dynamics in Bangladesh.

The most recent sample census in Bangladesh was conducted in 2023, but the sample survey data were not yet publicly available from BBS during 2025–2026, so the analysis had to rely on the 2011 dataset. Such national-level sample surveys are normally conducted following the population census; however, the round due in 2021 was delayed because of the COVID-19 pandemic and was eventually conducted in 2023. Although the 2011 dataset is not the most recent, it remains the most authentic and reliable publicly available national source, based on systematic sampling and population estimation methods covering the whole of Bangladesh (BBS, 2012). Given that this article is primarily methodological in nature, its use is considered justified for developing and testing the segregation framework.

2.5. Segregating climate migrants and climate non-migrants

A climate migrant must have some well-defined characteristics to be consistent with the current academic debates. They must fulfil some spatial, temporal, and multi-dimensional socio-economic-cultural criteria (Boas et al., 2019). There is no universal definition of climate migration and academic consensus on the salient features of climate migrants yet. However, for quantitative data analysis and for estimating the number of climate migrants and climate non-migrants, is it necessary to define them first. After rigorous literature review (Clement et al., 2021; de Sherbinin et al., 2022; McLeman et al., 2021; MoDMR, 2021; Piguet, 2022; Rigaud et al., 2018) and analysing the local context, a climate migrant has been theoretically defined as a person who:

i Was born in Bangladesh
ii Has a birthplace categorized as an extremely vulnerable climate hotspot (i.e. one of the 281 highly climate-vulnerable sub-districts or Upazilas)
iii Was born in a rural area
iv Has permanently migrated from their place of birth or ancestral home
v Migrated internally within Bangladesh (i.e. did not cross international borders)
vi Migrated due to a combination of natural calamities, livelihood needs, and other socio-economic reasons (not for exclusive personal reasons like marriage or study)
vii Relocated to an urban area
viii Moved from one district to another, thereby covering a meaningful distance to (also known as lifetime migration)

ix Has been living in their current urban destination for at least ten years or more

On the other hand, a climate non-migrant has been defined as a person who:

i Was born in Bangladesh
ii Has a birthplace categorized as an extremely vulnerable climate hotspot (i.e. one of the 281 highly climate-vulnerable sub-districts or Upazilas)
iii Was born in a rural area
iv Has never migrated from their place of birth in their lifetime (i.e. neither internally nor internationally)

The above definitions are meticulously designed in a way to avoid temporary and circular migrants, rural-to-rural or urban-to-rural migrants, and mixing up with purely economic, family, health, and education-related migrants, or other types of migrants such as emigrants, refugees, immigrants, asylum seekers, stateless people, undocumented or illegal migrants, and political migrants. To overcome literature gaps, we have also considered a person's geographic, social, economic, cultural, environmental, demographic, and institutional drivers of im(mobility).

2.5.1. Identifying climate migrants

To identify climate migrants and separate them from other types of migrants such as purely economic migrants or non-environment-related migrants, we have followed a 7-step methodological flow (see Appendix-III).

First, we identified the birthplace of a person. In the survey questionnaire, there were three options under the 'location of birthplace' question: same district, different district, and different country (Step 1, Appendix-III, and question no. 32a; BBS, 2012, p. 344). We selected the option 'different district' to identify internal migrants in Bangladesh. These people are categorized as lifetime internal migrants, meaning persons enumerated in a place different from the 'place of birth'. It also ensures that migrants are travelling to a certain minimum distance, in this context at least to a different district.

Second, in response to the question, main reason for coming to this current district (Step 2, Appendix-III, and question no. 33b; BBS, 2012, p. 344), we filtered the samples that selected the options: employment/business, in search of work, natural calamity, and others. We categorized them as economic migrants. By contrast, those who selected marriage, education, family quarrel, or tortured by spouse are categorized as non-economic migrants.

Third, we listed 13 districts as not highly vulnerable to various hydrometeorological and hydrogeomorphic hazards. These districts were selected based on analysing the multi-hazard risk map (Figure 3), results obtained from the Bangladesh Delta Plan 2100 (BDP, 2018, p. 7) and excluding some major cities or urban areas (see Appendix-III, Step 3). This step ensures that the remaining migrants have origins in districts that are highly exposed to natural hazards.

Fourth, to capture the nature of rural origin, we kept the samples with birthplace type coded as rural only (see Step 4, Appendix-III, and question no. 32c; BBS, 2012, p. 344). These rural-origin migrants from disaster-prone districts are categorized as environmental migrants. It is assumed that rural livelihoods in hazard-exposed districts are particularly sensitive to climate and weather shocks. This group includes permanent, temporary, and circular migrants.

Fifth, we filtered out people who moved to urban destinations. Each household response was linked to a geocode (BBS, 2019) that represents a unique location ID composed of the four administrative units in Bangladesh: division, district, sub-district/Upazila, and union.[1] Based on the geocode, we selected the persons currently living in urban, city corporation, other urban, and major urbanized districts in Bangladesh (see Steps 5a and 5b, Appendix-III). This group represents rural-to-urban migrants only, eliminating rural-to-rural environmental migrants, who typically originate from drought-prone areas and may move in a circular or temporary pattern (Ahmed et al., 2019).

Sixth, we analysed the multi-hazard risk map (Figure 3) and demarcated only the moderate to extremely severe risk zones (see Appendix-IV). At this stage, we deleted seven more districts to focus on purely climate-sensitive regions (see Appendix-III, Step 6a). We also analysed each Upazila's climate vulnerability index from the National Climate Vulnerability Assessment Report (MoEF, 2018, pp. 143–164). Next, we narrowed it down to 281 climate-vulnerable Upazilas (see Appendix-III, Steps 6b and 6c) for further analysis. Afterwards, we identified people originating from these extremely climate-vulnerable areas. This group represents migrants from rural climate hotspots who have moved a meaningful distance to an urban destination (i.e. district-level scale) and includes permanent, temporary, circular, voluntary, involuntary, and returning migrants.

Seventh, after identifying people originating from climate hotspots, we considered the minimum duration of residence in the destination district. We selected those who have lived in the current district for more than 9 years (question no. 33a; BBS, 2012, p. 344, and Appendix-III, Step 7) to reduce the likelihood of including temporary and circular migrants. The assumption is that within the last nine years they could still have moved between other urban centres, but those who have stayed longer are more stably settled in the current destination. This group is finally classified as climate migrants, both voluntary and involuntary in nature. They are internal lifetime migrants from rural, disaster-prone districts, who have moved a significant distance out of climate hotspot sub-districts primarily for economic and environmental reasons and have been residing in their current urban destination for at least ten years.

2.5.2. Identifying climate non-migrants

To calculate climate non-migrants, we followed a three-step procedure.

First, we identified people who were born in the same district where they were enumerated in the census. In the questionnaire, this corresponds to the response "same district" under the location of birthplace question (question no. 32a;

BBS, 2012, p. 344). This group represents non-migrants, that is, people who have never migrated at the district level.

Second, from this group, we considered only those who are residing within climate change hotspot Upazilas/sub-districts. These 281 hotspot sub-districts were identified earlier using the multi-hazard risk map (Appendix-IV, Step 6c) and the national climate vulnerability index (MoEF, 2018, pp. 143–164).

Third, we filtered this population to include only people who are currently living in rural areas (see Step 4, Appendix-III), using the rural locality code from the census geocode (BBS, 2019). This final group represents climate non-migrants, that is, individuals who were born in, and still reside in, rural climate hotspot areas without having migrated to another district.

2.6. Standard of living index calculation

Next, we developed a weight-based indexing method for calculating the standard of living of climate migrants and non-migrants, as shown in the equation below (Ahmed & Kelman, 2018):

$$SLI = \frac{W_1 \times S_1 + W_2 \times S_2 + W_3 \times S_3 + \ldots\ldots\ldots\ldots + W_n \times S_n}{W_1 + W_2 + W_3 + \ldots\ldots\ldots + W_n}$$

Where, 'SLI' denotes standard of living index; 'W' is indicator's weight; 'S' is class weight under each indicator; and 'n' is the total number of indicators.

To calculate the standard of living, we have broadly selected a range of tangible indicators from the questionnaire into two categories: (a) access to information and transportation (AIT), and (b) land possession and housing facilities (LPHF). A total of 9 and 18 indicators were utilized for creating the standard of living indices of AIT and LPHF. A brief justification of all the indicators and their associated classes and weights are given in Appendices V and VI. The weights were assigned in two stages. First, indicator weights are assigned in a scale of 1–3 (1 = low influence, and 3 = high influence) by analysing secondary literature and based on the authors' extensive fieldwork and local knowledge. Second, each indicator's class weights are assigned between 1 and 0, by considering the specific local context (such as rural or urban areas), and how each indicator influences people's standard of living. The lowest weight is allocated for the class, which indicates the household's lower standard of living and vice versa. Two classes are assigned as [1 (yes) and 0 (no)] or [1 (no) and 0.5 (yes)]. Three classes are assigned as 1, 0.67, and 0.33; four classes are assigned as [1, 0.75, 0.50, and 0.25] or [1, 0.67, 0.33, and 0]; five classes are assigned as 1, 0.8, 0.6, 0.4, and 0.2.

Finally, we applied multinomial logistic regression (Laerd Statistics, 2018) because the outcome variable had several categories, namely five wealth quintiles, to estimate how characteristics like age, sex, education, family size, and employment status change the odds of belonging to each wealth group (Anika et al., 2025; Hoque et al., 2024).

3. Results

3.1. Comparing climate migrants and climate non-migrants

The collected sample survey database had detailed information about 737,711 individual responses from 168,000 households representing an estimated household size of 4.39 (close to the national average of 4.35) and total population of 139,252,683 (BBS, 2012: xi, 19). After applying step-by-step filters based on the definition of climate migrants and non-migrants (see sections 2.5.1 and 2.5.2), the estimated number of climate migrants in Bangladesh was 1,936,386, whereas climate non-migrants were estimated at 59,639,772. Climate migrants make up 14.35% of all internal migrants and 1.39% of the total population in Bangladesh. These numbers are quite consistent with the findings of Rigaud et al. (2018, pp. 144–158). Climate non-migrants account for 42.83% of Bangladesh's total non-migrant population.

The results show (Figure 4) that most people had never migrated in Bangladesh (90.20%). Among the lifetime internal migrants (i.e. those who moved to a different district other than their birth district), 63.67% moved for economic reasons, including natural calamity-based forced migration and the search for jobs or business, while 36.33% migrated for non-economic reasons such as getting married or educational purposes. About 69% of the economic migrants were linked to various environmental factors such as originating from disaster-prone districts and rural areas only, including both rural to urban and rural to rural, and permanent, temporary and circular migrants. Climate migrants account for approx. 32.67% of the environment-related migrant group who fulfil additional criteria such as currently residing in urban areas for at least ten years or more, and originating from the extreme climate hotspots (i.e. the selected 281 sub-districts from multi-hazard mapping). Climate migrants are primarily driven by coastal hazards (54.33%) followed by floods and river erosion (43.33%) and only 2.34% by drought (Figure 4).

Figure 5 shows district-wise movements of climate migrants, which are concentrated in key urban centres in Bangladesh (Appendix-VII), especially the capital Dhaka (68%), with significant out-migration from the southern, northwestern, and central districts.

Finally, after cleaning the original dataset collected from BBS, which also includes estimated population values, and removing missing values, we selected 6,549 climate migrant samples and 251,906 climate non-migrant samples for the socio-demographic analysis, wealth quintile assessment, standard of living evaluation, and regression analysis. We used the original dataset (frequency = 139,252,683) where an estimate of the total population was required. For the remaining comparative analyses, including wealth quintile and standard of living calculations, we used the actual sample survey data, with a total sample size of 258,456.

3.2. Comparing socio-demographic characteristics

In this study, we have categorically selected a range of parameters to assess and compare the standard of living of climate

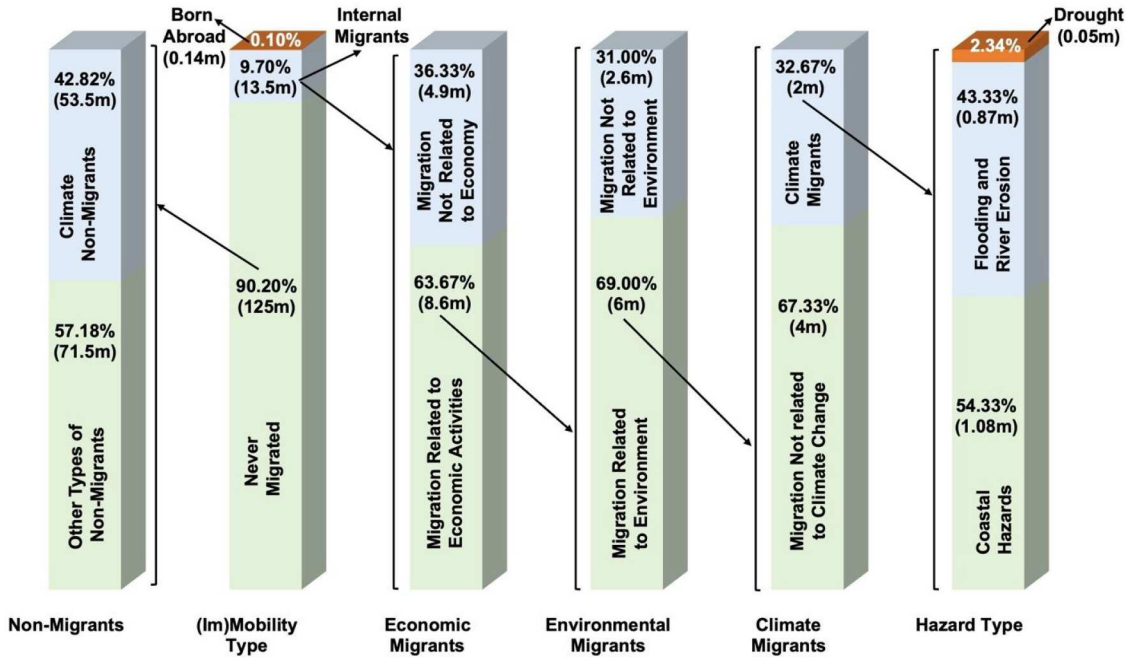

Figure 4. Distribution of different types of non-migrants and internal migrants in Bangladesh, based on 2011 population estimates. Source: The authors, 2026.

migrants and non-migrants that represent their social (e.g. marital status, level of education, tenancy type, cooking fuel), economic (e.g. wealth quintiles, ownership of car, boat, and bicycle, and type of dwelling, toilet and building materials), technological (e.g. access to internet, mobile, computer, and TV), cultural (e.g. age, gender, ownership of land and house), and institutional (e.g. literacy, water and electricity supply, and activity status) resources (see Appendices V–VI, and VIII).

Results show that climate migrants are predominantly characterized as male, primary working age group (25–54 years), somewhat more-educated, and currently enjoying better employability in their destinations, compared with their climate non-migrant counterparts (Appendix-VIII).

For both categories, the majority were primary workers (63% of climate migrants and 48% of non-migrants) and early workers (13% and 22% of climate migrants and non-migrants, respectively) whose ages fall under the age range of 25–54 and 15–24 years, respectively. Although female (36%) climate migrants were comparatively less than males (64%), for non-migrants, this difference was close to the national average, as males were 51% and females were 49% (BBS, 2012). Primary and secondary school-passed households were dominant in both groups. However, very few were educated enough (Level of Education 2), only 21% of climate migrants and 8% of climate non-migrants were more educated (i.e. got the opportunity to receive education even after completing a secondary school certificate). For both climate migrants and non-migrants, more than 90% of people received general education (Appendix-VIII).

A considerable number of households (61% of climate migrants and 55% of non-migrants) could read and write, although the majority did not receive higher education. Less than 25% (23% of climate migrants and 21% of non-migrants) of households belonged to small families with one to three members and the rest of the households were large. About 36% of climate migrants were unemployed, whereas 63% of non-migrants were unemployed, which indicates that the economic status was comparatively more stable among the climate migrants than climate non-migrants (Appendix-VIII).

3.3. Comparing wealth quintiles

We have also explored the factors influencing climate migrants' and non-migrants' wealth quintiles, which was readily available on the collected database. BBS (2012) utilized a principal component analysis-based wealth indexing method (Córdova, 2009) for calculating wealth quintiles. In this context, wealth quintile refers to the statistical division of a population (climate migrants vs non-migrants) into equal groups based on assets and resources available.

Figure 6 represents the frequency of the surveyed households' respective wealth quintiles. Interestingly, it is observed that, comparatively, climate migrants were wealthier than non-migrants. Out of 6,549 climate migrants, 4,410 (67.3%) belonged to the richest (fifth) quintile, followed by 1,268 (19.4%), 361 (5.5%), 218 (3.3%), and 292 (4.5%) were fourth, middle, second, and the poorest in wealth quintile, respectively (Figure 6a). On the other hand, out of 251,905 climate non-migrants, only 15,901 (6.3%) were the richest (fifth), followed by 45,992 (18.3%), 59,447 (23.6%), 70,543 (28%), and 60,023 (23.8%) were fourth, middle, second, and the poorest in wealth quintile, respectively (Figure 6b).

The distribution of climate migrants is highly skewed towards the richest quintile, whereas climate non-migrants show a more even distribution, with the highest concentration in the poorest, second, and middle quintiles. The results suggest poorer populations tend to stay behind in Bangladesh.

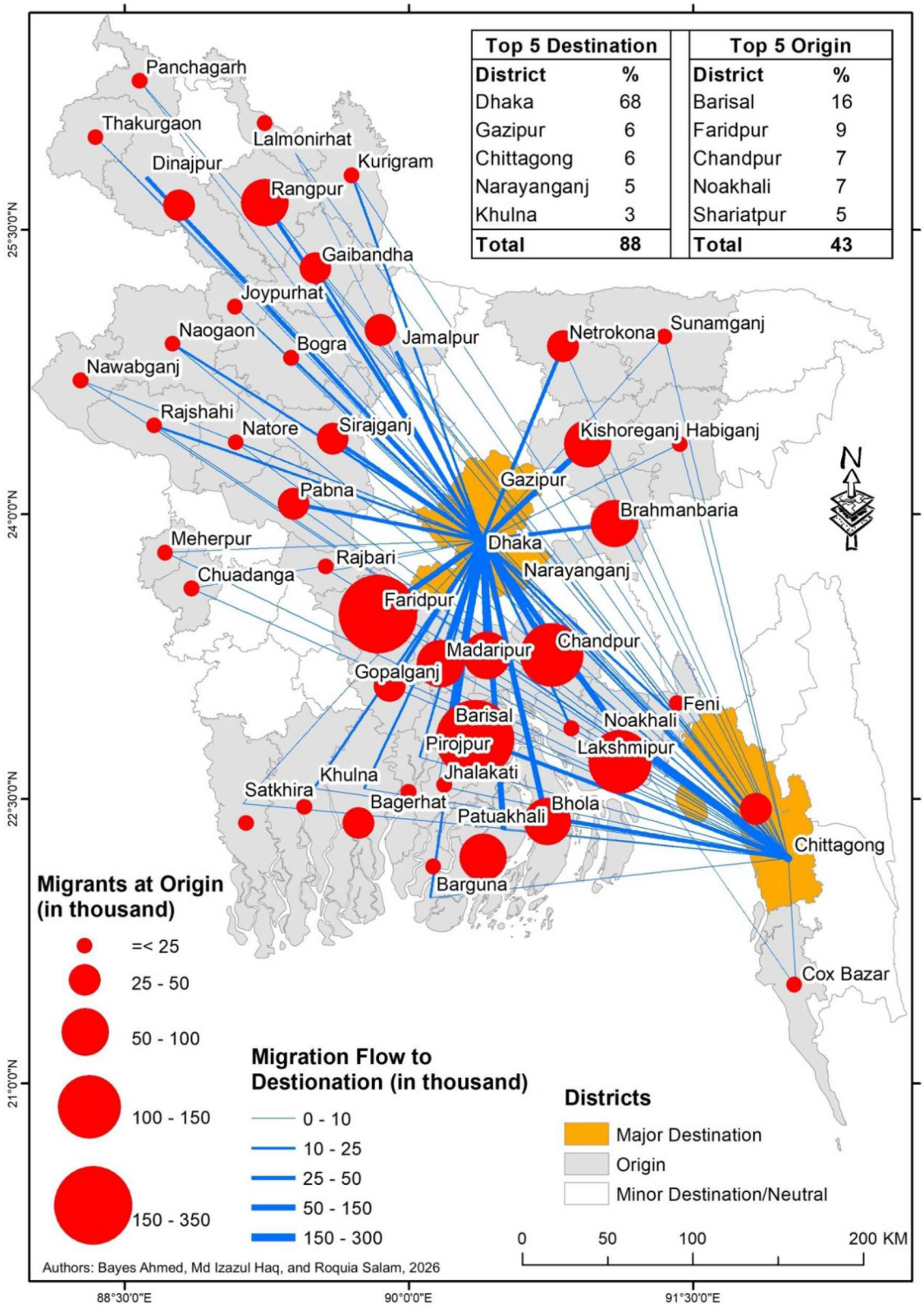

Figure 5. Map showing flows of climate migrants in Bangladesh, highlighting major origin and destination districts and the volume of people moving between them. Source: The authors, 2026.

For both climate migrants and non-migrants, a consistent pattern is observed from the results of the multinomial logistic regression (Appendix-IX). In this model, the middle wealth quintile is taken as the reference category, and the coefficients (B) and odds ratio (Exp(B)) show how various demographic factors are associated with wealth quintiles (see Appendix-IX). For instance, compared with elderly people, climate migrants in the primary working class (25–54 years) have

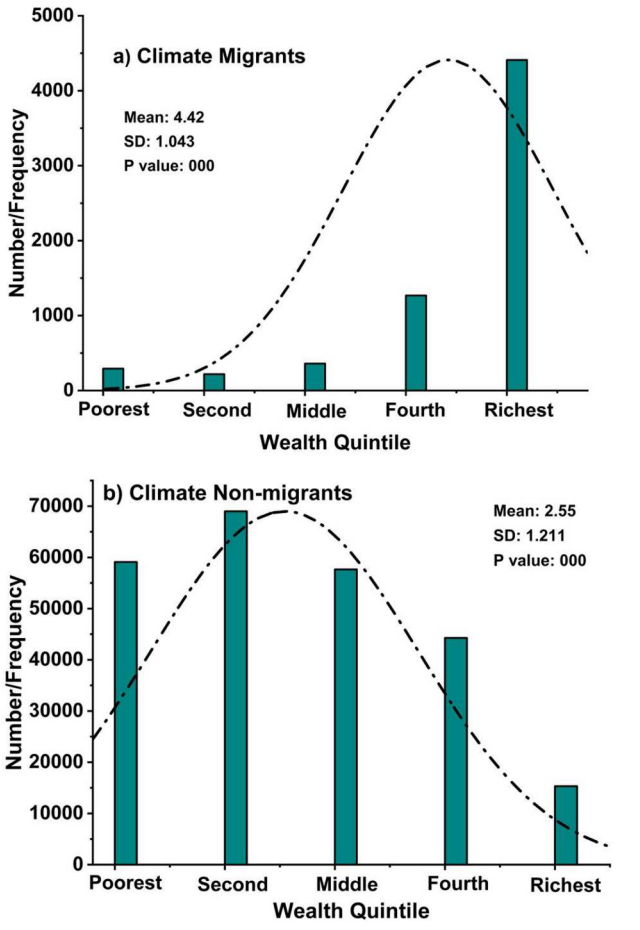

Figure 6. Frequency of wealth quintile of (a) climate migrants, and (b) climate non-migrants. Source: The authors, 2026.

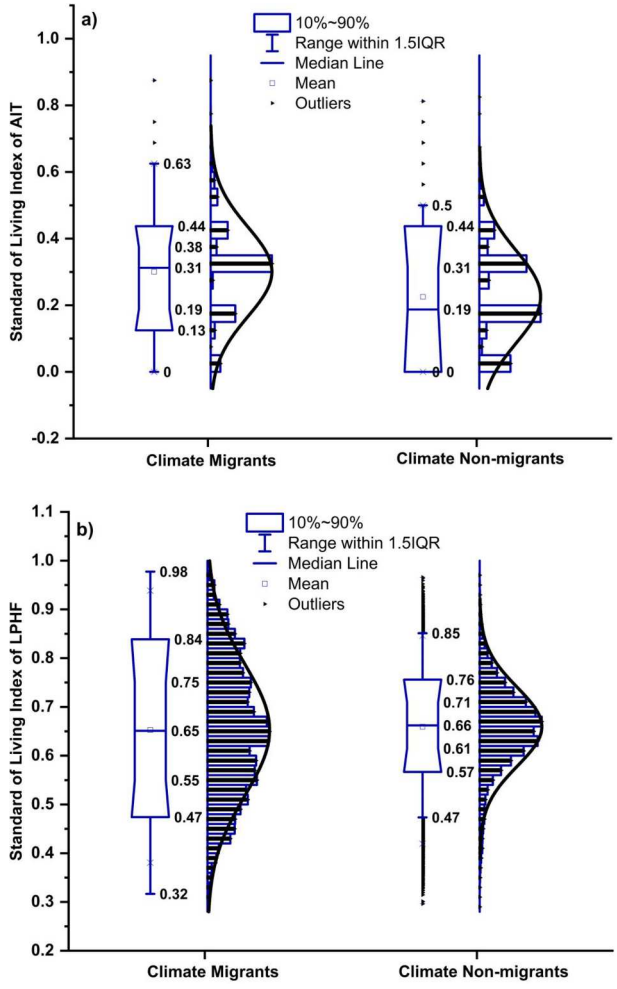

Figure 7. Standard of living indices of (a) climate migrants, and (b) climate non-migrants for access to information and transportation (AIT) and land possession and housing facilities (LPHF). Source: The authors, 2026.

much lower odds of being in the poorest group [B = −0.77, and Exp(B) = 0.46] and higher odds of being in the fourth [B = 0.63, and Exp(B) = 1.88] and richest quintiles [B = 0.77, and Exp(B) = 2.16]. It indicates that being in the economically most active age is strongly associated with better wealth outcomes. Illiterate climate migrants are more than twice as likely to fall into the poorest quintile relative to the middle group [B = 0.80, and Exp(B) = 2.23], whereas those with higher levels of education have much greater odds of being in the richest quintile [B = 1.32-2.01, and Exp(B) = 3.74-7.47]. It shows that education is a powerful route out of poverty for climate migrants.

In contrast, for climate non-migrants, children and early workers are several times more likely than the elderly to be in the poorest group [B = 1.74-1.83, and Exp(B) = 5.67-6.23], while primary workers have more than double the odds of being in the richest group [B = 0.83, and Exp(B) = 2.30]. In the poorest versus middle comparison, larger non-migrant families (size 4–6 members) have higher odds of falling into the poorest wealth quintile [B = 0.52, and Exp(B) = 1.68] relative to the middle group [B = −0.30, and Exp(B) = 0.74]. For climate non-migrants, activity status categories such as employer, employee, or self-employed in non-agricultural work are associated with higher odds of falling into the middle wealth quintile [Exp(B) = 1.45-1.92] relative to the richest group [Exp(B) = 1.81-4.57].

3.4. Comparison of the standard of living

Figure 7 demonstrates climate migrants' and non-migrants' level of standard of living index (SLI) for accessing information and transportation (AIT), and land possession and housing facilities (LPHF). In the box and whisker plot (Figure 7), there are certain parts: first, the 10th percentile, which is the marker for the lower bound of the whisker; second, the first quartile (bottom of the box) that represents 25% of the data; third, the middle line inside the box, representing the 50th percentile (median); fourth, the top of the box that represents the 75th percentile; and fifth, the marker for the upper bound of the whisker that represents the 90th percentile. The lower limit (just below the box) and the upper limit (just above the box) of the two whiskers indicate the minimum and maximum values of SLI, respectively. The outliers are data points shown in the plot that fall outside the lower and upper limits of the whiskers. A histogram with a distribution curve is shown alongside each box and whisker plot to illustrate the distribution of the SLI among all climate migrants and non-migrants.

The mean and median level of the SLI for AIT for climate migrants was slightly higher (same for both mean and median

0.31) than non-migrants (mean 0.25, and median 0.19) (Figure 7a). The minimum and maximum values of the SLI for AIT among climate migrants were 0.00 and 0.63, respectively (Figure 7a). The minimum and maximum values of the SLI for AIT of climate non-migrants were 0.00 and 0.50, respectively (Figure 7a). The mean SLI level for LPHF of both climate migrants (0.7) and non-migrants (0.69) showed very little difference. The median SLI level for LPHF of both climate migrants (0.65) and non-migrants (0.66) had a small difference similar to the mean values (Figure 7b). The minimum and maximum values of the SLI for LPHF among climate migrants were 0.32 and 0.98, respectively (Figure 7b). Minimum and maximum values of the SLI for LPHF of climate non-migrants were 0.47, and 0.85, respectively (Figure 7b). This indicates that the mean SLI for AIT among climate migrants was slightly higher and the SLI for LPHF of climate migrants was similar to that of non-migrants. However, the SLI for LPHF of climate non-migrants was comparatively better distributed (Figure 7b).

4. Discussion

The results above highlight important contrasts between climate migrants and climate non-migrants in Bangladesh in terms of wealth status, standard of living, and socio-demographic characteristics. These differences suggest that climate-related mobility is not simply a story of displacement, but should also be understood through uneven adaptation outcomes, emerging opportunities, and persistent vulnerabilities. In this section, these findings are discussed in relation to the wider climate (im)mobility literature, followed by a brief consideration of policy implications, study limitations, and future research directions.

4.1. Interpreting climate migrants and climate non-migrants

Bangladesh is highly exposed to climate-induced disasters due to its geographical location, weather, dense population, and social vulnerabilities (Huq et al., 2024). Only 6 out of 64 districts are considered relatively safe from climate change impacts (BDP, 2018). Most climate non-migrants live in rural areas and depend on climate-sensitive natural resources and agrifood systems such as crops, livestock, fishing, aquaculture, and forestry (FAO and UNU-EHS, 2025). Despite frequent disasters, many climate non-migrants choose not to move, fearing loss of land, property, and community ties (Mallick et al., 2023). Around 3.14% of the population has permanently migrated from rural climate-affected areas to cities, becoming climate migrants. Of them, 2.8% moved due to direct disasters (BBS, 2012), while others left to find new jobs after losing their livelihoods.

We focused on inter-district, rural-to-urban lifetime migration to define climate migrants. While rural-to-urban migration was slightly higher (4.29%) than rural-to-rural migration (4.20%) in Bangladesh (BBS, 2012, p. 322), the latter is often temporary or circular in nature (Solomon et al., 2024), so we excluded it from our analysis. We defined climate migrants as individuals who move across a specific spatial scale (i.e. district level) and within a temporal scale (i.e. a decade), in line with established literature (Rigaud et al., 2018: vii).

Climate non-migrants were found to be more unemployed than climate migrants (63% vs 36%, Appendix-VIII), and 67% of climate migrants belonged to the richest quintile, compared to only 6% climate non-migrants (Figure 6). Migrants often move to areas with better job opportunities and safer environments, while non-migrants remain in disaster-prone hotspots, facing frequent climate shocks and social vulnerabilities. To cope, climate non-migrants invest in adaptation measures like raising home and sanitary toilets, and protecting crops, which requires extra resources (Ahmed, 2018; Sammonds et al., 2021). These costs strain their finances, making it harder for climate non-migrants to be economically stable. These findings are consistent with the wider literature, which shows that disaster-prone districts have a much higher poverty index compared to relatively less vulnerable districts (BDP, 2018, p. 13).

Several socio-economic factors affect the wealth levels of both climate migrants and non-migrants. Having working members, especially adults, helps keep a family financially stable. Education and literacy are also key to obtaining good jobs, while those with low education often struggle to find stable work, reducing their wealth (Mallick et al., 2023). Unemployed family members, especially in climate non-migrant households (63%), can strain finances as they rely on others. In rural non-migrant families, many women are unemployed housewives with little property (Appendix-VIII), which likely contributes to their lower wealth levels (Nasreen, 2022). In contrast, climate migrants are mostly male, working-age population (aged 25–54 years), better educated, and more employable in urban areas (Appendix-VIII). These advantages help them earn more and build assets, allowing many climate migrants to reach the highest wealth quintiles, unlike climate non-migrants who often lack such opportunities (Figure 6). The regression results (Appendix-IX) show that, for both climate migrants and non-migrants, wealth status is strongly shaped by age, education, family size, and employment structure. For climate migrants, these effects confirm that successful integration into urban, non-agricultural labour markets and investment in education are crucial for escaping poverty after moving from climate-vulnerable rural origins.

Analysis of standard of living index (SLI) shows that climate migrants have slightly better scores for access to information and transportation (AIT) and land possession and housing facilities (LPHF) compared to climate non-migrants (Figure 7). This is because climate migrants usually move to urban areas, where they have better access to modern amenities like mobile phones, computers, and transportation (motor vehicles). However, climate migrants face higher living costs in cities and must spend more money on housing and services. Across all years, most climate migrants are already in the richer end of the wealth distribution (Figure 6a), but the share in the richest quintile increases steadily with longer duration of stay. It rises from about 62–64% in Years 1–3 to around 67–68% in Years 7–9 and then jumps to about 76% in Year 10 (Figure 8, and Appendix-III, Step 7). At the same time, the fourth quintile gradually declines from about 34%

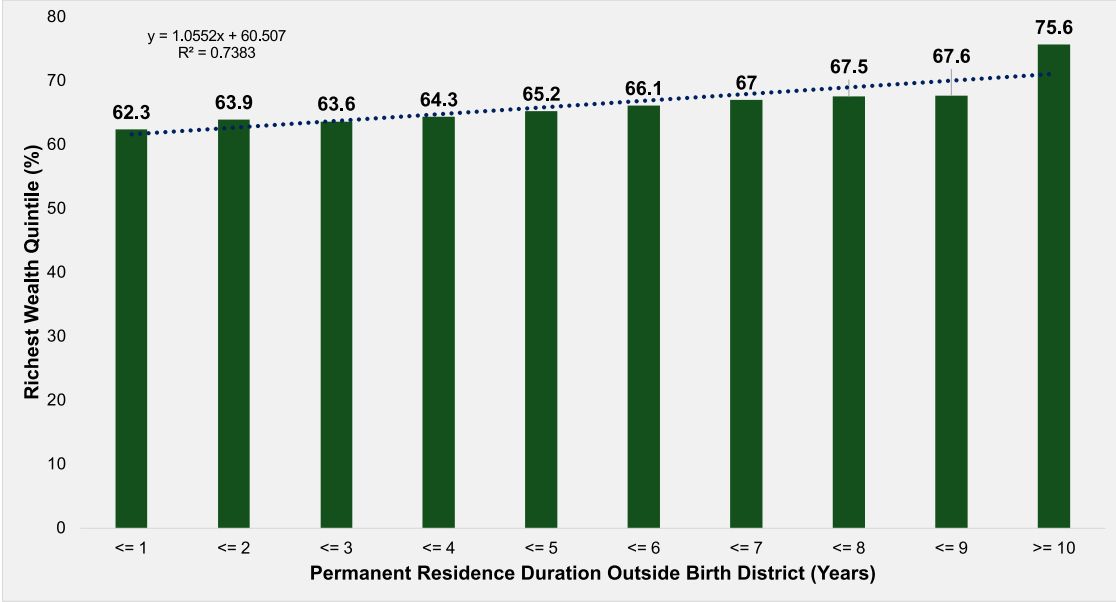

Figure 8. Duration of residence outside birth district and share of climate migrants in the richest wealth quintile. Source: The authors, 2026.

in Year 1–16% in Year 10. The middle, second, and poorest quintiles remain quite stable (see Appendix-X). Overall, the pattern suggests that climate migrants who have stayed longer in the destination district are increasingly concentrated in the richest wealth group. This suggests that, despite leaving much behind, more educated and working-age climate migrants are able to maintain or improve their standard of living by securing better jobs and overcoming economic hurdles.

Figure 8 also shows how the estimated number of climate migrants changes when different duration of residence thresholds is used (Appendix-III, Step 7), which illustrates a simple sensitivity analysis. There is no universally agreed cut-off for when someone becomes a "permanent" migrant, so a minimum of 10 years' residence outside the birth district has been used here, which gives an estimate of about 1.93 million climate migrants. If a lower threshold were used, such as 5 years, the estimate would be about 1.83 million, and with a 9-year threshold it would rise to around 2.56 million. On this basis, using only duration of residence as the key parameter, the plausible range of climate migrants in Bangladesh can be placed between roughly 1.61 and 2.56 million people in 2012 (Appendix-III, Step 7). This demonstrates that the results depend on context-specific choices, including the duration cut-off and the criteria for climate hotspot sub-districts, and that alternative scenarios could be constructed for Bangladesh or other countries by adjusting these parameters in a transparent and scientific way.

It is impractical to assume that climate migrants live comfortably in urban areas, while climate non-migrants are always struggling. Both groups face challenges. Climate migrants often deal with high living costs, air and water pollution, urban hazards such as heat stress and floods, and overcrowded housing in cities (Khan, 2022), but many have improved their standard of living compared to the lack of opportunities in their birthplace. In contrast, climate non-migrants, while exposed to climate-induced disasters, unemployment and economic hurdles, benefit from owning land and properties, strong social ties, and local knowledge to adapt (Mallick et al., 2023). Rana et al. (2025) found that longer-term migration improves standard of living, whereas temporary migration, which is mostly observed among the poorest households, has a greater positive effect on food consumption during lean-period in northern Bangladesh. In short, both groups face difficulties but also have ways to cope, and migration appears to function as an effective adaptation strategy for many households in Bangladesh (Khan et al., 2021).

4.2. Study limitations

Several limitations of this study should be acknowledged. First, the empirical analysis relies on the 2011 sample survey data (BBS, 2012), which is now relatively old. However, the value of the dataset lies in its ability to provide a rare nationwide baseline for developing and operationalizing a method to distinguish climate migrants from climate non-migrants. It is nevertheless recognized that migration dynamics, urbanization pattern, and socio-economic conditions in Bangladesh have continued to evolve since 2011. As such, the estimated numbers should not be interpreted as current totals for Bangladesh, but rather as a baseline methodological application using the most robust national data publicly accessible at the time.

Second, there is no universally agreed duration cut-off for defining a permanent migrant, and the estimated number of climate migrants may vary depending on the selected threshold, which is highly context-specific. In this study, the 10-year duration threshold was selected as a conservative operational criterion to identify more stable and long-term climate migrants, while reducing the inclusion of temporary, short-term, and highly circular forms of mobility. In the Bangladesh context, this threshold is also meaningful because the national population census is conducted every ten years, and the decade

preceding the 2011 census captured a period of recurrent and intensifying hydrometeorological disasters. This makes a 10-year threshold a practical way to identify more settled migration linked to sustained livelihood disruption rather than only short-term displacement. A sensitivity analysis has also been provided in the Appendix (see Step 7 of Appendix-III and Appendix-X), showing how the estimated number and wealth quintile composition change under alternative residence thresholds, including 1, 3, 5, 7, 9, and 10 or more years. This demonstrates that the method remains transparent and adaptable, while the 10-year threshold was retained to produce a stricter and more robust estimate of long-term climate migrants.

Third, the framework is primarily designed to identify relatively stable, long-term internal climate migrants, and therefore it cannot adequately capture return migration, repeated displacements, or highly circular forms of mobility. This is particularly relevant in Bangladesh, where some forms of rural-to-rural and seasonal migration may be temporary, cyclical, or linked to short-term livelihood adjustments (Rana et al., 2025). The use of district-level migration as a key filter also means that smaller-scale movements within districts are not fully represented, even though significant climate-induced relocation may occur at sub-district or intra-district scales. This limitation was partly addressed by integrating Upazila-level climate hotspot analysis; however, some important local variation may still be masked by district-scale aggregation.

Fourth, this study is based on cross-sectional survey data, which places important limits on causal interpretation. Likewise, the data do not allow the tracking of the same household or person over time to observe how climate-related shocks gradually influenced their migration decisions. A longitudinal study would be better suited to capturing temporal dynamics, adaptation pathways, and the cumulative effects of repeated climate shocks on mobility decisions. There is also potential recall bias in self-reported migration reasons, especially where respondents selected broad or ambiguous categories such as "others". Finally, the framework is limited to internal migration and does not include cross-border migration, mixed-migration, or international labour migration, all of which may also form part of the broader climate mobility landscape in Bangladesh (Chen & Mueller, 2018).

Despite these limitations, this study still provides, to our knowledge, the most comprehensive national-scale analysis of climate migration in Bangladesh to date. Its main contribution lies in offering a transparent, reproducible, and context-sensitive methodological framework that can be refined further as newer datasets become available.

4.3. Policy implications

The findings of this study suggest that climate (im)mobility policy in Bangladesh should be differentiated by stakeholder because climate migrants and climate non-migrants face markedly different socio-economic realities. Climate migrants are heavily concentrated in the richest wealth quintile (67.3%), whereas climate non-migrants are concentrated in the poorest (24%), second (28%), and middle quintiles (24%), with only 6.3% in the richest group. These results indicate that policy should respond separately to those who remain in rural climate hotspots, those who move to cities, and those who require support during the transition.

For origin areas, livelihood diversification and stronger social protection should be prioritized because climate non-migrants are disproportionately poorer, more likely to be unemployed, and concentrated in rural climate hotspot areas. Programmes supporting non-farm employment, vocational training, climate-resilient agriculture, interest-free targeted cash support, crop protection, early warning systems, local enterprise development, and assistance for women and other marginalized groups would therefore address the weaker labour market and wealth outcomes observed among non-migrants. Result show that coastal hazards account for 54% of climate migrant origins and flooding and river erosion for 43%. This suggests that nature-based solutions, together with climate-resilient rural infrastructure such as embankments, cyclone and flood shelters, drainage, raised drinking water and sanitation facilities, erosion protection, salinity management, and housing improvement, should be prioritized in those hotspot sub-districts.

For destination cities, especially Dhaka and Chittagong, climate migration should be incorporated into urban planning. The study shows a strong concentration of migrants in major urban centres, with Dhaka receiving around 68% of identified climate migrants. Since migrants show better wealth outcomes and slightly better standard of living scores over time, affordable housing, slum upgrading, transport access, training, social safety nets, and employment-linked services should be strengthened. Evidence from government-funded resettlement projects such as Ashrayan, which has rehabilitated over 300,000 people since its inception in 1997 (Parvin et al., 2022), shows that housing alone is insufficient (Anika et al., 2025). Although such programmes improve housing, electricity, water, and sanitation facilities, they often face problems related to weak access to livelihoods, services, and long-term integration. This suggests that urban and relocation policy should combine housing support with access to jobs, schools, health care, connectivity, and social inclusion (Anika et al., 2025; Parvin et al., 2022; Tanha & Islam, 2025).

A related priority is the planned development of migrant-friendly, climate-resilient secondary or satellite cities and urban growth centres (Khan et al., 2021). This follows from two findings: climate migrants are highly concentrated in a few large destinations, and migration from climate hotspots is spatially patterned. Strengthening secondary cities, such as in Khulna, Rajshahi, Bogra, Dinajpur, Jhenaidah, Noakhali, and Rangpur, would reduce excessive pressure on Dhaka Megacity (Jones et al., 2016, p. 112) while improving access to jobs, services and low-cost housing facilities elsewhere. The government's National Action Plan already recognizes decentralization and urban growth centres (MoDMR, 2022), and this study provides evidence on where such investments should be directed. In addition, selective relocation abroad can be considered a limited and planned adaptation option for Bangladesh by creating legal pathways through labour migration, education, or bilateral humanitarian mobility schemes for climate-affected populations (Khan et al., 2021).

The results also show that education, family size, age, and employment structure are strongly associated with wealth outcomes (see Appendix-VIII), meaning that climate migration policy should be linked not only to disaster management, but also to labour, education, housing, and social welfare. The GoB already has a strong policy base through the National Strategy on Internal Displacement Management (MoDMR, 2021) and the National Action Plan 2022–2042 (MoDMR, 2022), but this study suggests that implementation can be strengthened through better hotspot targeting, better urban and rural planning, and sustained funding.

Finally, the study has clear implications for resource allocation and climate justice financing. Because the framework identifies hotspot locations, migration flows, and differences in vulnerability between migrants and non-migrants, it can guide more evidence-based allocation of adaptation and displacement-related resources. In practical terms, this can support Bangladesh in seeking financing through the UN Loss and Damage agenda, the Paris Agreement framework, the Green Climate Fund, and related international mechanisms, while also justifying stronger domestic funding for adaptation, planned relocation, urban integration, peri-urban growth centres, and decentralization activities.

4.4. Future research directions

Several directions for future research emerge from this study. First, longitudinal studies are needed to track households over time and better establish how repeated climate shocks influence migration decisions, wealth, and standard of living. Second, qualitative and mixed-methods research would help explain the lived experiences, aspirations, and constraints behind migration and non-migration decisions, particularly in distinguishing voluntary staying from trapped immobility. Third, the framework developed here should be tested in other South Asian and climate-vulnerable countries to assess its wider applicability and to refine context-specific criteria. Fourth, future studies could combine this framework with climate scenario modelling to estimate likely climate mobility patterns for 2030–2205. Fifth, more focused research is needed on poorer climate non-migrants to understand whether staying is shaped more by choice or by constraint. Finally, policy evaluation studies would be valuable for assessing which interventions are most effective in reducing forced migration, improving adaptive capacity, and supporting safe and voluntary migration or relocation.

5. Conclusion

Disasters are not purely natural; they result from a mix of natural and human factors (Kelman, 2020). Similarly, climate change is one of the many reasons behind migration, but not the only cause. People migrate for a mix of social, economic, environmental, cultural, and personal reasons, such as loss of livelihood or feeling unsafe at home (FAO and UNU-EHS, 2025). In Bangladesh, migration has helped many to cope with climate impacts and improve their standard of living. However, moving is not easy, as it requires education, skills, and resources, and often means leaving behind property, family, ancestral heritage, and community ties. Climate migration is now a major development challenge, and Bangladesh has policies focused on prevention, protection, and long-term durable solutions (MoDMR, 2022, p. 50), including disaster risk reduction, humanitarian aid, and options for return, local integration or resettlement. The Government of Bangladesh is also promoting smaller, migrant-friendly town to reduce pressure on large cities and help people stay closer to home (Khan et al., 2021). In this context, in-country adaptation and planned relocation (Anika et al., 2025) are seen as the most practical way forward.

This study developed an empirical, data-driven method to characterize climate migrants and analyse their mobility patterns at the national scale, ensuring high levels of transparency, replicability, and reliability. The major novel contribution of this study lies in drawing a clear distinction between economic, environmental, and climate migrants through a stepwise filtering of geospatial and census microdata. Lifetime internal migrants are first identified and those reporting employment, business, search for work, natural calamity, or other related reasons for moving are treated as economic migrants. A subset is then classified as environmental migrants by restricting this group to people with a rural birthplace in hazard-prone districts, on the assumption that rural livelihoods in these districts are particularly exposed to environmental stress and shocks (Ahmed & Kelman, 2018; Rana et al., 2025). From within this population, climate migrants are finally identified as those originating from climate hotspot sub-districts, moving a meaningful distance to an urban destination, and residing in the current district for at least a decade.

A key question is why we need to estimate and separate climate migrants from non-migrants or other types of migrants. We believe that developing new ways to identify these groups is essential to understand their specific needs and ensure that resources and support are properly targeted (MoDMR, 2022). The strength of this study lies in its novel method, which combines geospatial and statistical data to clearly distinguish between climate migrants and climate non-migrants and compare their standard of living. These findings will help researchers and policymakers better understand the complex situation, identify key factors affecting outcomes, and take informed action to address climate-related challenges.

This method is universal; however, findings may vary depending on the specific context. It can be applied in other climate-affected regions, helping to promote climate justice and protect the rights of climate migrants, one of the most overlooked groups. Several assumptions are context specific to Bangladesh, including the use of districts and sub-districts as spatial filters, reliance on national census microdata, multi-hazard risk maps and community vulnerability indices, the strong climate dependence on rural livelihoods, and a threshold for duration of residence. In other countries, the similar logic can be applied by substituting equivalent administrative units, drawing on nationally appropriate hazard and disaster vulnerability assessments, adapting reasons for migration categories to integrating statistical and geospatial data, and selecting a duration threshold that matches national mobility and settlement patterns.

Authors' contribution statement

Bayes Ahmed and Md Izazul Haq jointly conceptualized the study, designed the methodology, and analysed the data. Bayes Ahmed wrote the first draft of the paper. Md Izazul Haq collected the BBS data, developed key maps and figures, and contributed to the writing and reviewing intellectual content of the paper. Roquia Salam analysed the data, produced the tables, diagrams and some maps, and wrote parts of the introduction, results, and discussion sections. All the authors approved the final version of the paper and agree to be accountable for all aspects of the work.

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Note

1. Division is the largest and first-level administrative unit, currently there are eight divisions in Bangladesh. Divisions are sub divided into 64 districts, the second tier of administration. Districts are further divided into 495 sub-districts, also known as Upazila. Finally, each Upazila, excluding metropolitan areas that has wards, is composed of several unions, the lowest administrative unit of Bangladesh. There were 4,545 unions in Bangladesh (BBS, 2019). Mymensingh division was established in 2015, which is not included for data analysis in this article.

Author contributions

CRediT: **Bayes Ahmed:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – original draft, Writing – review & editing; **Md Izazul Haq:** Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – review & editing; **Roquia Salam:** Formal analysis, Software, Visualization, Writing – original draft.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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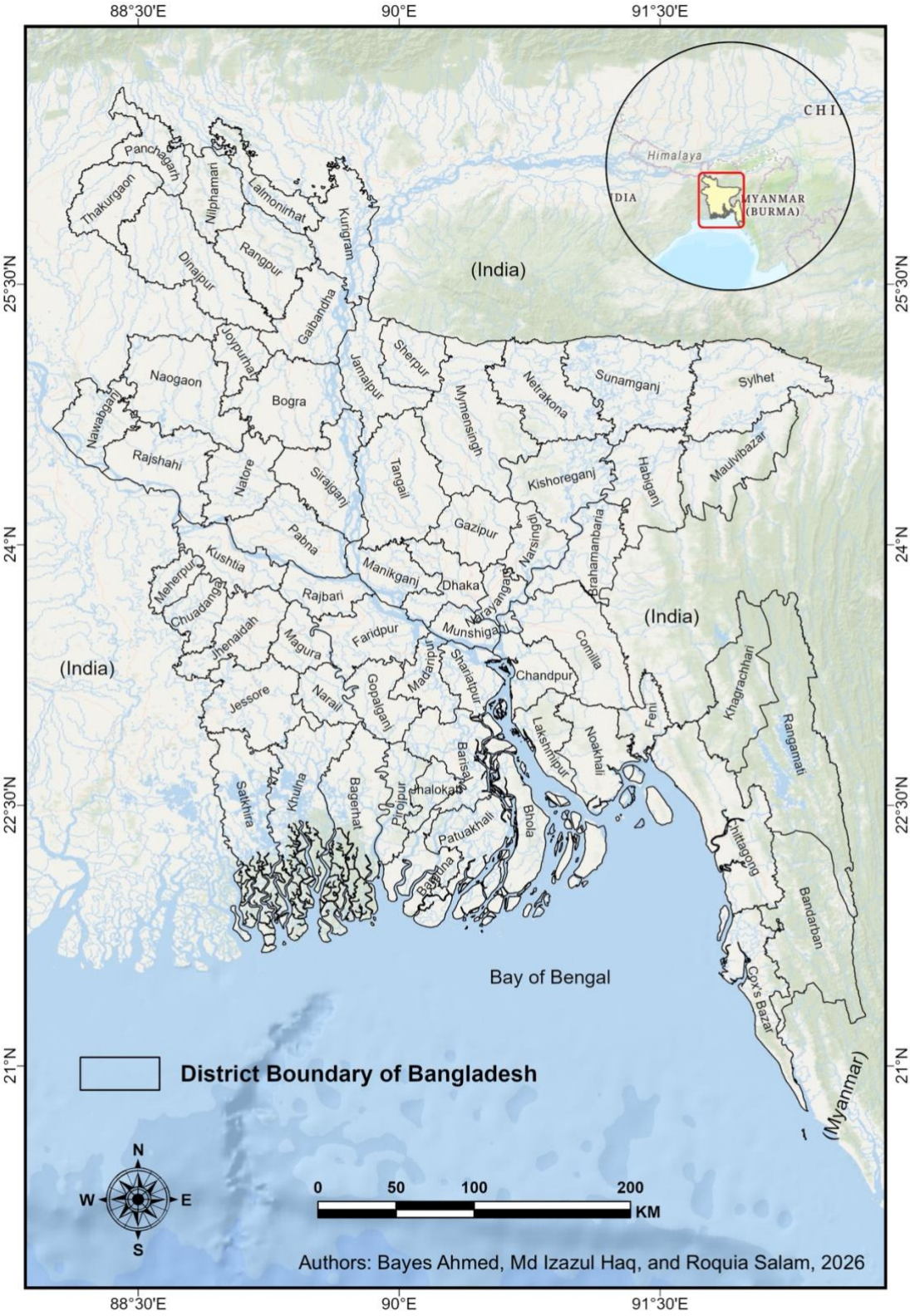
Appendix-I. Map showing the 64 administrative districts of Bangladesh. Source: The authors, 2026.



Appendix-II. The allocation of sample size among strata. Source: BBS, 2012: 13-14. [EA = Enumeration area, and HH = Households]

Sl. No.	Zila Code	Name of Zila	Rural No. of EAs	Rural No. of HHs	Urban No. of EAs	Urban No. of HHs	Total No. of EAs	Total No. of HHs
1	4	Barguna	88	220	8	200	96	2400
2	6	Barisal	91	227	5	125	96	2400
3	6	Barisal (City Corporation)	–	–	–	–	96	2400
4	9	Bhola	90	225	6	150	96	2400
5	42	Jhalokati	85	212	11	275	96	2400
6	78	Patuakhali	89	222	7	175	96	2400
7	79	Pirojpur	89	222	7	175	96	2400
8	3	Bandarban	81	202	15	375	96	2400
9	12	Brahmanbaria	87	217	9	225	96	2400
10	13	Chandpur	81	202	15	375	96	2400
11	15	Chittagong	89	222	7	175	96	2400
12	15	Chittagong (City)	–	–	–	–	96	2400
13	19	Comilla	84	210	12	300	96	2400
14	22	Cox’s Bazar	83	207	13	325	96	2400
15	30	Feni	77	192	19	475	96	2400
16	46	Khagrachhari	83	207	13	325	96	2400
17	51	Lakshmipur	87	217	9	225	96	2400
18	75	Noakhali	85	212	11	275	96	2400
19	84	Rangamati	81	202	15	375	96	2400
20	26	Dhaka	89	222	7	175	96	2400
21	26	Dhaka (City Corporation)	–	–	–	–	96	2400
22	29	Faridpur	86	215	10	250	96	2400
23	33	Gazipur	66	165	30	750	96	2400
24	35	Gopalganj	89	222	7	175	96	2400
25	39	Jamalpur	83	207	13	325	96	2400

Sl. No.	Zila Code	Name of Zila	Rural No. of EAs	Rural No. of HHs	Urban No. of EAs	Urban No. of HHs	Total No. of EAs	Total No. of HHs
26	48	Kishoreganj	83	207	13	325	96	2400
27	54	Madaripur	86	215	10	250	96	2400
28	56	Manikganj	90	225	6	150	96	2400
29	59	Munshiganj	89	222	7	175	96	2400
30	61	Mymensingh	86	215	10	250	96	2400
31	67	Narayangonj	64	160	32	800	96	2400
32	82	Narsingdi	81	202	15	375	96	2400
33	72	Netrokona	89	222	7	175	96	2400
34	82	Rajbari	87	217	9	225	96	2400
35	86	Shariatpur	87	217	9	225	96	2400
36	89	Sherpur	85	212	11	275	96	2400
37	93	Tangail	84	210	12	300	96	2400
38	1	Bagerhat	89	222	7	175	96	2400
39	18	Chuadanga	82	205	14	350	96	2400
40	41	Jessore	81	202	15	375	96	2400
41	44	Jhenaidah	82	205	14	350	96	2400
42	47	Khulna	94	235	2	50	96	2400
43	47	Khulna (City Corporation)	–	–	–	–	96	2400
44	50	Kushtia	88	220	8	200	96	2400
45	55	Magura	86	215	10	250	96	2400
46	57	Meherpur	87	217	9	225	96	2400
47	65	Narail	84	210	12	300	96	2400
48	71	Satkhira	90	225	6	150	96	2400
49	20	Bogra	81	202	15	375	96	2400
50	38	Joypurhat	83	207	13	325	96	2400
51	69	Naogaon	90	225	6	150	96	2400
52	70	Natore	84	210	12	300	96	2400
53	72	Chapai Nawabganj	80	200	16	400	96	2400
54	76	Pabna	82	205	14	350	96	2400

Sl. No.	Zila Code	Name of Zila	Rural No. of EAs	Rural No. of HHs	Urban No. of EAs	Urban No. of HHs	Total No. of EAs	Total No. of HHs
55	81	Rajshahi	79	197	17	425	96	2400
56	81	Rajshahi (City Corporation)	–	–	–	–	96	2400
57	88	Sirajganj	85	212	11	275	96	2400
58	27	Dinajpur	84	210	12	300	96	2400
59	32	Gaibandha	91	227	5	125	96	2400
60	49	Kurigram	87	217	9	225	96	2400
61	73	Lalmonirhat	89	222	7	175	96	2400
62	73	Nilphamari	84	210	12	300	96	2400
63	77	Panchagarh	90	225	6	150	96	2400
64	85	Rangpur	85	212	11	275	96	2400
65	36	Thakurgaon	88	220	8	200	96	2400
66	30	Habiganj	88	220	8	200	96	2400
67	58	Maulvibazar	89	222	7	175	96	2400
68	60	Sunamganj	92	227	5	125	96	2400
69	91	Sylhet	91	227	5	125	96	2400
70	91	Sylhet (City Corporation)	–	–	–	–	96	2400
Total					–	–	**6,720**	**16,800**

Appendix-III. Results from filtering different options for identifying climate migrants. Data Source: BBS, 2012.

Step 1: 32a. Birthplace					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Same Zila	125574650	90.2	90.2	90.2
	Different Zila	13488976	9.7	9.7	99.9
	Different Country	189057	.1	.1	100.0
	Total	139252683	100.0	100.0	

Step 2: 33b. Reason Residence					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Marriage	3982237	29.5	29.5	29.5
	Education	726157	5.4	5.4	34.9
	Employment/Business	2531814	18.8	18.8	53.7
	In Search of Work	1864201	13.8	13.8	67.5
	Natural Calamity	241838	1.8	1.8	69.3
	Family Quarrel	173247	1.3	1.3	70.6
	Tortured/Deserted by Spouse	19504	.1	.1	70.7
	Others	3949978	29.3	29.3	100.0
	Total	13488976	100.0	100.0	

Step 3. The list of 13 districts identified as not highly vulnerable to various types of hydrometeorological and hydrogeomorphic hazards.

District Code	**District Name**
3	Bandarban
19	Comilla
26	Dhaka
33	Gazipur
44	Jhenaidah
46	Khagrachhari
55	Magura
61	Mymensingh
67	Narayangonj
68	Narsingdi
73	Lalmonirhat
84	Rangamati

District Code	District Name
89	Sherpur

Step 4: 32c. Birth Location Type					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Rural**	5926554	89.8	89.8	89.8
	Metropolitan	232057	3.5	3.5	93.3
	Other Urban Area	439254	6.7	6.7	100.0
	Total	6597865	100.0	100.0	

Step 5a: Destination categories					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	2241344	39.7	39.7	39.7
	Urban	955022	16.9	16.9	56.6
	Other Urban	78883	1.4	1.4	58.0
	City Corporation	2375151	42.0	42.0	100.0
	Total	5650401	100.0	100.0	

Step 5b. Districts with destination types.

% within Zila						
		Rural	Urban	Other Urban	City Corporation	
Zila	Bagerhat		92.3%	7.7%		100.0%
	Bandarban		100.0%			100.0%
	Barguna		100.0%			100.0%
	Barisal		2.6%		97.4%	100.0%
	Bhola		100.0%			100.0%
	Bogra	**63.4%**	36.6%			100.0%
	Brahmanbaria		100.0%			100.0%
	Chandpur		90.0%	10.0%		100.0%
	Chittagong	**17.8%**	0.6%	0.2%	81.4%	100.0%
	Chuadanga		42.7%	57.3%		100.0%
	Comilla	**51.9%**	46.2%	1.9%		100.0%
	Cox's bazar		100.0%			100.0%
	Dhaka	**38.3%**	5.1%		56.6%	100.0%
	Dinajpur	**79.6%**	20.4%			100.0%

% within Zila						
		Rural	Urban	Other Urban	City Corporation	
	Faridpur	**64.3%**	35.7%			100.0%
	Feni		100.0%			100.0%
	Gaibandha		100.0%			100.0%
	Gazipur	**52.2%**	47.8%			100.0%
	Gopalganj	**60.9%**	39.1%			100.0%
	Habiganj	**92.1%**	7.9%			100.0%
	Joypurhat		100.0%			100.0%
	Jamalpur		100.0%			100.0%
	Jessore	**49.1%**	50.4%	0.4%		100.0%
	Jhalokati		96.1%	3.9%		100.0%
	Jhenaidah	**46.4%**	53.6%			100.0%
	Khagrachhari		36.6%	63.4%		100.0%
	Khulna	**22.2%**	0.6%	3.2%	74.0%	100.0%
	Kishoreganj		100.0%			100.0%
	Kurugram		100.0%			100.0%
	Kushtia	**66.2%**	33.8%			100.0%
	Kakshmipur		100.0%			100.0%
	Lalmonirhat		65.5%	34.5%		100.0%
	Madaripur		47.1%	52.9%		100.0%
	Magura		100.0%			100.0%
	Manikganj	**93.0%**	7.0%			100.0%
	Meherpur		100.0%			100.0%
	Moulvibazar	**44.9%**	55.1%			100.0%
	Munshiganj	**61.9%**	24.1%	14.0%		100.0%
	Mymensingh	**27.3%**	48.1%	24.7%		100.0%
	Naogaon		46.7%	53.3%		100.0%
	Narail		100.0%			100.0%
	Narayanganj	**67.5%**	28.7%	3.8%		100.0%
	Narsingdi	**39.2%**	60.8%			100.0%
	Natore		100.0%			100.0%
	Chapai Nawabganj		100.0%			100.0%
	Netrokona		100.0%			100.0%
	Nilphamari		91.4%	8.6%		100.0%
	Noakhali	**89.9%**	7.9%	2.2%		100.0%
	Pabna		100.0%			100.0%

% within Zila						
		Rural	Urban	Other Urban	City Corporation	
	Panchagarh		47.8%	52.2%		100.0%
	Patuakhali		92.0%	8.0%		100.0%
	Pirojpur		100.0%			100.0%
	Rajshahi	**13.2%**	25.7%		61.0%	100.0%
	Rajbari		85.0%	15.0%		100.0%
	Rangamati		100.0%			100.0%
	Rangpur	**57.9%**	42.1%			100.0%
	Shariatpur		100.0%			100.0%
	Satkhira		100.0%			100.0%
	Sirajganj		40.0%	60.0%		100.0%
	Sherpur		100.0%			100.0%
	Sunamganj		100.0%			100.0%
	Sylhet	**24.6%**	0.6%	19.1%	55.6%	100.0%
	Tangail	**68.0%**	28.0%	4.0%		100.0%
	Thakurgaon		100.0%			100.0%
Total		39.7%	16.9%	1.4%	42.0%	100.0%

Step 6a. Exclusion list of additional districts for identifying climate-sensitive regions.

41	Jessore
50	Kushtia
55	Magura
59	Munshiganj
65	Narail
91	Sylhet
93	Tangail

Step 6b. List of the 281 extremely vulnerable climate hotspot sub-districts/*Upazilas*.

Division	District	Sub-District/*Upazila*	GeoCode
Barisal	Barguna	Amtali	10409
Barisal	Barguna	Bamna	10419
Barisal	Barguna	Borguna	10428
Barisal	Barguna	Betagi	10447

Division	District	Sub-District/*Upazila*	GeoCode
Barisal	Barguna	Patharghata	10485
Barisal	Barisal	Agailjhara	10602
Barisal	Barisal	Babuganj	10603
Barisal	Barisal	Bakerganj	10607
Barisal	Barisal	Banaripara (Barisal)	10610
Barisal	Barisal	Gournadi	10632
Barisal	Barisal	Hizla	10636
Barisal	Barisal	Barisal	10651
Barisal	Barisal	Mehendiganj	10662
Barisal	Barisal	Muladi	10669
Barisal	Barisal	Wazirpur	10694
Barisal	Bhola	Bhola	10918
Barisal	Bhola	Burhanuddin	10921
Barisal	Bhola	Charfasson	10925
Barisal	Bhola	Daulatkhan	10929
Barisal	Bhola	Lalmohan	10954
Barisal	Bhola	Monpura	10965
Barisal	Bhola	Tazumuddin	10991
Barisal	Jhalakati	Jhalakati	14240
Barisal	Jhalakati	Kathalia	14243
Barisal	Jhalakati	Nalchity	14273
Barisal	Jhalakati	Rajapur	14284
Barisal	Patuakhali	Bauphal	17838
Barisal	Patuakhali	Dashmina	17852
Barisal	Patuakhali	Galachipa	17857
Barisal	Patuakhali	Kalapara	17866
Barisal	Patuakhali	Mirzaganj	17876
Barisal	Patuakhali	Patuakhali	17895
Barisal	Pirojpur	Bhandaria	17914
Barisal	Pirojpur	Kawkhali (Pirojpur)	17947
Barisal	Pirojpur	Mathbaria	17958
Barisal	Pirojpur	Nazirpur	17976
Barisal	Pirojpur	Pirojpur	17980
Barisal	Pirojpur	Banaripara/ Swarupkhati/ Nesarabad	17987
Chittagong	Brahmanbaria	Akhaura	21202
Chittagong	Brahmanbaria	Bancharampur	21204
Chittagong	Brahmanbaria	Kasba	21263
Chittagong	Brahmanbaria	Nabinagar	21285
Chittagong	Brahmanbaria	Nasirnagar	21290

Division	District	Sub-District/*Upazila*	GeoCode
Chittagong	Brahmanbaria	Sarail	21294
Chittagong	Chandpur	Chandpur	21322
Chittagong	Chandpur	Faridganj	21345
Chittagong	Chandpur	Haimchar	21347
Chittagong	Chandpur	Hajiganj	21349
Chittagong	Chandpur	Kachua (Chandpur)	21358
Chittagong	Chandpur	Matlab	21376
Chittagong	Chandpur	Shaharasti	21395
Chittagong	Chittagong	Anwara	21504
Chittagong	Chittagong	Banshkhali	21508
Chittagong	Chittagong	Boalkhali	21512
Chittagong	Chittagong	Chandanaish	21518
Chittagong	Chittagong	Fatikchhari	21533
Chittagong	Chittagong	Hathazari	21537
Chittagong	Chittagong	Lohagara (Chittagong)	21547
Chittagong	Chittagong	Mirsharai	21553
Chittagong	Chittagong	Patiya	21561
Chittagong	Chittagong	Rangunia	21570
Chittagong	Chittagong	Rauzan	21574
Chittagong	Chittagong	Sandwip	21578
Chittagong	Chittagong	Satkania	21582
Chittagong	Chittagong	Sitakunda	21586
Chittagong	Cox Bazar	Chakaria	22216
Chittagong	Cox Bazar	Kutubdia	22245
Chittagong	Cox Bazar	Maheskhali	22249
Chittagong	Cox Bazar	Ramu	22266
Chittagong	Cox Bazar	Teknaf	22290
Chittagong	Cox Bazar	Ukhia	22294
Chittagong	Feni	Chhagalnaiya	23014
Chittagong	Feni	Dagonbhuiyan	23025
Chittagong	Feni	Parshuram	23051
Chittagong	Feni	Sonagazi	23094
Chittagong	Lakshmipur	Lakshmipur	25143
Chittagong	Lakshmipur	Raipur (Lakshmipur)	25158
Chittagong	Lakshmipur	Ramganj	25165
Chittagong	Lakshmipur	Ramgati	25173
Chittagong	Noakhali	Begumganj	27507
Chittagong	Noakhali	Chatkhil	27510
Chittagong	Noakhali	Companiganj (Noakhali)	27521
Chittagong	Noakhali	Hatiya	27536

Division	District	Sub-District/*Upazila*	GeoCode
Chittagong	Noakhali	Senbag	27580
Chittagong	Noakhali	Noakhali	27587
Dhaka	Faridpur	Alfadanga	32903
Dhaka	Faridpur	Bhanga	32910
Dhaka	Faridpur	Boalmari	32918
Dhaka	Faridpur	Charbhadrasan	32921
Dhaka	Faridpur	Madhukhali	32956
Dhaka	Faridpur	Nagarkanda	32962
Dhaka	Faridpur	Sadarpur	32984
Dhaka	Gopalganj	Kasiani	33543
Dhaka	Gopalganj	Kotalipara	33551
Dhaka	Gopalganj	Muksudpur	33558
Dhaka	Jamalpur	Baksiganj	33907
Dhaka	Jamalpur	Dewanganj	33915
Dhaka	Jamalpur	Islampur	33929
Dhaka	Jamalpur	Madarganj	33958
Dhaka	Jamalpur	Melandaha	33961
Dhaka	Jamalpur	Sarishabari	33985
Dhaka	Kishoreganj	Astogram	34802
Dhaka	Kishoreganj	Bajitpur	34806
Dhaka	Kishoreganj	Bhairab	34811
Dhaka	Kishoreganj	Hossainpur	34827
Dhaka	Kishoreganj	Itna	34833
Dhaka	Kishoreganj	Kuliarchar	34854
Dhaka	Kishoreganj	Mithamoin	34859
Dhaka	Kishoreganj	Pakundia	34879
Dhaka	Madaripur	Kalkini	35440
Dhaka	Madaripur	Madaripur	35454
Dhaka	Madaripur	Rajoir	35480
Dhaka	Madaripur	Shibchar	35487
Dhaka	Netrokona	Dhubarua	36116
Dhaka	Netrokona	Barhatta	37209
Dhaka	Netrokona	Khaliajhuri	37238
Dhaka	Netrokona	Kalmakanda	37240
Dhaka	Netrokona	Purbadhala	37283
Dhaka	Rajbari	Baliakandi	38207
Dhaka	Rajbari	Goalanda	38229
Dhaka	Rajbari	Pangsa	38273
Dhaka	Shariatpur	Bhedarganj	38614
Dhaka	Shariatpur	Damudya	38625

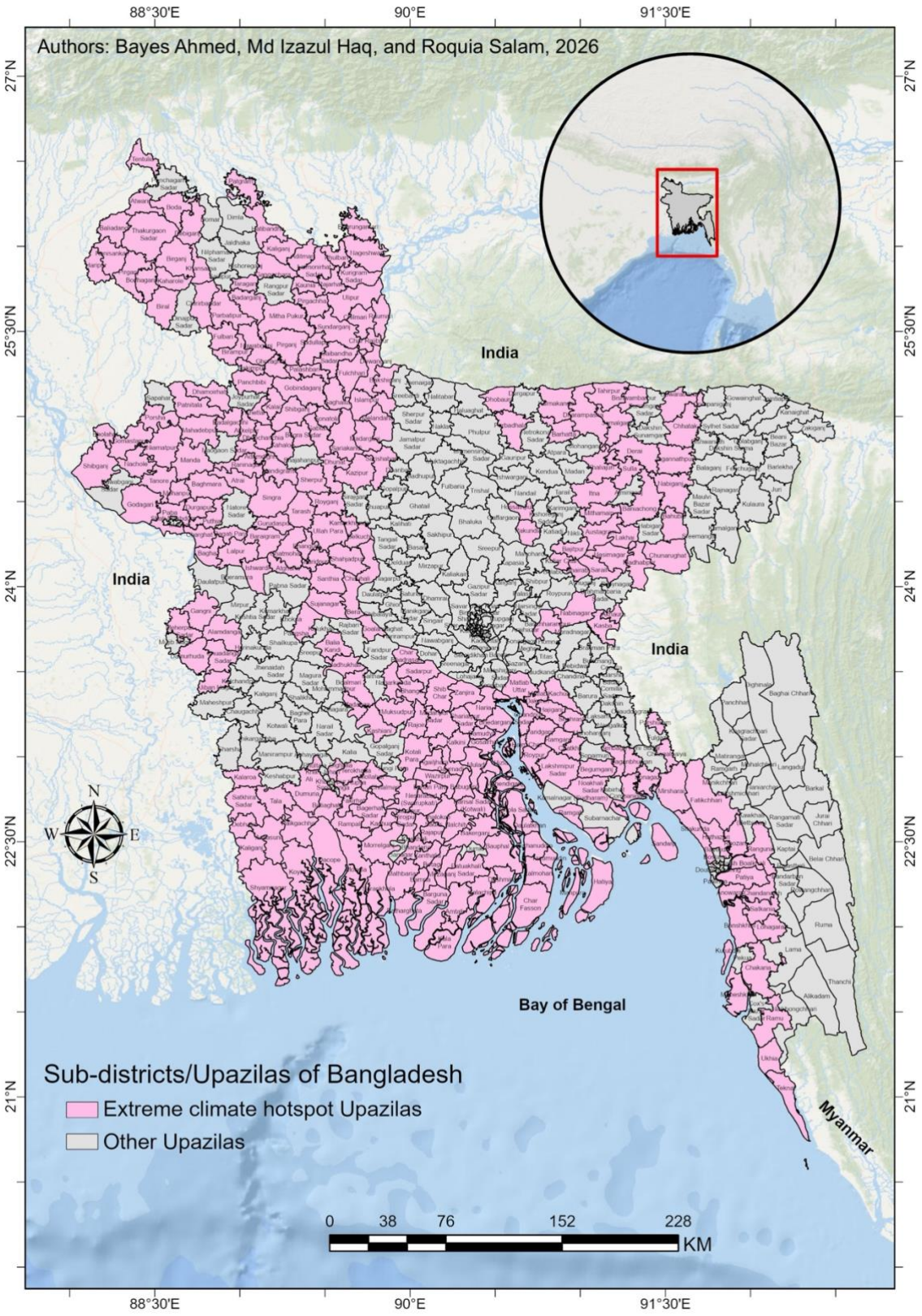
Division	District	Sub-District/*Upazila*	GeoCode
Dhaka	Shariatpur	Goshairhat	38636
Dhaka	Shariatpur	Naria	38665
Dhaka	Shariatpur	Shariatpur	38669
Dhaka	Shariatpur	Janjira	38694
Khulna	Bagerhat	Bagerhat	40108
Khulna	Bagerhat	Chitalmari	40114
Khulna	Bagerhat	Fakirhat	40134
Khulna	Bagerhat	Kachua (Bagerhat)	40138
Khulna	Bagerhat	Mollahat	40156
Khulna	Bagerhat	Mongla	40158
Khulna	Bagerhat	Morrelganj	40160
Khulna	Bagerhat	Rampal	40173
Khulna	Bagerhat	Sarankhola	40177
Khulna	Chuadanga	Alamdanga	41807
Khulna	Chuadanga	Chuadanga	41823
Khulna	Chuadanga	Damurhuda	41831
Khulna	Chuadanga	Jibannagar	41855
Khulna	Khulna	Batiaghata	44712
Khulna	Khulna	Dacope	44717
Khulna	Khulna	Dumuria	44730
Khulna	Khulna	Dighalia	44740
Khulna	Khulna	Koyra	44753
Khulna	Khulna	Paikgachha	44764
Khulna	Khulna	Phultala	44769
Khulna	Khulna	Rupsha	44775
Khulna	Khulna	Terokhada	44794
Khulna	Meherpur	Gangni	45747
Khulna	Meherpur	Meherpur	45787
Khulna	Satkhira	Assasuni	48704
Khulna	Satkhira	Debhata	48725
Khulna	Satkhira	Kalaroa	48743
Khulna	Satkhira	Kaliganj (Satkhira)	48747
Khulna	Satkhira	Satkhira	48782
Khulna	Satkhira	Shyamnagar	48786
Khulna	Satkhira	Tala	48790
Rajshahi	Bogra	Adamdighi	51006
Rajshahi	Bogra	Bogra	51020
Rajshahi	Bogra	Dhunat	51027
Rajshahi	Bogra	Dubchachia	51033
Rajshahi	Bogra	Gabtali	51040

Division	District	Sub-District/*Upazila*	GeoCode
Rajshahi	Bogra	Kahalu	51054
Rajshahi	Bogra	Nandigram	51067
Rajshahi	Bogra	Shariakandi	51081
Rajshahi	Bogra	Sherpur (Bogra)	51088
Rajshahi	Bogra	Shibganj (Bogra)	51094
Rajshahi	Bogra	Sonatola	51095
Rajshahi	Dinajpur	Birampur	52710
Rajshahi	Dinajpur	Birganj	52712
Rajshahi	Dinajpur	Biral	52717
Rajshahi	Dinajpur	Bochaganj	52721
Rajshahi	Dinajpur	Chirirbandar	52730
Rajshahi	Dinajpur	Phulbari (Dinajpur)	52738
Rajshahi	Dinajpur	Ghoraghat	52743
Rajshahi	Dinajpur	Hakimpur	52747
Rajshahi	Dinajpur	Kaharol	52756
Rajshahi	Dinajpur	Khansama	52760
Rajshahi	Dinajpur	Nawabganj (Dinajpur)	52769
Rajshahi	Dinajpur	Parbatipur	52777
Rajshahi	Gaibandha	Fulchhari	53221
Rajshahi	Gaibandha	Gaibandha	53224
Rajshahi	Gaibandha	Gobindaganj	53230
Rajshahi	Gaibandha	Palasbari	53267
Rajshahi	Gaibandha	Sadullapur	53282
Rajshahi	Gaibandha	Sughatta	53288
Rajshahi	Gaibandha	Sundarganj	53291
Rajshahi	Joypurhat	Akkelpur	53813
Rajshahi	Joypurhat	Kalai	53858
Rajshahi	Joypurhat	Khetlal	53861
Rajshahi	Joypurhat	Panchbibi	53874
Rajshahi	Kurigram	Bhurungamari	54906
Rajshahi	Kurigram	Razibpur	54908
Rajshahi	Kurigram	Chilmari	54909
Rajshahi	Kurigram	Phulbari (Kurigram)	54918
Rajshahi	Kurigram	Kurigram	54952
Rajshahi	Kurigram	Nageswari	54961
Rajshahi	Kurigram	Rajarhat	54977
Rajshahi	Kurigram	Rowmari	54979
Rajshahi	Kurigram	Ulipur	54994
Rajshahi	Lalmonirhat	Aditmari	55202
Rajshahi	Lalmonirhat	Hatibandha	55233

Division	District	Sub-District/*Upazila*	GeoCode
Rajshahi	Lalmonirhat	Kaliganj (Lalmonirhat)	55239
Rajshahi	Lalmonirhat	Lalmonirhat	55255
Rajshahi	Lalmonirhat	Patgram	55270
Rajshahi	Naogaon	Atrai	56403
Rajshahi	Naogaon	Badalgachhi	56406
Rajshahi	Naogaon	Dhamoirhat	56428
Rajshahi	Naogaon	Manda	56447
Rajshahi	Naogaon	Mohadebpur	56450
Rajshahi	Naogaon	Niamatpur	56469
Rajshahi	Naogaon	Patnitala	56475
Rajshahi	Naogaon	Porsha	56479
Rajshahi	Naogaon	Raninagar	56485
Rajshahi	Naogaon	Shapahar	56486
Rajshahi	Natore	Bagatipara	56909
Rajshahi	Natore	Baraigram	56915
Rajshahi	Natore	Gurudaspur	56941
Rajshahi	Natore	Lalpur	56944
Rajshahi	Natore	Singra	56991
Rajshahi	Nawabganj	Bholahat	57018
Rajshahi	Nawabganj	Gomastapur	57037
Rajshahi	Nawabganj	Nachol	57056
Rajshahi	Nawabganj	Shibganj (Nawabganj)	57088
Rajshahi	Pabna	Atghoria	57605
Rajshahi	Pabna	Bera	57616
Rajshahi	Pabna	Bhangura	57619
Rajshahi	Pabna	Chatmohar	57622
Rajshahi	Pabna	Faridpur (Pabna)	57633
Rajshahi	Pabna	Iswardi	57639
Rajshahi	Pabna	Santhia	57672
Rajshahi	Pabna	Sujanagar	57683
Rajshahi	Panchagarh	Atwari	57704
Rajshahi	Panchagarh	Boda	57725
Rajshahi	Panchagarh	Debiganj	57734
Rajshahi	Panchagarh	Tetulia	57790
Rajshahi	Rajshahi	Bagha	58110
Rajshahi	Rajshahi	Bagmara	58112
Rajshahi	Rajshahi	Charghat	58125
Rajshahi	Rajshahi	Durgapur (Rajshahi)	58131
Rajshahi	Rajshahi	Godagari	58134
Rajshahi	Rajshahi	Mohanpur	58153

Division	District	Sub-District/*Upazila*	GeoCode
Rajshahi	Rajshahi	Paba	58172
Rajshahi	Rajshahi	Puthia	58182
Rajshahi	Rajshahi	Tanor	58194
Rajshahi	Rangpur	Badarganj	58503
Rajshahi	Rangpur	Gangachara	58527
Rajshahi	Rangpur	Kaunia	58542
Rajshahi	Rangpur	Mithapukur	58558
Rajshahi	Rangpur	Pirgachha	58573
Rajshahi	Rangpur	Pirganj (Rangpur)	58576
Rajshahi	Rangpur	Taraganj	58592
Rajshahi	Sirajganj	Belkuchi	58811
Rajshahi	Sirajganj	Chowhali	58827
Rajshahi	Sirajganj	Kamarkanda	58844
Rajshahi	Sirajganj	Kazipur	58850
Rajshahi	Sirajganj	Raiganj	58861
Rajshahi	Sirajganj	Shahjadpur	58867
Rajshahi	Sirajganj	Tarash	58889
Rajshahi	Sirajganj	Ullapara	58894
Rajshahi	Thakurgaon	Baliadangi	59408
Rajshahi	Thakurgaon	Haripur	59451
Rajshahi	Thakurgaon	Pirganj (Thakurgaon)	59482
Rajshahi	Thakurgaon	Ranisonkail	59486
Rajshahi	Thakurgaon	Thakurgaon	59494
Sylhet	Habiganj	Bahubal	63605
Sylhet	Habiganj	Baniachang	63611
Sylhet	Habiganj	Chunarughat	63626
Sylhet	Habiganj	Lakhai	63668
Sylhet	Habiganj	Madhabpur	63671
Sylhet	Habiganj	Nabiganj	63677
Sylhet	Sunamganj	Bishwambarpur	69018
Sylhet	Sunamganj	Chhatak	69023
Sylhet	Sunamganj	Derai	69029
Sylhet	Sunamganj	Dharampasha	69032
Sylhet	Sunamganj	Dowarabazar	69033
Sylhet	Sunamganj	Jagannathpur	69047
Sylhet	Sunamganj	Jamalganj	69050
Sylhet	Sunamganj	Sulla	69086
Sylhet	Sunamganj	Tahirpur	69092

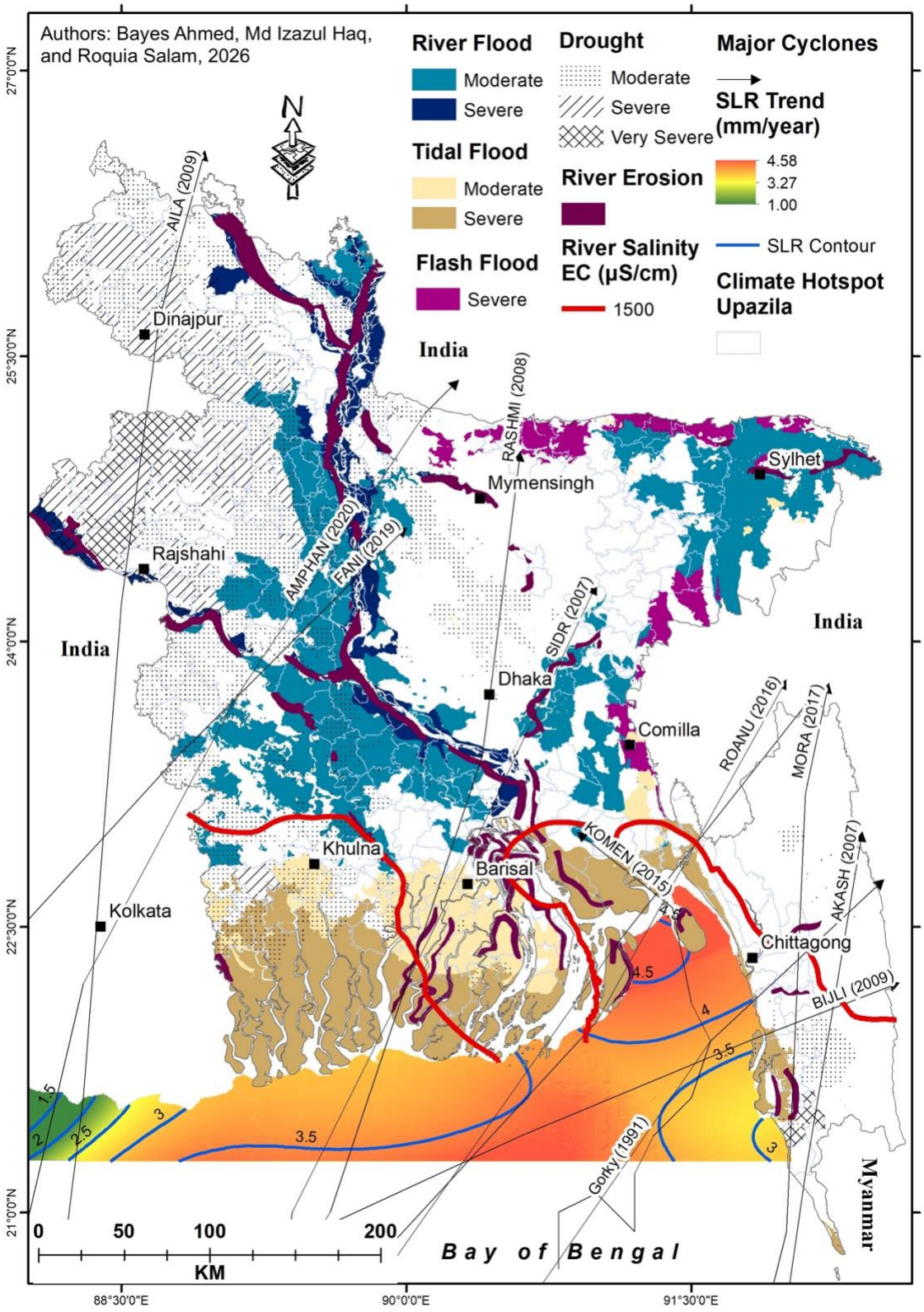
Step 6c. Map showing the 281 extremely vulnerable climate hotspot sub-districts/Upazilas. Source: The authors, 2026.



Step 7. Sensitivity of estimated climate migrant population to duration of residence in destination districts, Bangladesh. Source: The authors, 2025.

Duration Residence (Year) [33a]	Estimated Population	Ratio of Total Population	Richest Wealth Quantile
<= 1	617,592	0.44%	62.30%
<= 2	988,262	0.71%	63.90%
<= 3	1,307,330	0.94%	63.60%
<= 4	1,544,527	1.11%	64.30%
<= 5	1,826,333	1.31%	65.20%
<= 6	2,053,247	1.47%	66.10%
<= 7	2,258,348	1.62%	67.00%
<= 8	2,452,084	1.76%	67.50%
<= 9	2,560,553	1.84%	67.60%
>= 10	1,936,386	1.39%	75.60%

Appendix-IV. Climate vulnerable hotspot map of Bangladesh. Source: The authors, 2026.



Appendix-V. Classifications, weights, and justifications associated with the indicators for accessing information and transportation (AIT).

Indicator	Justification	Indicator Weight*	Class	Class Weight	Frequency (F) (258,456)							
					Climate migrants (6,549)				Climate non-migrants (251,906)			
					F	Mean	SD	P value	F	Mean	SD	P value
Have telephone	Possession of communication devices and transportation means improves mobility and economic opportunities, collectively raising standard of living.	1	Yes	1	460 (7.02%)	0.07	0.26	0.000***	2,042 (0.81%)	0.01	0.09	0.000***
			No	0	6,089 (92.98%)	0.93	0.26	0.000***	249,864 (99.19%)	0.99	0.09	0.000***
Have mobile		3	Yes	1	5,805 (88.64%)	0.89	0.32	0.000***	194,065 (77.04%)	0.77	0.42	0.000***
			No	0	744 (11.36%)	0.11	0.32	0.000***	57,841 (22.96%)	0.23	0.42	0.000***
Have television		2	Yes	1	4,578 (69.90%)	0.70	0.46	0.000***	66,876 (26.55%)	0.27	0.44	0.000***
			No	0	1,971 (30.10%)	0.30	0.46	0.000***	185,030 (73.45%)	0.73	0.44	0.000***
Have a computer		2	Yes	1	832 (12.70%)	0.13	0.33	0.000***	2,834 (1.13%)	0.01	0.11	0.000***
			No	0	5,717 (87.30%)	0.87	0.33	0.000***	249,072 (98.87%)	0.99	0.11	0.000***
Ownership of boat		1	Yes	1	93 (1.42%)	0.01	0.12	0.000***	18,120 (7.19%)	0.07	0.26	0.000***
			No	0	6,456 (98.58%)	0.99	0.12	0.000***	233,786 (92.81%)	0.93	0.26	0.000***
Ownership of rickshaw		3	Yes	1	232 (3.54%)	0.04	0.18	0.000***	4,687 (1.86%)	0.02	0.14	0.000***
			No	0	6,317 (96.46%)	0.96	0.18	0.000***	247,219 (98.14%)	0.98	0.14	0.000***
Ownership of bicycle		2	Yes	1	790 (12.06%)	0.12	0.33	0.000***	69,697 (27.67%)	0.28	0.45	0.000***
			No	0	5,759 (87.94%)	0.88	0.33	0.000***	182,209 (72.33%)	0.72	0.45	0.000***
Ownership of motorcycle		1	Yes	1	274 (4.18%)	0.04	0.20	0.000***	11,912 (4.73%)	0.05	0.21	0.000***
			No	0	6,275 (95.82%)	0.96	0.20	0.000***	239,994 (95.27%)	0.95	0.21	0.000***
Ownership of motorcar		1	Yes	1	173 (2.64%)	0.03	0.16	0.000***	1,420 (0.56%)	0.01	0.07	0.000***
			No	0	6,376 (97.36%)	0.97	0.16	0.000***	250,486 (99.44%)	0.99	0.07	0.000***

*Note: Indicator Weight (1 = Low, 2 = Medium, and 3 = High)**;** ***P ≤ 0.001; **P ≤ 0.01; *P ≤ 0.05. Source: The authors, 2025.

Appendix-VI. Class, weight, and justification associated with the indicators of land possession and housing facilities (LPHF).

Indicator	Indicator Weight*	Class	Frequency (F) (258,456)								Class Weight	Justification
			Climate migrants (6,549)				Climate non-migrants (251,906)					
			F	Mean	SD	P value		Mean	SD	P value		
Type of dwelling	3	Separate	1,987 (30.34%)	0.30	0.46	0.000***	224,067 (88.95%)	0.89	0.31	0.000***	1	Separate houses offer better space, privacy, and comfort, enhancing the standard of living. Apartments provide privacy but may be overcrowded. Joint or barrack houses often have poor sanitation, limited space, and overcrowding, lowering standard of living.
		Apartment	1,487 (22.71%)	0.23	0.42	0.000***	3,482 (1.38%)	0.01	0.12	0.000***	0.67	
		Joint/Barrack house	3,075 (46.95%)	0.47	0.50	0.000***	24357 (9.67%)	0.10	0.30	0.000***	0.33	
Wall material	2	Brick-cement	4,387 (66.99%)	0.67	0.47	0.000***	37,926 (15.06%)	0.15	0.36	0.000***	1	Materials like brick, cement, and tiles offer stability, luxury, comfort, and weather protection, enhancing standard of living. In contrast, tin and tally or wood provide some protection but lack long-term durability. Mud, straw, and bamboo common in informal or remote isolated settlements, fail to protect against harsh environment and require further maintenance, lowering standard of living.
		Wood/Tin	1,352 (20.64%)	0.21	0.40	0.000***	124,130 (49.28%)	0.49	0.50	0.000***	0.8	
		Mud/Unburnt brick	175 (2.67%)	0.03	0.16	0.000***	47,214 (18.74%)	0.19	0.39	0.000***	0.6	
		Straw	630 (9.62%)	0.10	0.29	0.000***	39,682 (15.75%)	0.16	0.36	0.000***	0.4	
		Others	5 (0.08%)	0.00	0.03	0.000***	2,954 (1.17%)	0.01	0.11	0.000***	0.2	
Roof material	2	Brick-cement	2,298 (35.09%)	0.35	0.48	0.000***	10,613 (4.21%)	0.04	0.20	0.000***	1	
		Tally	31 (0.47%)	0.00	0.07	0.000***	4,634 (1.84%)	0.02	0.13	0.000***	0.8	
		Tin	3,995 (61.00%)	0.61	0.49	0.000***	220,955 (87.71%)	0.88	0.33	0.000***	0.6	
		Straw	210 (3.21%)	0.03	0.18	0.000***	14,398 (5.72%)	0.06	0.23	0.000***	0.4	
		Others	15 (0.23%)	0.00	0.05	0.000***	1,306 (0.52%)	0.01	0.07	0.000***	0.2	
Floor material	2	Mosaic/Tiles	388 (5.92%)	0.06	0.24	0.000***	261 (0.10%)	0.00	0.03	0.000***	1	
		Brick/Cement	4,556 (69.57%)	0.70	0.46	0.000***	25,647 (10.18%)	0.10	0.30	0.000***	0.8	
		Wood/Bamboo	112 (1.71%)	0.02	0.13	0.000***	1,885 (0.75%)	0.01	0.09	0.000***	0.6	
		Mud	1,489 (22.74%)	0.23	0.42	0.000***	224,007 (88.92%)	0.89	0.31	0.000***	0.4	

Indicator	Indicator Weight*	Class	Frequency (F) (258,456)								Class Weight	Justification
			Climate migrants (6,549)				Climate non-migrants (251,906)					
			F	Mean	SD	P value		Mean	SD	P value		
		Others	4 (0.06%)	0.00	0.02	0.000***	106 (0.04%)	0.00	0.02	0.000***	0.2	
Total number of rooms	3	>6	94 (1.44%)	0.01	0.12	0.000***	4,619 (1.83%)	0.02	0.13	0.000***	1	As CNMs do not migrate anywhere, they already have their previous houses, having one or more rooms. For them (CNM), the total number of sleeping rooms was an important indicator, indicating their SL for LPHF. On the other hand, CMs leave their previous living areas and have to build new homes or rent in new areas. In such a case, those who have enough economic facilities can make or rent their new homes with the desired number of rooms and with good infrastructure. In such a case, the total number of rooms for sleeping is the secondary necessity, as they first need to have enough room to stay.
		5-6	472 (7.21%)	0.07	0.26	0.000***	24,684 (9.80%)	0.10	0.30	0.000***	0.8	
		3-4	1,722 (26.29%)	0.26	0.44	0.000***	111,968 (44.45%)	0.44	0.50	0.000***	0.6	
		2	1,636 (24.98%)	0.25	0.43	0.000***	73,420 (29.15%)	0.29	0.45	0.000***	0.4	
		1	2,625 (40.08%)	0.40	0.49	0.000***	37,215 (14.77%)	0.15	0.35	0.000***	0.2	
Number of rooms used for sleeping	2	≥5	93 (1.42%)	0.02	0.12	0.000***	5,321 (2.11%)	0.02	0.15	0.000***	1	
		3-4	1,019 (15.56%)	0.16	0.36	0.000***	59,361 (23.56%)	0.24	0.42	0.000***	0.75	
		2	2,243 (34.25%)	0.34	0.47	0.000***	101,926 (40.46%)	0.40	0.49	0.000***	0.50	
		1	3,194 (48.77%)	0.49	0.50	0.035*	85,298 (33.86%)	0.34	0.47	0.000***	0.25	
Slum	1	No	5,822 (88.90%)	0.89	0.31	0.000***	250,501 (99.44%)	0.99	0.07	0.000***	1 0.5	Slums often lack basic infrastructures (e.g., improved sanitation, safe drinking water source, adequate houses) necessary for maintaining a hygienic and healthy life. Therefore, living in a slum lowers the standard of living.
		Yes	727 (11.10%)	0.11	0.31	0.000***	1,405 (0.56%)	0.01	0.07	0.000***		
Tenancy type	3	Owned	1,548 (23.64%)	0.24	0.42	0.000***	235,392 (93.44%)	0.93	0.25	0.000***	1	Homeowners are free to control the conditions of their homes. They do not need to pay others for the house, making them able to invest in other productive areas. However, people who rent a house need to pay others, making their economic condition comparatively unstable, and they also do not have a full housing security and control over the conditions of their homes, making their standard of living poor.
		Rent-free	322 (4.92%)	0.05	0.22	0.000***	14,187 (5.63%)	0.06	0.23	0.000***	0.67	
		Rented	4,679 (71.45%)	0.71	0.45	0.000***	2,327 (0.92%)	0.01	0.10	0.000***	0.33	
Source of water	3	Tap	2,338 (35.70%)	0.36	0.48	0.000***	1,681 (0.67%)	0.01	0.08	0.000***	1	Safe water sources like tap, tube well, or others reduce waterborne diseases, and

Indicator	Indicator Weight*	Class	Frequency (F) (258,456)								Class Weight	Justification
			Climate migrants (6,549)				Climate non-migrants (251,906)					
			F	Mean	SD	P value		Mean	SD	P value		
		Tube well	4,172 (63.70%)	0.64	0.48	0.000**	240,171 (95.34%)	0.95	0.21	0.000**	0.8	improve hygiene. However, unsafe water sources like rivers, ditches, canals, ponds are the significant source of waterborne diseases, which is a serious public health concern, a factor for lower standard of living.
		Well	19 (0.29%)	0.00	0.05	0.000**	738 (0.29%)	0.00	0.05	0.000**	0.6	
		Pond	7 (0.11%)	0.00	0.03	0.000**	6,888 (2.73%)	0.03	0.16	0.000**	0.4	
		River/Ditch/Canal	13 (0.20%)	0.00	0.04	0.000**	2,428 (0.96%)	0.01	0.10	0.000**	0.2	
Distance to water source	3	Inside dwelling	4,258 (65.02%)	0.65	0.48	0.000**	131,962 (52.39%)	0.52	0.50	0.000**	1	Getting water from nearby sources reduces physical effort and time, which can be used in other productive activities like education, a job, and so on. However, it may limit water access if the distance is long, affecting public health.
		Within 200 meters	2,052 (31.33%)	0.31	0.46	0.000**	91,386 (36.28%)	0.36	0.48	0.000**	0.67	
		More than 200 m	239 (3.65%)	0.04	0.19	0.000**	28,558 (11.34%)	0.11	0.32	0.000**	0.33	
Type of toilet	3	Sanitary with water seal	2,763 (42.19%)	0.42	0.49	0.000**	65,184 (25.88%)	0.26	0.44	0.000**	1 0.67	Improved sanitation minimises the risk of spreading diseases, improving cleanliness, and ensures overall hygiene. However, poor sanitation like an open space, or non-sanitary (Kutcha) increases the risk of water contamination, pollution, spreading diseases; thus, decreases the standard of living.
		Sanitary without water seal	2,765 (42.22%)	0.42	0.49	0.000**	84,938 (33.72%)	0.34	0.47	0.000**	0.33	
		Non-sanitary/ Kutcha	988 (15.09%)	0.15	0.36	0.000**	83,269 (33.06%)	0.33	0.47	0.000**	0	
		Open space	33 (0.50%)	0.01	0.07	0.000**	18,515 (7.35%)	0.07	0.26	0.000**		
Disposal of solid waste	3	Managed dustbin	3,451 (52.70%)	0.53	0.50	0.000**	35,372 (14.04%)	0.14	0.35	0.000**	1	Unmanaged dump sites and, in some cases, burn sites are serious concerns for public health. Disposing of solid waste in a managed dustbin or burying it reduces the risk to public health, indicating a good standard of living.
		Bury/ Inside pit	600 (9.16%)	0.09	0.29	0.000**	78,787 (31.28%)	0.31	0.46	0.000**	0.75	
		Burn	21 (0.32%)	0.00	0.06	0.000**	2,057 (0.82%)	0.01	0.09	0.000**	0.5	
		Unmanaged dump site	2,477 (37.82%)	0.38	0.48	0.000**	135,690 (53.87%)	0.54	0.50	0.000**	0.25	
Sources of light or electricity	2	Electricity	6,078 (92.81%)	0.93	0.26	0.000**	102,867 (40.84%)	0.41	0.49	0.000**	1	Conventional sources of light like kerosene, and others, are responsible for
		Solar energy	33 (0.50%)	0.01	0.07	0.000**	15,530 (6.16%)	0.06	0.24	0.000**	0.8	air pollution, and thus, contributing to respiratory diseases that ultimately reduce the standard of living. However, modern sources of light like electricity,
		Biogas	2 (0.03%)	0.00	0.02	0.000**	481 (0.19%)	0.00	0.04	0.000**	0.6	

Indicator	Indicator Weight*	Class	Frequency (F) (258,456)								Class Weight	Justification
			Climate migrants (6,549)				Climate non-migrants (251,906)					
			F	Mean	SD	P value		Mean	SD	P value		
		Kerosene	427 (6.52%)	0.07	0.25	0.000***	131,698 (52.28%)	0.52	0.50	0.000***	0.4	solar energy, and biogas are more convenient for high illumination, and low chances of respiratory diseases, improving the standard of living.
		Others	9 (0.14%)	0.00	0.04	0.000***	1,330 (0.53%)	0.01	0.07	0.000***	0.2	
Cocking fuel	3	Electricity/Gas/LPG	3,821 (58.34%)	0.58	0.49	0.000***	1,572 (0.62%)	0.01	0.08	0.000***	1	Conventional cooking fuels such as straw/cow dung, kerosene, and wood are a significant source of air pollution and are responsible for respiratory diseases and environmental degradation, limiting SL. Conversely, modern fuels like LPG, gas, electricity, and biogas improve the standard of living by enhancing public health.
		Biogas	5 (0.08%)	0.00	0.03	0.000***	117 (0.05%)	0.00	0.02	0.000***	0.8	
		Wood	2,066 (31.55%)	0.32	0.46	0.000***	96,904 (38.47%)	0.38	0.49	0.000***	0.6	
		Kerosene	31 (0.47%)	0.00	0.07	0.000***	2,918 (1.16%)	0.01	0.11	0.000***	0.4	
		Straw/Cow dung	626 (9.56%)	0.10	0.29	0.000***	150,395 (59.70%)	0.60	0.49	0.000***	0.2	
Ownership of refrigerator	1	Yes	2,240 (34.20%)	0.34	0.47	0.000***	10,786 (4.28%)	0.04	0.20	0.000***	1	Electricity is necessary for using the refrigerator, and thus, the urban population has more access to using the refrigerator. Having a refrigerator facilitates preserving food, which helps to have a diverse diet as well as save the food from being rotten. Thus, the refrigerator enhances standard of living.
		No	4,309 (65.80%)	0.66	0.47	0.000***	241,120 (95.72%)	0.96	0.20	0.000***	0	
Have a sewing machine	2	Yes	1,256 (19.18%)	0.19	0.39	0.000***	15,001 (5.95%)	0.06	0.24	0.000***	1	Having a sewing machine (especially in rural areas) helps the household to earn extra money through sewing or reduce the cost of sewing if this service is needed.
		No	5,293 (80.82%)	0.81	0.39	0.000***	236,905 (94.05%)	0.94	0.24	0.000***	0	
Ownership of land	3	Yes	3,393 (51.81%)	0.52	0.50	0.003**	238,828 (94.81%)	0.95	0.22	0.000***	1	Both in urban and rural areas, ownership of land significantly enhances the SL. In rural areas, it supports self-sufficiency, allowing for agricultural activities and providing financial security. In urban areas, it ensures wealth accumulation and increases social status.
		No	3,156 (48.19%)	0.48	0.50	0.003**	13,078 (5.19%)	0.05	0.22	0.000***	0	
Ownership of house	3	Yes	3,349 (51.14%)	0.51	0.50	0.066	229,994 (91.30%)	0.91	0.28	0.000***	1	Ownership of a house ensures housing security, asset growth, and financial stability, by reducing rental costs. Thus, improving the standard of living.
		No	3,200 (48.86%)	0.49	0.50	0.066	21,912 (8.70%)	0.09	0.28	0.000***	0	

*Note: Indicator Weight (1 = Low, 2 = Medium, and 3 = High); ***$P \leq 0.001$; **$P \leq 0.01$; *$P \leq 0.05$. Source: The authors, 2025.

Appendix-VII. The distribution of climate migrants among the origin and destination districts. Source: BSS, 2012 and the authors, 2025.

Origin Districts					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bagerhat	292	4.4	4.4	4.4
	Barguna	58	.9	.9	5.3
	Barisal	943	14.3	14.3	19.7
	Bhola	194	2.9	2.9	22.6
	Bogra	67	1.0	1.0	23.6
	Brahmanbaria	213	3.2	3.2	26.9
	Chandpur	399	6.1	6.1	32.9
	Chittagong	201	3.1	3.1	36.0
	Chuadanga	75	1.1	1.1	37.1
	Cox's bazar	50	.8	.8	37.9
	Dinajpur	108	1.6	1.6	39.5
	Faridpur	487	7.4	7.4	46.9
	Feni	94	1.4	1.4	48.4
	Gaibandha	114	1.7	1.7	50.1
	Gopalganj	176	2.7	2.7	52.8
	Habiganj	128	1.9	1.9	54.7
	Joypurhat	8	.1	.1	54.8
	Jamalpur	103	1.6	1.6	56.4
	Jhalokati	48	.7	.7	57.1
	Khulna	66	1.0	1.0	58.1
	Kishoreganj	261	4.0	4.0	62.1
	Kurugram	50	.8	.8	62.9
	Kakshmipur	79	1.2	1.2	64.1
	Lalmonirhat	38	.6	.6	64.6
	Madaripur	154	2.3	2.3	67.0
	Meherpur	6	.1	.1	67.1
	Naogaon	57	.9	.9	67.9
	Natore	51	.8	.8	68.7
	Chapai Nawabganj	71	1.1	1.1	69.8
	Netrokonaq	122	1.9	1.9	71.6
	Noakhali	447	6.8	6.8	78.4
	Pabna	159	2.4	2.4	80.8

Origin Districts					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Panchagarh	30	.5	.5	81.3
	Patuakhali	177	2.7	2.7	84.0
	Pirojpur	99	1.5	1.5	85.5
	Rajshahi	65	1.0	1.0	86.5
	Rajbari	2	.0	.0	86.5
	Rangpur	176	2.7	2.7	89.2
	Shariatpur	215	3.3	3.3	92.5
	Satkhira	106	1.6	1.6	94.1
	Sirajganj	112	1.7	1.7	95.8
	Sunamganj	264	4.0	4.0	99.8
	Thakurgaon	14	.2	.2	100.0
	Total	657	100.0	100.0	

Destination Districts					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bandarban	101	1.5	1.5	1.5
	Bogra	2	.0	.0	1.6
	Chittagong	527	8.0	8.0	9.6
	Comilla	18	.3	.3	9.8
	Cox's bazar	5	.1	.1	9.9
	Dhaka	2342	35.6	35.6	45.5
	Dinajpur	41	.6	.6	46.1
	Faridpur	4	.1	.1	46.2
	Feni	42	.6	.6	46.8
	Gazipur	324	4.9	4.9	51.8
	Gopalganj	3	.0	.0	51.8
	Habiganj	23	.3	.3	52.2
	Joypurhat	24	.4	.4	52.5
	Jessore	127	1.9	1.9	54.5
	Jhenaidah	33	.5	.5	55.0
	Khagrachhari	136	2.1	2.1	57.0
	Khulna	920	14.0	14.0	71.0
	Kishoreganj	3	.0	.0	71.1
	Kushtia	72	1.1	1.1	72.2

Destination Districts					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Magura	14	.2	.2	72.4
	Manikganj	35	.5	.5	72.9
	Moulvibazar	71	1.1	1.1	74.0
	Munshiganj	95	1.4	1.4	75.4
	Mymensingh	21	.3	.3	75.7
	Naogaon	4	.1	.1	75.8
	Narail	19	.3	.3	76.1
	Narayanganj	332	5.0	5.0	81.1
	Narsingdi	56	.9	.9	82.0
	Natore	36	.5	.5	82.5
	Chapai Nawabganj	8	.1	.1	82.7
	Nilphamari	4	.1	.1	82.7
	Noakhali	44	.7	.7	83.4
	Pabna	7	.1	.1	83.5
	Panchagarh	8	.1	.1	83.6
	Patuakhali	2	.0	.0	83.6
	Rajshahi	230	3.5	3.5	87.1
	Rajbari	14	.2	.2	87.4
	Rangamati	101	1.5	1.5	88.9
	Rangpur	27	.4	.4	89.3
	Sirajganj	2	.0	.0	89.3
	Sylhet	688	10.5	10.5	99.8
	Tangail	14	.2	.2	100.0
	Total	6579	100.0	100.0	

Note: A further 30 samples with missing values (0.01%) were removed from the dataset, leaving 6,549 samples for the socio-demographic analysis, standard of living evaluation, and regression analysis.

Appendix-VIII. Demographic characteristics of climate migrants and climate non-migrants.

Demographic Parameter	Category	Climate Migrants				Climate Non-Migrants			
		Frequency (%) [N = 6,549]	Mean	SD	*P*-value	Frequency (%) [N = 251,906]	Mean	SD	*P*-value
Age Class	Children (1-14 years)	349 (5%)	0.05	0.22	0.000***	39322 (16%)	0.16	0.36	0.000***
	Early worker (15-24 years)	847 (13%)	0.13	0.34	0.000***	56080 (22%)	0.22	0.42	0.000***
	Primary worker (25-54 years)	4140 (63%)	0.63	0.48	0.000***	120243 (48%)	0.48	0.50	0.000***
	Mature worker (55-64 years)	709 (11%)	0.11	0.31	0.000***	19032 (7%)	0.08	0.26	0.000***
	Elderly (≥65 years)	504 (8%)	0.08	0.27	0.000***	17229 (7%)	0.07	0.25	0.000***
Gender	Male	4176 (64%)	0.64	0.48	0.000***	128808 (51%)	0.51	0.50	0.000***
	Female	2373 (36%)	0.36	0.48	0.000***	123098 (49%)	0.49	0.50	0.000***
Level of Education 1	Illiterate	561 (9%)	0.09	0.28	0.000***	14883 (6%)	0.06	0.24	0.000***
	Primary (Class 1-5)	1968 (30%)	0.30	0.46	0.000***	102216 (41%)	0.41	0.49	0.000***
	Secondary (Class 6-10)	2628 (40%)	0.40	0.49	0.000***	113509 (45%)	0.45	0.50	0.000***
	Higher Secondary (Class 11-12)	613 (9%)	0.09	0.29	0.000***	13341 (5%)	0.05	0.22	0.000***
	Bachelor or Higher	779 (12%)	0.12	0.32	0.000***	7957 (3%)	0.03	0.17	0.000***
Marital Status	Single	1091 (16.66%)	0.17	0.37	0.000***	80961 (32.14%)	0.32	0.47	0.000***
	Married	5091 (77.74%)	0.78	0.42	0.000***	157387(62.48%)	0.62	0.48	0.000***
	Widowed	303 (4.63%)	0.05	0.21	0.000***	11998 (4.76%)	0.05	0.21	0.000***
	Separated	64 (0.98%)	0.01	0.10	0.000***	1560 (0.62%)	0.01	0.08	0.000***
Level of Education 2	Less-educated	5157 (79%)	0.79	0.41	0.000***	230608 (92%)	0.92	0.28	0.000***
	More educated	1392 (21%)	0.21	0.41	0.000***	21298 (8%)	0.08	0.28	0.000***
Field of Education	General	6282 (96%)	0.96	0.20	0.000***	235863 (93%)	0.94	0.24	0.000***
	Technical/Vocational	88 (1%)	0.01	0.12	0.000***	1643 (1%)	0.01	0.08	0.000***
	Religious	179 (3%)	0.03	0.16	0.000***	14400 (6%)	0.06	0.23	0.000***
Literacy	Cannot read and write	2219 (34%)	0.34	0.47	0.000***	97913 (39%)	0.39	0.49	0.000***
	Can read only	306 (5%)	0.05	0.21	0.000***	16183 (6%)	0.06	0.25	0.000***
	Can read and write	4024 (61%)	0.61	0.49	0.000***	137810 (55%)	0.55	0.50	0.000***
Total members in the family	1-3	1497 (23%)	0.23	0.42	0.000***	53799 (21%)	0.21	0.41	0.000***
	4-6	4152 (63%)	0.63	0.48	0.000***	154145 (61%)	0.61	0.49	0.000***
	>6	900 (14%)	0.14	0.34	0.000***	43962 (18%)	0.17	0.38	0.000***
Activity Status	Unemployed	2387 (36%)	0.36	0.48	0.000***	158256 (63%)	0.63	0.48	0.000***
	Employer	185 (3%)	0.03	0.17	0.000***	1555 (1%)	0.01	0.08	0.000***
	Employee	2167 (33%)	0.33	0.47	0.000***	16834 (7%)	0.07	0.25	0.000***
	Self-employed (agriculture)	249 (4%)	0.04	0.19	0.000***	35994 (14%)	0.14	0.35	0.000***
	Self-employed (non-agriculture)	1138 (17%)	0.17	0.38	0.000***	23494 (9%)	0.09	0.29	0.000***
	Family helper	61 (1%)	0.01	0.10	0.000***	4766 (2%)	0.02	0.14	0.000***
	Others	362 (6%)	0.06	0.23	0.000***	11007 (4%)	0.04	0.20	0.000***

*Note: ***$P \leq 0.001$; **$P \leq 0.01$; *$P \leq 0.05$. Source: The authors, 2025.

Appendix-IX. *Statistics of the multinomial logistic regression between wealth quintile and demographic information. Source: The authors, 2025.

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
Poorest	Age class	Children (1-14 years)	0.20	0.43	0.21	1	0.646	1.22	1.83	0.06	999.40	1	0.000***	6.23
		Early worker (15-24 years)	-0.12	0.33	0.14	1	0.710	0.89	1.74	0.05	1217.35	1	0.000***	5.67
		Primary worker (25-54 years)	-0.77	0.21	13.11	1	0.000***	0.46	0.83	0.04	402.99	1	0.000***	2.30
		Mature worker (55-64 years)	-0.32	0.25	1.71	1	0.191	0.72	0.09	0.05	3.52	1	0.061	1.10
		Elderly (≥65 years)	0b			0			0b			0		
	Gender	Male	0.01	0.17	0.01	1	0.942	1.01	0.03	0.03	1.85	1	0.174	1.04
		Female	0b			0			0b			0		
	Level of education 1	Illiterate	0.80	0.40	4.03	1	0.045*	2.23	1.48	0.07	495.32	1	0.000***	4.38
		Primary (Class 1-5)	2.01	0.36	30.70	1	0.000***	7.47	2.23	0.05	2278.11	1	0.000***	9.33
		Secondary (Class 6-10)	1.32	0.36	13.16	1	0.000***	3.74	1.22	0.04	754.09	1	0.000***	3.40
		Higher Secondary (Class 11-12)	0.73	0.44	2.76	1	0.097	2.08	0.15	0.05	7.48	1	0.006**	1.16
		Bachelor or Higher	0b			0			0b			0		
	Marital status	Single	0.15	0.71	0.05	1	0.827	1.17	-0.63	0.14	20.17	1	0.000***	0.53
		Married	0.19	0.65	0.08	1	0.772	1.21	-0.54	0.14	15.45	1	0.000***	0.58
		Widowed	-0.36	0.69	0.27	1	0.605	0.70	-0.75	0.15	26.49	1	0.000***	0.47
		Separated	0b			0			0b			0		
	Level of education 2	Less-educated	0b			0			0b			0		
		More educated	0b			0			0b			0		
	Field of education	General	-0.62	0.35	3.14	1	0.076	0.54	-0.56	0.05	151.05	1	0.000***	0.57
		Technical/Vocational	-1.28	1.11	1.32	1	0.251	0.28	-0.98	0.11	85.34	1	0.000***	0.38
		Religious	0b			0			0b			0		
	Literacy	Cannot read and write	2.12	0.15	188.72	1	0.000***	8.30	2.61	0.03	8772.90	1	0.000***	13.60
		Can read only	0.58	0.32	3.27	1	0.070	1.78	1.34	0.05	802.29	1	0.000***	3.80
		Can read and write	0b			0			0b			0		

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
	Total members in the family	1-3	0.59	0.21	8.15	1	0.004**	1.81	0.96	0.03	1006.36	1	0.000***	2.61
		4-6	-0.01	0.18	0.00	1	0.978	0.99	0.52	0.02	454.83	1	0.000***	1.68
		>6	0b			0			0b			0		
	Activity status	Unemployed	-0.74	0.26	7.92	1	0.005**	0.48	-0.97	0.06	294.24	1	0.000***	0.38
		Employer	-2.63	1.03	6.46	1	0.011**	0.07	-1.52	0.11	182.14	1	0.000***	0.22
		Employee	-1.65	0.28	34.14	1	0.000***	0.19	-0.59	0.06	90.39	1	0.000***	0.55
		Self-employed (agriculture)	1.35	0.30	20.93	1	0.000***	3.87	-0.16	0.06	7.03	1	0.008**	0.85
		Self-employed (non-agriculture)	-0.70	0.28	6.33	1	0.012**	0.50	-0.70	0.06	134.33	1	0.000***	0.50
		Family helper	0.49	0.48	1.04	1	0.308	1.63	-0.62	0.09	47.44	1	0.000***	0.54
		Others	0b			0			0b			0		
Second	Age class	Children (1-14 years)	-0.70	0.61	1.34	1	0.248	0.50	-0.70	0.04	392.38	1	0.000***	0.49
		Early worker (15-24 years)	-0.32	0.45	0.50	1	0.480	0.73	-0.41	0.03	182.85	1	0.000***	0.67
		Primary worker (25-54 years)	-0.41	0.28	2.26	1	0.133	0.66	-0.22	0.02	80.46	1	0.000***	0.80
		Mature worker (55-64 years)	-0.18	0.32	0.33	1	0.566	0.83	-0.01	0.03	0.11	1	0.736	0.99
		Elderly (≥65 years)	0b			0			0b			0		
	Gender	Male	-0.15	0.24	0.40	1	0.527	0.86	0.04	0.02	7.49	1	0.006**	1.05
		Female	0b			0			0b			0		
	Level of education 1	Illiterate	-0.38	0.55	0.48	1	0.488	0.68	-0.09	0.04	4.85	1	0.028*	0.91
		Primary (Class 1-5)	-0.30	0.50	0.37	1	0.542	0.74	-0.13	0.04	11.38	1	0.001***	0.88
		Secondary (Class 6-10)	-0.29	0.50	0.35	1	0.556	0.74	0.01	0.04	0.04	1	0.833	1.01
		Higher Secondary (Class 11-12)	-0.02	0.61	0.00	1	0.968	0.98	0.06	0.05	1.73	1	0.188	1.06
		Bachelor or Higher	0b			0			0b			0		
	Marital status	Single	0.15	1.03	0.02	1	0.882	1.17	0.34	0.07	25.89	1	0.000***	1.40
		Married	-0.16	0.95	0.03	1	0.864	0.85	0.24	0.06	13.71	1	0.000***	1.27
		Widowed	-0.25	1.01	0.06	1	0.802	0.78	0.15	0.07	4.52	1	0.034*	1.16
		Separated	0b			0			0b			0		

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
	Level of education 2	Less-educated	0b			0			0b			0		
		More educated	0b			0			0b			0		
	Field of education	General	-0.30	0.45	0.46	1	0.499	0.74	0.02	0.02	0.46	1	0.497	1.02
		Technical/Vocational	-17.76	6933.55	0.00	1	0.998	0.00	-0.16	0.09	3.56	1	0.059	0.85
		Religious	0b			0			0b			0		
	Literacy	Cannot read and write	0.19	0.22	0.74	1	0.388	1.21	-0.70	0.01	2689.08	1	0.000***	0.49
		Can read only	0.02	0.49	0.00	1	0.960	1.03	-0.21	0.02	88.75	1	0.000***	0.81
		Can read and write	0b			0			0b			0		
	Total members in the family	1-3	0.37	0.32	1.38	1	0.241	1.45	-0.45	0.02	584.88	1	0.000***	0.64
		4-6	0.58	0.29	4.07	1	0.044*	1.79	-0.18	0.02	125.17	1	0.000***	0.83
		>6	0b			0			0b			0		
	Activity status	Unemployed	-0.30	0.35	0.70	1	0.403	0.74	0.36	0.03	160.76	1	0.000***	1.43
		Employer	2.01	1.12	3.22	1	0.073	7.48	0.46	0.09	27.91	1	0.000***	1.58
		Employee	0.07	0.38	0.04	1	0.848	1.08	0.27	0.03	65.38	1	0.000***	1.31
		Self-employed (agriculture)	-0.36	0.38	0.92	1	0.339	0.70	0.32	0.03	126.26	1	0.000***	1.38
		Self-employed (non-agriculture)	-0.01	0.38	0.00	1	0.969	0.99	0.24	0.03	59.93	1	0.000***	1.27
		Family helper	-20.42	0.00		1		0.00	0.36	0.05	55.32	1	0.000***	1.43
		Others	0b			0			0b			0		
Middle	Age class	Children (1-14 years)	-0.58	0.55	1.09	1	0.296	0.56	-1.09	0.04	848.30	1	0.000***	0.34
		Early worker (15-24 years)	-0.19	0.42	0.21	1	0.644	0.82	-0.71	0.03	503.05	1	0.000***	0.49
		Primary worker (25-54 years)	0.31	0.27	1.33	1	0.249	1.36	-0.33	0.03	158.22	1	0.000***	0.72
		Mature worker (55-64 years)	0.05	0.31	0.03	1	0.861	1.06	-0.01	0.03	0.19	1	0.663	0.99
		Elderly (≥65 years)	0b			0			0b			0		
	Gender	Male	0.46	0.22	4.42	1	0.036*	1.58	0.08	0.02	21.95	1	0.000***	1.08
		Female	0b			0			0b			0		
		Illiterate	0.36	0.50	0.49	1	0.482	1.43	-0.23	0.04	25.52	1	0.000***	0.80

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
	Level of education 1	Primary (Class 1-5)	0.06	0.46	0.02	1	0.896	1.06	-0.39	0.04	97.32	1	0.000***	0.68
		Secondary (Class 6-10)	-0.01	0.46	0.00	1	0.975	0.99	-0.07	0.04	3.37	1	0.066	0.93
		Higher Secondary (Class 11-12)	0.24	0.55	0.19	1	0.659	1.28	0.14	0.05	8.72	1	0.003**	1.15
		Bachelor or Higher	0b			0			0b			0		
	Marital status	Single	0.19	0.87	0.05	1	0.823	1.21	0.68	0.08	75.44	1	0.000***	1.98
		Married	-0.20	0.79	0.06	1	0.805	0.82	0.52	0.08	46.57	1	0.000***	1.68
		Widowed	0.19	0.85	0.05	1	0.822	1.21	0.49	0.08	36.10	1	0.000***	1.62
		Separated	0b			0			0b			0		
	Level of education 2	Less-educated	0b			0			0b			0		
		More educated	0b			0			0b			0		
	Field of education	General	0.80	0.50	2.53	1	0.112	2.23	0.03	0.03	1.17	1	0.279	1.03
		Technical/Vocational	2.10	1.23	2.91	1	0.088	8.20	0.10	0.08	1.34	1	0.247	1.10
		Religious	0b			0			0b			0		
	Literacy	Cannot read and write	-0.18	0.19	0.89	1	0.346	0.83	-1.16	0.01	6466.05	1	0.000***	0.31
		Can read only	0.31	0.39	0.63	1	0.428	1.36	-0.50	0.02	412.92	1	0.000***	0.61
		Can read and write	0b			0			0b			0		
	Total members in the family	1-3	0.31	0.27	1.32	1	0.250	1.36	-0.65	0.02	1091.77	1	0.000***	0.52
		4-6	0.26	0.25	1.12	1	0.289	1.30	-0.30	0.02	322.74	1	0.000***	0.74
		>6	0b			0			0b			0		
	Activity status	Unemployed	-0.30	0.32	0.93	1	0.335	0.74	0.59	0.03	361.82	1	0.000***	1.80
		Employer	1.42	1.10	1.65	1	0.199	4.12	0.65	0.09	53.13	1	0.000***	1.92
		Employee	0.51	0.32	2.45	1	0.117	1.66	0.37	0.04	106.18	1	0.000***	1.45
		Self-employed (agriculture)	-1.82	0.40	20.74	1	0.000***	0.16	0.39	0.03	155.29	1	0.000***	1.48
		Self-employed (non-agriculture)	0.25	0.32	0.59	1	0.442	1.28	0.41	0.03	148.44	1	0.000***	1.51
		Family helper	-0.55	0.62	0.78	1	0.376	0.58	0.48	0.05	86.17	1	0.000***	1.62
		Others	0b			0			0b			0		
Fourth	Age class	Children (1-14 years)	0.03	0.45	0.01	1	0.940	1.03	-1.52	0.04	1413.44	1	0.000***	0.22

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
		Early worker (15-24 years)	0.46	0.34	1.84	1	0.175	1.59	-1.20	0.03	1202.71	1	0.000***	0.30
		Primary worker (25-54 years)	0.63	0.22	8.09	1	0.004**	1.88	-0.54	0.03	363.68	1	0.000***	0.58
		Mature worker (55-64 years)	0.12	0.26	0.23	1	0.633	1.13	-0.03	0.03	0.61	1	0.435	0.97
		Elderly (≥65 years)	0b			0			0b			0		
	Gender	Male	-0.01	0.18	0.00	1	0.949	0.99	0.05	0.02	7.98	1	0.005**	1.05
		Female	0b			0			0b			0		
	Level of education 1	Illiterate	-0.46	0.42	1.22	1	0.270	0.63	-0.79	0.05	281.96	1	0.000***	0.46
		Primary (Class 1-5)	-0.72	0.38	3.62	1	0.057	0.49	-1.09	0.04	790.35	1	0.000***	0.34
		Secondary (Class 6-10)	-0.56	0.38	2.17	1	0.141	0.57	-0.50	0.04	172.40	1	0.000***	0.60
		Higher Secondary (Class 11-12)	-0.48	0.46	1.06	1	0.303	0.62	0.05	0.05	1.14	1	0.286	1.05
		Bachelor or Higher	0b			0			0b			0		
	Marital status	Single	-0.24	0.72	0.11	1	0.739	0.79	0.80	0.09	75.38	1	0.000***	2.23
		Married	-0.23	0.66	0.13	1	0.723	0.79	0.63	0.09	49.87	1	0.000***	1.89
		Widowed	0.21	0.71	0.09	1	0.770	1.23	0.67	0.09	50.44	1	0.000***	1.96
		Separated	0b			0			0b			0		
	Level of education 2	Less-educated	0b			0			0b			0		
		More educated	0b			0			0b			0		
	Field of education	General	-0.02	0.35	0.00	1	0.959	0.98	0.20	0.03	48.55	1	0.000***	1.22
		Technical/Vocational	0.32	1.15	0.08	1	0.782	1.37	0.52	0.08	37.27	1	0.000***	1.67
		Religious	0b			0			0b			0		
	Literacy	Cannot read and write	-0.55	0.16	11.83	1	0.001***	0.58	-1.76	0.02	11588.52	1	0.000***	0.17
		Can read only	0.18	0.33	0.29	1	0.592	1.19	-0.83	0.03	888.97	1	0.000***	0.44
		Can read and write	0b			0			0b			0		
	Total members in the family	1-3	-0.01	0.22	0.00	1	0.976	0.99	-0.70	0.02	1079.10	1	0.000***	0.50
		4-6	0.25	0.20	1.58	1	0.208	1.28	-0.33	0.02	336.83	1	0.000***	0.72
		>6	0b			0			0b			0		
		Unemployed	-0.16	0.27	0.36	1	0.551	0.85	0.79	0.04	490.06	1	0.000***	2.21

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
	Activity status	Employer	1.78	1.05	2.88	1	0.090	5.90	1.03	0.09	123.69	1	0.000***	2.79
		Employee	0.88	0.28	9.64	1	0.002**	2.42	0.52	0.04	162.13	1	0.000***	1.68
		Self-employed (agriculture)	-1.36	0.30	20.11	1	0.000***	0.26	0.41	0.04	128.03	1	0.000***	1.51
		Self-employed (non-agriculture)	0.36	0.28	1.67	1	0.196	1.44	0.58	0.04	229.93	1	0.000***	1.79
		Family helper	-0.93	0.51	3.32	1	0.069	0.39	0.64	0.06	124.37	1	0.000***	1.91
		Others	0b			0			0b			0		
Richest	Age class	Children (1-14 years)	-0.20	0.43	0.21	1	0.646	0.82	-1.83	0.06	999.40	1	0.000***	0.16
		Early worker (15-24 years)	0.12	0.33	0.14	1	0.710	1.13	-1.74	0.05	1217.35	1	0.000***	0.18
		Primary worker (25-54 years)	0.77	0.21	13.11	1	0.000***	2.16	-0.83	0.04	402.99	1	0.000***	0.43
		Mature worker (55-64 years)	0.32	0.25	1.71	1	0.191	1.38	-0.09	0.05	3.52	1	0.061	0.91
		Elderly (≥65 years)	0b			0			0b			0		
	Gender	Male	-0.01	0.17	0.01	1	0.942	0.99	-0.03	0.03	1.85	1	0.174	0.97
		Female	0b			0			0b			0		
	Level of education 1	Illiterate	-0.80	0.40	4.03	1	0.045*	0.45	-1.48	0.07	495.32	1	0.000***	0.23
		Primary (Class 1-5)	-2.01	0.36	30.70	1	0.000***	0.13	-2.23	0.05	2278.11	1	0.000***	0.11
		Secondary (Class 6-10)	-1.32	0.36	13.16	1	0.000***	0.27	-1.22	0.04	754.09	1	0.000***	0.29
		Higher Secondary (Class 11-12)	-0.73	0.44	2.76	1	0.097	0.48	-0.15	0.05	7.48	1	0.006**	0.86
		Bachelor or Higher	0b			0			0b			0		
	Marital status	Single	-0.15	0.71	0.05	1	0.827	0.86	0.63	0.14	20.17	1	0.000***	1.88
		Married	-0.19	0.65	0.08	1	0.772	0.83	0.54	0.14	15.45	1	0.000***	1.72
		Widowed	0.36	0.69	0.27	1	0.605	1.43	0.75	0.15	26.49	1	0.000***	2.12
		Separated	0b			0			0b			0		
	Level of education 2	Less-educated	0b			0			0b			0		
		More educated	0b			0			0b			0		
	Field of education	General	0.62	0.35	3.14	1	0.076	1.85	0.56	0.05	151.05	1	0.000***	1.75
		Technical/Vocational	1.28	1.11	1.32	1	0.251	3.59	0.98	0.11	85.34	1	0.000***	2.66

Wealth quintile	Variable	Class	Climate Migrants						Climate Non-Migrants					
			B	Std. Error	Wald	df	Sig.	Exp(B)	B	Std. Error	Wald	df	Sig.	Exp(B)
		Religious	0b			0			0b			0		
	Literacy	Cannot read and write	-2.12	0.15	188.72	1	0.000***	0.12	-2.61	0.03	8772.90	1	0.000***	0.07
		Can read only	-0.58	0.32	3.27	1	0.070	0.56	-1.34	0.05	802.29	1	0.000***	0.26
		Can read and write	0b			0			0b			0		
	Total members in the family	1-3	-0.59	0.21	8.15	1	0.004**	0.55	-0.96	0.03	1006.36	1	0.000***	0.38
		4-6	0.01	0.18	0.00	1	0.978	1.01	-0.52	0.02	454.83	1	0.000***	0.59
		>6	0b			0			0b			0		
	Activity status	Unemployed	0.74	0.26	7.92	1	0.005**	2.10	0.97	0.06	294.24	1	0.000***	2.63
		Employer	2.63	1.03	6.46	1	0.011**	13.84	1.52	0.11	182.14	1	0.000***	4.57
		Employee	1.65	0.28	34.14	1	0.000***	5.18	0.59	0.06	90.39	1	0.000***	1.81
		Self-employed (agriculture)	-1.35	0.30	20.93	1	0.000***	0.26	0.16	0.06	7.03	1	0.008**	1.17
		Self-employed (non-agriculture)	0.70	0.28	6.33	1	0.012**	2.01	0.70	0.06	134.33	1	0.000***	2.01
		Family helper	-0.49	0.48	1.04	1	0.308	0.61	0.62	0.09	47.44	1	0.000***	1.85
		Others	0b			0			0b			0		

*Note: B = The estimated regression coefficient; A positive “B” indicated higher log-odds and a negative “B” indicates a lower log-odds.
Std. Error = The standard error of B. Larger standard errors indicates less precise estimates.
Wald = The Wald test statistics for the coefficient.
df = The degrees of freedom of the Wald test. For a single coefficient it is usually 1.
Sig. = The significance or *p* value associated with the Wald test. A small *p* value (for example less than 0.05) indicates that the coefficient is statistically significant. ***$P \leq 0.001$; **$P \leq 0.01$; *$P \leq 0.05$.
Exp(B) = The exponential coefficient, often called the odds ratio. Values greater than 1 indicate increased odds, and values less than 1 indicate reduced odds.
0b = The category that all the other categories are compared against in the model (Laerd Statistics, 2018).

Appendix-X: Wealth quintiles of climate migrants over time. Source: BSS, 2012 and the authors, 2025.

Wealth Quintile Duration of Residence (Year <= 1)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	3134	.5	.5	.5
	Second	3282	.5	.5	1.0
	Middle	17633	2.9	2.9	3.9
	Fourth	208676	33.8	33.8	37.7
	Richest	384866	62.3	62.3	100.0
	Total	617592	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 2)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	5434	.5	.5	.5
	Second	8432	.9	.9	1.4
	Middle	32798	3.3	3.3	4.7
	Fourth	310570	31.4	31.4	36.1
	Richest	631028	63.9	63.9	100.0
	Total	988262	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 3)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	8254	.6	.6	.6
	Second	14400	1.1	1.1	1.7
	Middle	49415	3.8	3.8	5.5
	Fourth	404357	30.9	30.9	36.4
	Richest	830905	63.6	63.6	100.0
	Total	1307330	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 4)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	9101	.6	.6	.6
	Second	17269	1.1	1.1	1.7
	Middle	56968	3.7	3.7	5.4
	Fourth	467648	30.3	30.3	35.7
	Richest	993542	64.3	64.3	100.0
	Total	1544527	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 5)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	12319	.7	.7	.7
	Second	23580	1.3	1.3	2.0
	Middle	66654	3.6	3.6	5.6
	Fourth	533148	29.2	29.2	34.8
	Richest	1190631	65.2	65.2	100.0
	Total	1826333	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 6)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	16554	.8	.8	.8
	Second	25630	1.2	1.2	2.1
	Middle	75170	3.7	3.7	5.7
	Fourth	579321	28.2	28.2	33.9
	Richest	1356573	66.1	66.1	100.0
	Total	2053247	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 7)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	20057	.9	.9	.9
	Second	26211	1.2	1.2	2.0

Wealth Quintile Duration of Residence (Year <= 7)					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Middle	81798	3.6	3.6	5.7
	Fourth	617862	27.4	27.4	33.0
	Richest	1512419	67.0	67.0	100.0
	Total	2258348	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 8)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	25366	1.0	1.0	1.0
	Second	27314	1.1	1.1	2.1
	Middle	88886	3.6	3.6	5.8
	Fourth	654856	26.7	26.7	32.5
	Richest	1655662	67.5	67.5	100.0
	Total	2452084	100.0	100.0	

Wealth Quintile Duration of Residence (Year <= 9)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	26040	1.0	1.0	1.0
	Second	29994	1.2	1.2	2.2
	Middle	91663	3.6	3.6	5.8
	Fourth	681495	26.6	26.6	32.4
	Richest	1731362	67.6	67.6	100.0
	Total	2560553	100.0	100.0	

Wealth Quintile Duration of Residence (Year >= 10)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	53172	2.7	2.7	2.7
	Second	41161	2.1	2.1	4.9
	Middle	64728	3.3	3.3	8.2
	Fourth	314041	16.2	16.2	24.4

Wealth Quintile Duration of Residence (Year >= 10)					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Richest	1463285	75.6	75.6	100.0
	Total	1936386	100.0	100.0	