# Exploring Factors Influencing the Internal Displacement Decisions Amidst Natural Disasters in Bangladesh

**MD MONIRUZZAMAN MUZIB[1,*], SIVASANKAR VEDI[1] AND SHARMIN AKTHER LIZA[2]**
[1]*Department of Economics, Pondicherry University, Puducherry, 605014, India*
[2]*Department of Political Science, Brindaban Govt. College, Habiganj, 3300, Bangladesh*
E-mail: zamanmuzib@pondiuni.ac.in, sivasankar.eco@pondiuni.ac.in, sharminakther.liza@yahoo.com
**\*Corresponding author**

**ABSTRACT**

Bangladesh, a densely populated country in the world's largest coastal delta, is seriously threatened by the ongoing onslaught of major natural disasters brought on by climate change. The main perpetrators, cyclonic storms and floods cause millions of displaced people each year and increase the vulnerability of communities already facing devastation from the environment and poverty due to these disasters. This study explores the complex patterns of internal displacement brought on by cyclonic storms and floods in Bangladesh from 2008 to 2022. The study identifies the patterns, trends, vulnerable districts, and influencing factors of displacement by analysing data from multiple sources. Every year, an average of 6.14 million people are displaced by floods, a persistent problem. Gaibandha is the district most at risk, having seen 13 floods in the previous 15 years. Throughout the study period, Bhola experienced eight strikes from cyclonic storms that decimated the southern coast. These natural disasters force people to move from environmentally susceptible to safe areas. The disaster's intensity or frequency and some economic, social, and political factors influence this decision to displace. The study also identifies factors that influence displacement decisions after catastrophic disasters. Additionally, it emphasises the importance of understanding displacement patterns and influencing factors to make informed decisions about displacement in such situations.

**Key words:** Natural disaster, Vulnerability, Trend, Decision-making factors, Internal Displacement

## INTRODUCTION

Safe shelter is one of the basic needs of human life. Man has fought against all the natural calamities from the early stages of human history to ensure secure living. However, the extreme natural disasters due to climate change have threatened shelter, livelihood, food security, essential treatment, and education at an alarming rate (Moniruzzaman 2015). These extreme natural disasters can be sorted into two categories viz., (1) sudden-onset phenomena, including floods, tropical cyclones, heatwaves, and landslides, etc., and (2) slow-onset phenomena, including sea level rise, drought, erosion, and desertification (Piguet et al. 2011). As natural disasters due to climate change jeopardise the subsistence means of living, resetting or relocating to new places is necessary. So, natural disasters are one of the displacement-inducing factors (Ahsan 2017). People are displaced internally in response to sudden-onset weather disruptions, usually temporary. Conversely, slow-onset weather phenomena compel people to relocate permanently

to geographically distant locations (Piguet et al. 2011). Natural disasters are complex and intertwined with other factors that push and pull people to displacement. It has a dual influence on the direct and indirect migration decisions. Relocations are inherently forced by catastrophic weather events, such as floods and cyclones, as their frequency and intensity are rising (Jha et al. 2018). However, through intensifying already-existing political, social, and economic forces, long-term changes like rising sea levels and changing rainfall patterns indirectly cause migration (Porter et al. 2014). Climate change, then, is a complicated element influencing migration choices. Migration prompted by climate change is a strategy for surviving severe natural disasters that cause displacement (Hall 2006). Bangladesh is a fast-growing country with 169.83 million people (Anonymous 2023) that is located close to the mouth of the Ganges River in a low-lying area of the world's largest coastal delta (Alam et al. 2020, Bautdinova 2022, Sarker 2015). Covering 147,570 km², Bangladesh sits in the northeast corner of the Indian subcontinent, bordering the Bay of

Bengal (Anonymous 2023). Much of the land is flat and prone to flooding due to its location on a river delta. The confluence of three major rivers - the Ganges, Brahmaputra, and Meghna - creates a vast deltaic plain (Sikder and Xiaoying 2014). This topography makes the region vulnerable to water flow from upstream areas towards the Bay of Bengal (Mustafa et al. 2023). An extensive network of over 230 rivers, numerous canals, and waterways crisscrosses the country (Alam et al. 2020). These rivers have many tributaries with a total of 24,140 kilometers (Anonymous 2023). The country grapples with regular seasonal floods (Kasem and Alam 2019). These floods stem from various sources, including snowmelt and coastal storms that cause surges of seawater, intensifying the flooding. The risk is widespread, with almost 25% of the country being inundated yearly (Alam et al. 2011). Floods typically start with flash floods in March-April, followed by rising river levels peaking in August-September, leading to continuous inundation nationwide from March to September (Pavel et al. 2019). The low-lying coastal zone is particularly prone to frequent cyclones, Bangladesh's most common natural disaster. Consequently, Bangladesh's geography exposes it to significant challenges from seasonal floods and cyclones. The country generally faces losses from tropical cyclones of about $1 billion annually or 0.7% of the national GDP. Bangladesh may lose 30% of its food output and 17% of its land to the detrimental impacts of climate change, according to the Intergovernmental Panel on Climate Change (IPCC) predictions (Mustafa et al. 2023).

Asia accounted for 17 of the 20 most significant global displacements that occurred in 2013 (Anonymous 2014). In addition, projections state that by 2050, Bangladesh, India, and China will have 26 million, 20 million, and 73 million displaced people, respectively (Biermann and Boas 2010). Bangladesh underwent a string of severe weather events between 1998 and 2017, according to the Global Climate Risk Index 2019, placing it 7th among the countries most severely impacted (Eckstein et al. 2019). Furthermore, the Global Internal Displacement Database 2023 estimates that between 2008 and 2022, nearly 16.94 million individuals in Bangladesh were moved due to weather-related disasters. Sudden-onset calamities always cause displacement, but economic and social factors such as resource availability, social networks, and livelihood prospects influence whether or not migration happens. Therefore, there is an intricate link between natural disasters like floods and cyclones, internal displacement, and several other variables that affect migratory decisions. This study aims to determine the most vulnerable location in Bangladesh for cyclonic storms and flooding and to look into the trend of internal displacement. Additionally, the study seeks to identify the factors that influence internal displacement decisions made during cyclonic storms and floods.

## METHODOLOGY

This study was based on secondary sources and analysed data on internal displacement in Bangladesh caused by floods and storms between 2008 and 2022. Data was primarily sourced from the Internal Displacement Monitoring Centre (IDMC), Bangladesh Bureau of Statistics (BBS), Ministry of Disaster Management and Relief (MoDMR), Bangladesh Meteorological Department (BMD), and Bangladesh Water Development Board (BWDB). Additionally, the study reviewed relevant documents, such as books, journals, reports, online and offline sources, articles, concepts, theories, and newspapers, to collect background information on the concept.

Hazard categories, types, and sub-types based on CRED EM-DAT. Internal displacements correspond to the estimated number over a given period. The study uses descriptive analysis based on the data to determine the number of people in flood-prone and cyclone-prone areas in Bangladesh who were displaced over the period. This study allowed us to identify significant changes in the number of displaced individuals annually. Additionally, absolute percentage changes were calculated to understand the magnitude of flood- and cyclone-induced displacement compared to the total disaster-induced displaced population. Moreover, the study wants to explore which districts are more vulnerable to floods and cyclonic storms. These techniques were chosen to comprehensively understand temporal and spatial trends in internal displacement due to floods and storms in Bangladesh. However, it is essential to acknowledge the limitations of the data, such as
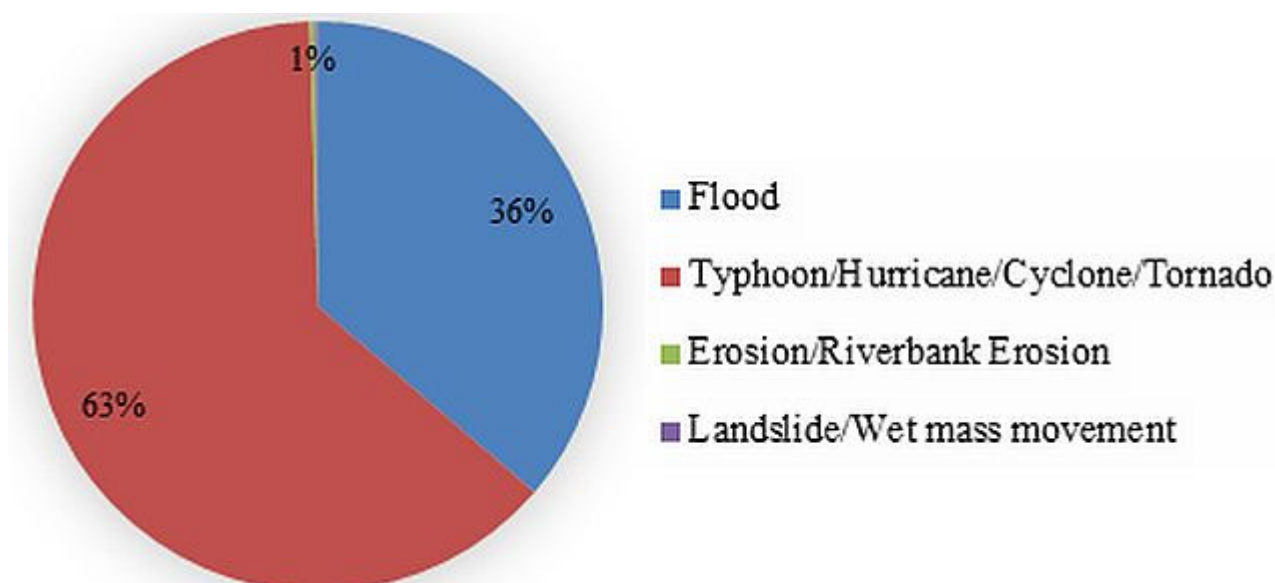
Figure 1. Natural disaster-related Internal Displacement from 2008 to 2022

potential inaccuracies in reporting and the absence of information on individual motivations for displacement. A comprehensive literature review was conducted to identify factors influencing internal displacement decisions due to floods and cyclonic storms in Bangladesh. The study reviewed the literature from 2008 to 2023, focusing on the literature published in databases such as Google Scholar, Scopus, and ScienceDirect. It followed a thematic approach to analyse the qualitative data. To meet our objectives and focus on research issues, we finally got 31 papers after excluding irrelevant materials.

Table 1. Number of individuals (%) affected by natural disaster-related internal displacement (2008-2022)

| Year | Flood | Typhoon/Hurricane/ Cyclone/Tornado | Erosion | Landslide/Wet mass movement |
|------|-------|-----------------------------------|---------|------------------------------|
| 2008 | 97.21(59200) | - | - | 2.79(1700) |
| 2009 | 37.26(500000) | 62.74(842000) | - | - |
| 2010 | 89.98(512000) | 7.91(45000) | - | 2.11(12000) |
| 2011 | 100.00(400000) | - | - | - |
| 2012 | 92.17(600000) | 7.83(51000) | - | - |
| 2013 | 1.93(22400) | 98.07(1137000) | - | - |
| 2014 | 99.82(542000) | 0.18(1000) | - | - |
| 2015 | 23.98(104400) | 76.02(331000) | - | - |
| 2016 | 19.22(118000) | 80.78(496000) | - | - |
| 2017 | 47.35(448000) | 51.79(490000) | 0.07(630) | 0.79(7500) |
| 2018 | 39.46(30480) | 0.33(254) | 56.98(44016) | 3.24(2500) |
| 2019 | 7.53(307240) | 92.46(3773800) | 0.01(440) | - |
| 2020 | 43.34(1925200) | 56.51(2510210) | 0.11(4749) | 0.05(2000) |
| 2021 | 81.44(80420) | 18.44(18210) | 0.01(13) | 0.11(108) |
| 2022 | 32.27(491098) | 67.34(1025000) | 0.08(1210) | 0.31(4760) |

## RESULTS AND DISCUSSION

Bangladesh is suffering greatly from floods, cyclones, erosion, and landslides. Every year, millions of people are compelled to move from their homes to different locations due to damage to properties due to natural calamities. Cyclone storms account for 63% of the displaced individuals between 2008 and 2022, whereas floods account for 36% (Fig 1). This finding is consistent with extensive scientific research emphasizing Bangladesh's fragility to adverse climate effects due to its topography and geographic location (Rahman and Rahman 2015). So, floods and cyclones are the two most common sudden onset weather calamities for internal displacement in Bangladesh (Patwary 2016).

The flood affected almost 0.4 million people, accounting for 100%, the highest percentage, of overall displacement from 2008 to 2022 (Table 1). In addition, cyclones affected 98.07% of people, the highest percentage in the entire study period. Moreover, it displaced a record number of 3.77 million people in 2019 and 2.51 million in 2020. The results of (Cash et al. 2013) and (Andrews 2020) about the effects of floods and cyclones on the people of Bangladesh are comparable to and generally accepted by this result. Floods displaced 1.93 million people internally, accounting for 43.34% of all displaced persons in 2020 (Table 1). About 0.6 million individuals were displaced in 2012, followed by 0.54 million in 2014, the second and third most

significant numbers among the 15 years from 2008 to 2022. These conclusions are corroborated by (Rahaman et al. 2021), who reported that 2014 flash floods in northern and northeastern Bangladesh caused over 800,000 people to be affected and 500,000 to be moved. The 2013 flood affected the least amount of land (10.6%), covering an area of 15650 km$^2$. Each year, the intensity of floods in covered land increases (Fig. 2, Table 2). The 2017 flood affected the most significant proportion (42%) of the area, 61979 km$^2$, illustrating the increasing intensity and coverage of floods similar to (Mirza 2011).

Bangladesh consists of 08 divisions and 64 districts. The Dhaka division's ten districts have significantly impacted the last 15 years. Nearly every year, at least one of its districts is experienced by flooding and waterlogging. This finding is strongly proved by the findings of urban flooding by (Dasgupta et al. 2015). Rangpur and Barisal were the second and third most impacted divisions, with eight and six districts, respectively. Khulna was the least impacted division, with two districts affected throughout the study period (Fig 3). These results suggest that certain areas are more susceptible to natural disasters due to their geographic and environmental characteristics.

During the study period from 2008 to 2022, some districts in Bangladesh were impacted by floods every year, while others were affected one after one year. The district of Gaibandha was submerged 13
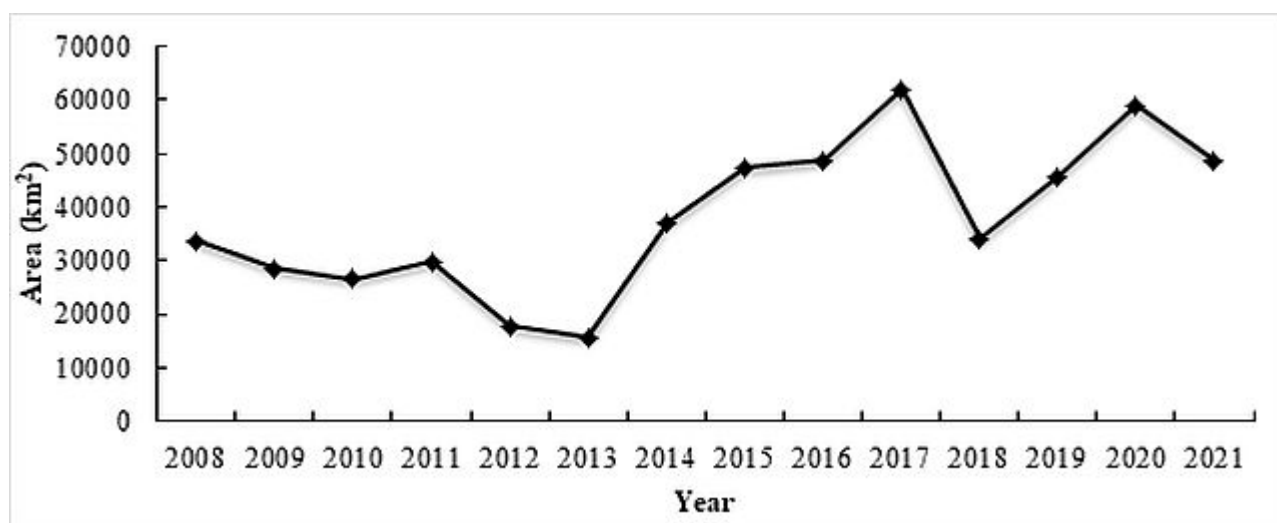


Figure 2. Year-wise flood affected area (km$^2$) in Bangladesh (2008-2021) (Anonymous 2023)
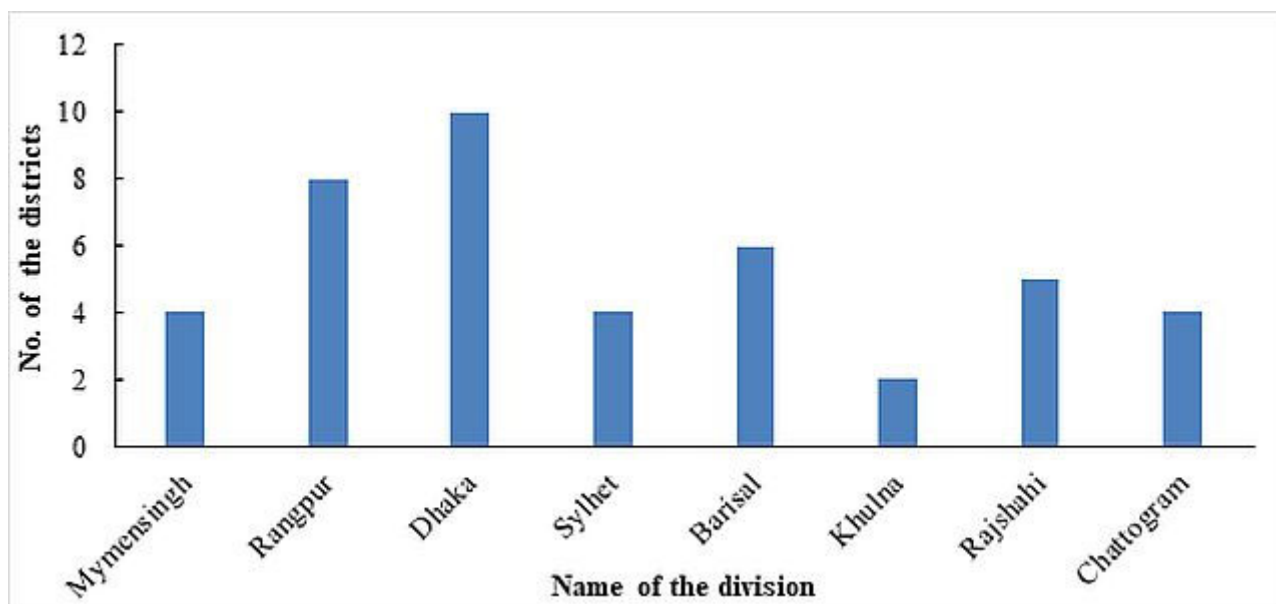
Figure 3. The number of flood-affected districts in each division

times in the last 15 years. Kurigram, Jamalpur, Sirajganj, and Rangpur were all affected twelve, eleven, and ten times, respectively. Gaibandha, Kurigram, Jamalpur, Sirajganj, and Rangpur were the hardest hit practically every year throughout the study period (Fig. 4). So, Bangladesh's most vulnerable districts include Gaibandha, Kurigram, Jamalpur, and Sirajganj. People in these districts do

Table 2. Area (%) affected by flood (2008 to 2021)

| Year | Total area (%) |
|------|----------------|
| 2008 | 23 |
| 2009 | 19 |
| 2010 | 18 |
| 2011 | 20 |
| 2012 | 12 |
| 2013 | 10.6 |
| 2014 | 25 |
| 2015 | 32 |
| 2016 | 33 |
| 2017 | 42 |
| 2018 | 23 |
| 2019 | 31 |
| 2020 | 40 |
| 2021 | 33 |

Source: Anonymous (2023)

not have enough time to recover from flood-related losses, nor do they have the opportunity to rebuild their lives. Every year, they face this natural calamity. Most of the time, they lost and moved from their father's home to another location, sometimes in another district (Fig 5).

The list of significant cyclones from 2008 to 2022 is presented in Table 3. Most cyclones, including Feni, Bulbul, and Amphan, struck Bangladesh and India jointly. However, cyclonic storms such as Mahasen, Roanu, Mora, and Sitrang only struck Bangladesh's south shore. These cyclonic episodes result in long-term socioeconomic problems, such as lost livelihoods, infrastructure damage, and higher poverty rates, in addition to the acute displacement they cause (Islam and Walkerden 2015).

Bhola is the most affected district by cyclonic storms because most of its areas are on the Bay of Bengal coast. It has been affected eight (08) times in the last 15 years. Barisal, Patuakhali, Lakshmipur, Noakhali, Cox's Bazar, Chattogram, Bagerhat, and Satkhira are hit every two years during the study period (Fig. 6). As a result, residents in these districts had little choice but to relocate. People are not relocated because of the flood's magnitude, the area covered, or cyclonic storms. In 2012, approximately 0.6 million people were displaced, but the area was only 17700 km² , accounting for 12% of the country's total area. In 2016, only 0.12 million people were
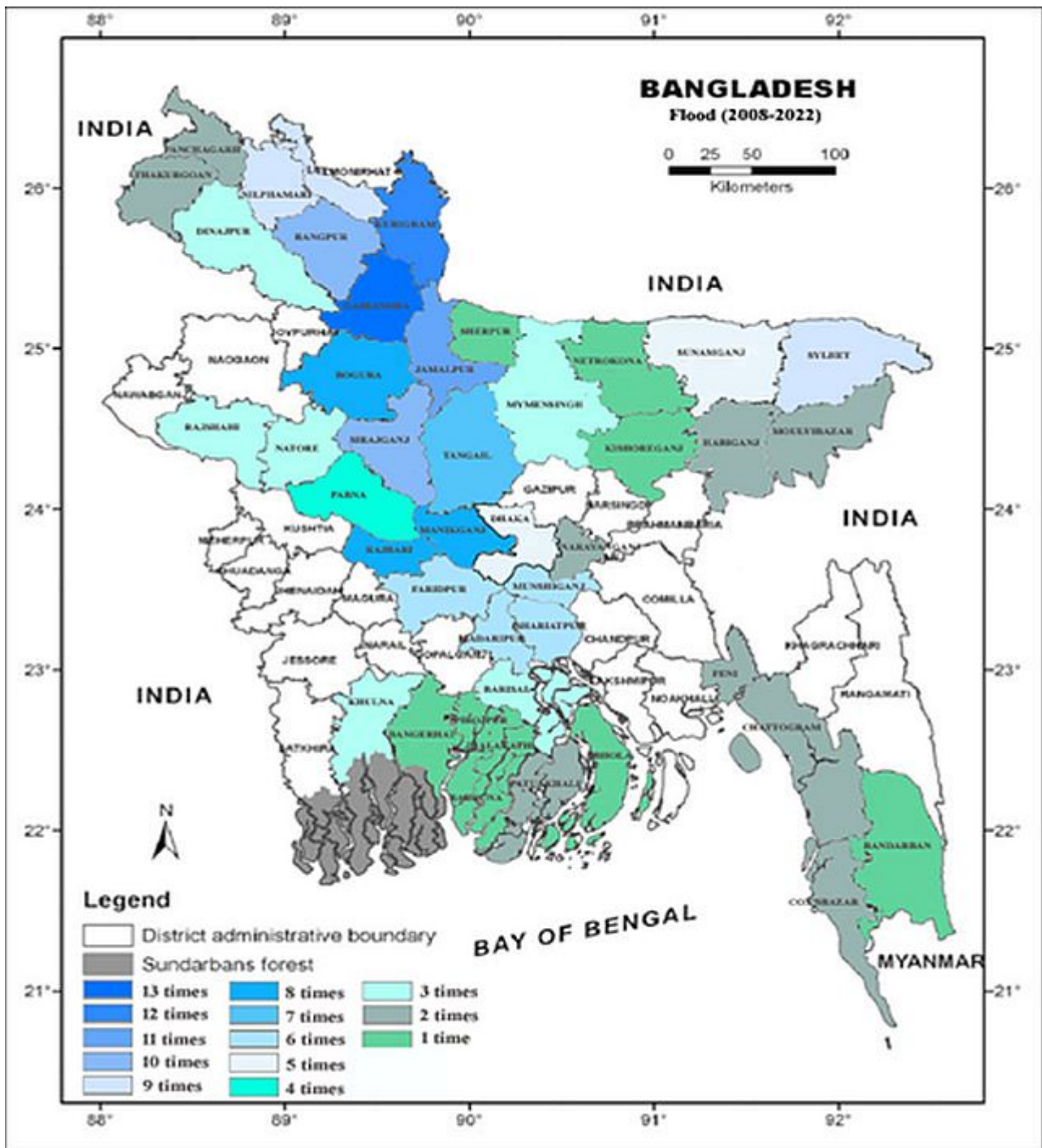
Figure 4. The frequency of the flood in each district in Bangladesh from 2008 to 2022

displaced, but the area was 48675 km², accounting for nearly one-third, or 33%, of the country's total area. As a result, the study inferred that other factors besides natural disasters indirectly influence the decision to displacement.

**Factors influence the internal displacement decision**

Some factors, directly or indirectly, impact the decision to relocate or migrate during floods and cyclonic storms from 2008 to 2022. The study identified direct and indirect influential factors based on available literature about the internal displacement

Table 3. List of major cyclonic storms from 2008 to 2022

| Date | Nature of cyclonic storm | Landfall area |
|------|--------------------------|---------------|
| 25.05.2009 | Cyclonic Storm (AILA) | West Bengal- Khulna Coast |
| 16.05.2013 | Cyclonic Storm (MAHASEN) | Noakhali-Chattogram Coast |
| 30.07.2015 | Cyclonic Storm (KOMEN) | Chattogram-Cox's Bazar Coast |
| 21.05.2016 | Cyclonic Storm (ROANU) | Barisal-Chattogram Coast Potenga |
| 30.05.2017 | Severe Cyclonic Storm (MORA) | Chattogram-Cox's Bazar Coast Kutubdia |
| 04.05.2019 | Very Severe Cyclonic Storm (FANI) | Odisha Coast India then moved towards Bangladesh |
| 10.11.2019 | Very Severe Cyclonic Storm (BULBUL) | Sagar Island of India, then moved to Bangladesh |
| 20.05.2020 | Severe Cyclonic Storm (AMPHAN) | West Bengal- Bangladesh Coast |
| 24.10.2022 | Cyclonic Storm (SITRANG) | Barisal-Chattogram Coast near Bhola |

Source: Anonymous (2023)
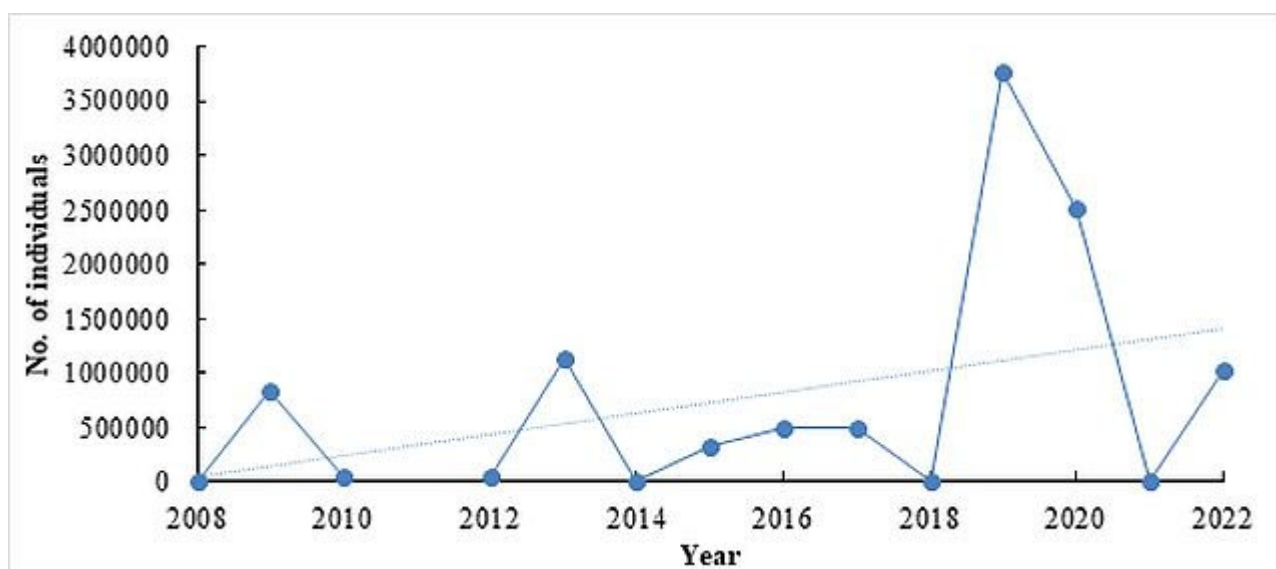


Figure 5. Cyclonic storms-related internal displacement (2008 to 2022)

Table 4. Factors directly influence internal displacement decisions amidst flood and cyclone

| Factors | Description | References |
|---------|-------------|-----------|
| Environmental Factors | ·Environmental degradation, Distance of sea and river,· River bank erosion due to flood, · Erratic and excess rainfall, · High tides, · Land productivity,· Geographic disadvantage | Mustafa et al. (2023), Rana and Ilina (2021), · Barua et al. (2017), Sakapaji (2023), Moniruzzaman (2015), Fusco (2016), Hasnat et al. (2022), Islam and Shamsuddoha (2017), Rahmati and Tularam (2017) |
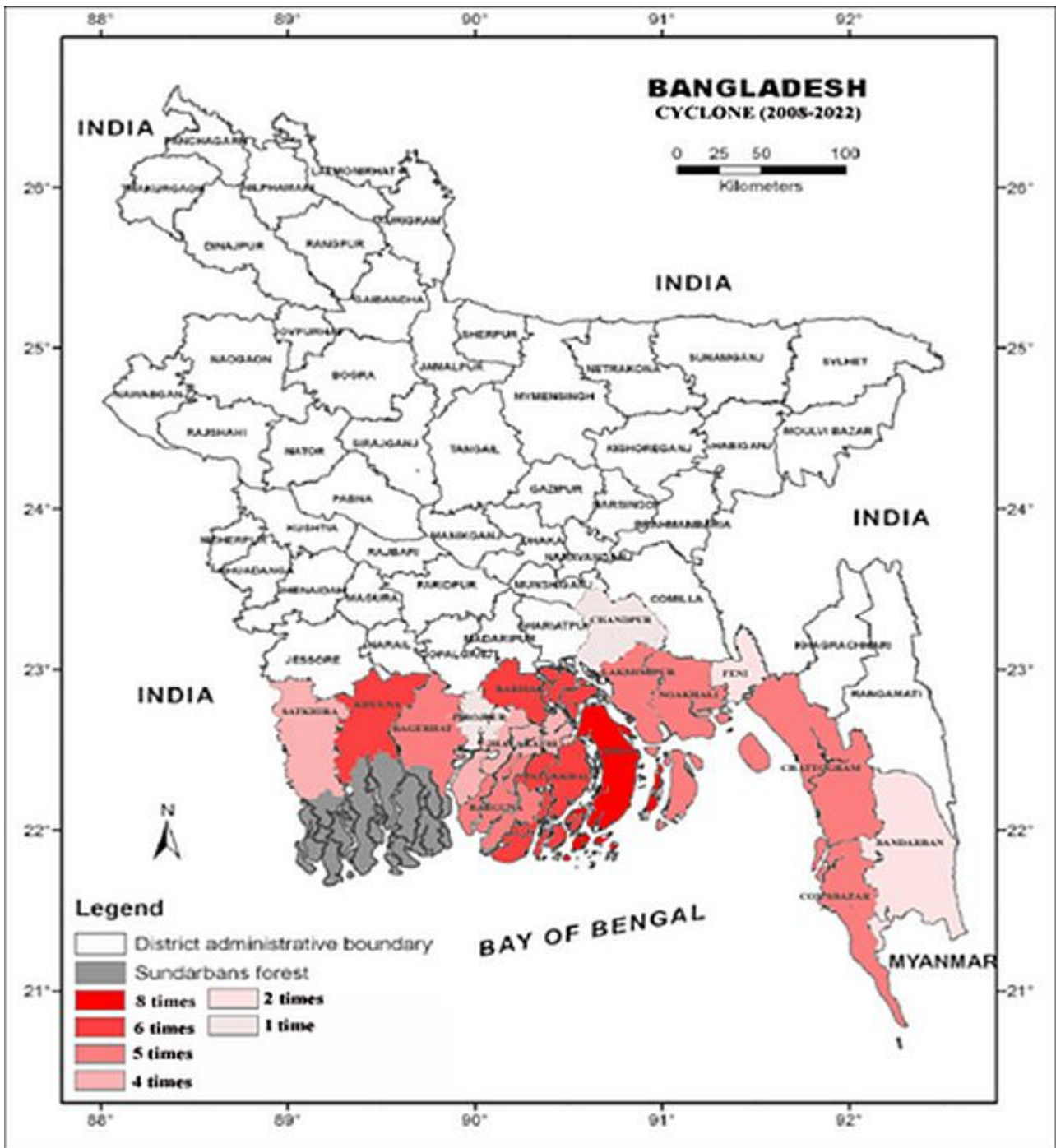
Figure 6. The frequency of the cyclonic storm in each district of Bangladesh  (2008 to 2022)

of Bangladesh (Table 4). Environmental variables underscore the importance of displacement decisions. Displacement decisions are directly influenced by factors such as distance from the river or sea and riverbank degradation caused by flooding. The cyclonic storms cause high tides and waterlogging, rendering the coastal area unproductive. As a result, people must migrate to other locations. Floods are caused by environmental degradation, monsoon rain, and excess rainfall, putting the riverine area at risk. All of these things substantially influence people's displacement.

Lack of economic prospects, damage, loss, and experience from past disasters, poverty, demographic considerations, loan and safety net programs, and security all indirectly influence the decision-making

Table 5. Factors indirectly influence internal displacement decisions amidst flood and cyclone

| Factors | Description | References |
|---|---|---|
| Lack of economic opportunities | Loss of livelihood, lack of working opportunities, lack of diversified livelihood, low-wage employment, Income insufficiency, Unstable small business, Lack of assets and capital, Development discrimination | Mustafa et al. (2023), Barua et al. (2017), Sakapaji (2023), Moniruzzaman (2015), Fusco (2016), Hasnat et al. (2022), Mehedi et al. (2010), Kasem and Alam (2019), Troh (2021), Koubi et al. (2022), Bautdinova (2022), Sarker (2015), Ober (2019) |
| Damage, loss, and previous experiences | Destroyed homestead, health center, and educational institution, Loss of agriculture and fisheries, crop loss, ·Damaged infrastructure, damage to roads,·transportation difficulties, ·Loss of livestock and cattle,·Loss of life·Experiences of previous disaster | Rana and Ilina (2021), Barua et al. (2017), Sakapaji (2023), Moniruzzaman (2015), Fusco (2016), Hasnat et al. (2022), Islam and Shamsuddoha (2017), Mehedi et al. (2010), Akter (2009), Kasem and Alam (2019), Troh (2021), Andrews (2020), Koubi et al. (2022), Bautdinova (2022), Sarker (2015), Best et al. (2021), Pavel et al. (2019), Ober (2019) |
| Poverty | Poor standard of living Food insecurity Lack of drinking water, Lack of health facilities, Lack of sanitation | Rana and Ilina (2021), Barua et al. (2017), Sakapaji (2023), Moniruzzaman (2015), Fusco (2016), Hasnat et al. (2022), Mehedi et al. (2010), Akter (2009), Kasem and Alam (2019), Troh (2021), Andrews (2020), Koubi et al. (2022), Bautdinova (2022), Sarker (2015), Best et al. (2021), Ober (2019) |
| Demographic factors | Household size, Female household head, Age burden, Gender inequality, Family and kin obligation | Sarker (2015), Pavel et al. (2019), Ober (2019) |
| Loan and social safety net program | Lack of social safety net program, Insufficient relief and support from the Government and NGOs, Lack of rehabilitation and reconstruction support, NGOs, or affluent families, Lack of credit facilities, Failure to address the vulnerability and damage of assets, lack of social capital and network | Kasem and Alam (2019), Mallick (2014), Bautdinova (2022), Sarker (2015), Pavel et al. (2019), Ober (2019), Stojanov et al. (2016) |
| Security | Lack of security, Insecure of women & adolescents, Criminal activities during disaster time and pre-disaster time, and stealing, | Mustafa et al. (2023), Hasnat et al. (2022), Ahsan (2017), Mehedi et al. (2010), Akter (2009), Mallick (2014), Best et al. (2021), Pavel et al. (2019), Ober (2019) |

process for displacement during floods and cyclones in Bangladesh (Table 5). These problems are caused by natural disasters such as floods and cyclonic storms. Floods and cyclonic storms, for example, destroy water sanitation facilities, crops, treatment facilities, and land fertility, as well as roads, homesteads, and valuable assets, resulting in loss of livelihood, unemployment, an excess supply of labour, low wages, unstable small businesses, a lack of necessities, and individuals becoming less resilient and more prone to displacement. Indirect factors exacerbate migrating propensity (Gray and Mueller 2012). Larger households, particularly those with many older adults, children, and women, feel apprehensive in the face of disasters. Prior disaster experiences may also influence decision-making about displacement and risk perception. When recovery and reconstruction efforts are hampered by a lack of access to financing, credit facilities, and assistance from the government or non-governmental organisations, displacement becomes a more likely coping mechanism.

## CONCLUSION

This study reveals how internally displaced people in Bangladesh have been severely affected by sudden on-set climatic events. Natural catastrophes, especially cyclones and floods, have a severe influence on internal displacement in the country and have done so since 2008. Although more people were displaced by cyclones (63%) and by floods (36%), the two events are highly hazardous. Furthermore, cyclonic solid storms recorded the most immense displacement in 2019 and 2020. Based on this study, the districts most prone to flooding are Gaibandha, Kurigram, Jamalpur, Sirajganj, and Rangpur. Because of its geographical vulnerability, coastal Bhola was particularly vulnerable to cyclones. Interestingly, the decision to displace is not only influenced by the disaster's magnitude, intensity, or frequency. The study also shows which environmental, socioeconomic, and demographic factors interact to influence internal displacement decisions in the face of natural disasters. Environmental degradation, riverbank erosion, and coastal vulnerability contribute directly to displacement, whereas economic restrictions,

poverty, and a lack of livelihood options indirectly impact movement patterns. Furthermore, previous catastrophe experience, household composition, and availability of resources all influence people's decisions to relocate in the event of natural disasters.

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