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Climate Change, Natural Disasters and Socioeconomic Livelihood Vulnerabilities: Migration Decision Among the Char Land People in Bangladesh

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Abstract The main research objective was to explore the causes and nature of the char peoples' migration decisions due to their livelihood vulnerabilities related to climate change and natural disasters in Bangladesh. Based on a mixed method approach, this study employed a multimethod data collection approach including face-to-face interviews, focus group discussions, key informant interviews, in-depth case studies, community mapping, and participant observations. The study was conducted on 28 chars in the three Northern Districts that is, Nilphamari, Lalmonirhat and Pabna. Results showed that the char people encountered multiple causes assorted with climate change and natural disasters, as well as socio-economic vulnerabilities that reinforced their decision to migrate from one char to another char. The study found that floods, river bank erosion, lack of employment, and fiscal deficits were prominent factors for their migration. These findings provide an important guideline for the governmental and non-governmental organizations working in disaster prevention, policy makers, and development practitioners.

Keywords Bangladesh · Char land · Climate change · Natural disasters · Socioeconomic livelihood vulnerabilities · Migration decision

1 Introduction

Climate change and natural disasters related vulnerabilities are important factors for migration decisions for poor people in vulnerable locations such as char land areas. The term 'char' has been used with a number of synonyms such as riverine land, island, newly-emerged land and so on. As a Bengali term, char refers to a riverine island. Mondal et al. (2015) mentioned that chars can be created in two areas which are called riverine and

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coastal chars respectively. In general, char-lands are islands which adjoin rivers, but which are unshielded from the main lands. Nearly 10% of the world's population lives in these islands (Baldacchino 2006; Kelman and Khan 2013). A number of sources such as Mondal et al. (2015), Paul and Islam (2015), Islam and Hossain (2014), and Kelly and Chowdhury (2002) mentioned that 4–5% of Bangladesh's total population of 160 million live in the chars which cover approximately 7200 km^2. There are 56 large and 226 small chars in the country (Banglapedia 2014). The char lands in Bangladesh are often perceived as a zone of multiple vulnerabilities (Paul and Islam 2015). Among the different agro-ecological zones and hydrological regions of the country, the chars are particularly vulnerable to natural hazards, such as floods, erosion and drought, low and unstable land, remoteness from the mainland areas, and absence of extension and support services (Mondal et al. 2015).

The char land is relatively isolated and fragile, with poor and vulnerable communities living there (Kelman and Khan 2013). In most of the chars in Bangladesh, the char dwellers have few economic assets, minimal access to basic service or markets, and consequently have few economic opportunities. Share-cropping, irregular poorly-paid agricultural day labour, and livestock rearing are the main income sources for the poorest of these households. The chars face threats to flooding and erosion that can destroy crops, croplands and homesteads, and cause significant disruption to char livelihoods. However, food insecurity is one of the major causes of the vulnerability of the char people (WFP 2002). Living with, and fighting against floods is a part and parcel of the life of a char dweller. As a result, migration from an original char, and resettlement to a new char, as victims of erosion, has happened at least once in the lifetimes of most of the char inhabitants (Mondal et al. 2015). Agriculture is the mainstay of livelihoods in these riverine chars; however, the cropping system of the chars is at risk to different hydro climatic hazards due to their vulnerable physical and climatic situation (Mondal et al. 2015).

Chowdhury (2007) reports that most of the char households are reliant on daily wage employment for survival. The high food insecurity and the low income which ensue from this kind of employment results in the out migration of at least one household member (usually an adult male) to find employment, leaving women and children to subsist. The lack of communication (Zaman 1991), heavily dependence on seasonal income (WEP 2002), sustained losses in income, assets, consumption and future household growth (Khandker 2009; Carter and Barrett 2006), under-nutrition and malnutrition (DFID 2010), and lack of NGO and public services (Paul and Islam 2015; Islam and Hossain 2014; Islam and Hasan 2016) means the life of these families is very vulnerable. A number of studies reported that more than 6.5 million people of the char lands struggle for a living without basic infrastructure or access to proper sanitation, primary healthcare, education, or protection from the law. The reality for these inhabitants of char-land is that about 80% are ultra-poor and have no land of their own. They live on land leased from others who exploit them in various ways (Islam and Hossain 2014; Paul and Islam 2015; Islam and Hasan 2016). Further, the char people are excluded from state initiatives and institutional services such as legal aid, health, education, livelihoods, safety net, village courts or formal judiciary (see Paul and Islam 2015; Islam and Hossain 2014; Islam and Hasan 2016). A number of disasters and climate change related vulnerabilities such as climate shocks, geographical isolation, poor infrastructure, poor access to basic services, weak markers, fragmented economic activities, and high transaction cost, are very common in char land areas. As a result, the migration/displacement among the char people is very high. This study captured a number of interrelated factors related to climate change and disasters, along with economic and social vulnerabilities that force migration decisions among the char people.

2 Literature Review

This study considered four principal concepts of economic and social vulnerabilities, climate change, natural disasters, and migration decision. This paper only considers the literature which demonstrates the nature and causes of migration decisions due to climate change, natural disasters, and economic and social vulnerabilities. Vulnerability is most often associated with poverty, but it can also arise when people are isolated, insecure and defenceless in the face of risk, shock or stress (Paul and Islam 2015). Kelly and Adger (2000) stated that vulnerability is the ability or inability of individuals or social groups to respond or adapt to, cope with, or recover from, any external stress placed on livelihoods and well-being. Most vulnerability literature has emphasized the physical and ecological vulnerability of coastal areas. The natural hazard literature has tended to emphasize hazard assessment, and has placed less effort on estimating economic or behavioural responses (Felsenstein and Lichter 2014). A significant number of studies have focused on climate change related vulnerabilities (Kelly and Adger 2000; Cutter et al. 2003; Hesselberg and Yaro 2006; Adger 2006; Snover et al. 2007; Fussel 2007; Amos et al. 2015; Bergstrand et al. 2015; Simane et al. 2016). From a socioeconomic perspective, it is not so much the magnitude of the event that is important, but rather the ability of people to cope with its results (Felsenstein and Lichter 2014). In the context of climate change, the Intergovernmental Panel on Climate Change (IPCC) adopts a variant of this definition, stated as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC 2007). In this definition, vulnerability is typically presented as a condition of three inter-related factors: exposure to impacts; sensitivity to impacts; and capacity to adapt to impacts (Adger 2006; Smit and Wandel 2006; Snover et al. 2007; Simane et al. 2016; Reed et al. 2013).

The relationship between climate change, natural disasters and migration has been well documented in the literature. Migration is a complex and multidimensional process that may occur for different reasons. A number of studies mention migration as a coping strategy that may reduce environmental and socio-economic vulnerabilities (Warner 2010; Bhatta et al. 2015). McLeman and Smit (2006), and Drabo and Mbaye (2011) described migration as a possible adaptive response to risks associated with climate change. Naudé (2008) mentioned three climate change channels that can intensify migration, namely scarcity of water and land, natural hazards, and conflicts over natural resources. A number of other studies, for example, Barnett and Adger (2007), have argued that people migrant from one community to another because of climate change related tensions and conflicts. On the other hand, McGregor (1994) clearly established the link between environmental change, migration and food insecurity. In the context of char land, a number of global studies have recognized that migration is a common phenomenon in char land areas due to the climate change and natural disasters, for example Lewis (1999), Karim and Mimura (2008), Brown and Funk (2008), Gero et al. (2010), Webb and Kench (2010), Black et al. (2011), Rankey (2011), Connell (2013), and Siddiqui (2014).

In Bangladesh, a number of studies have reported climate change and natural disasters as a cause of migration, such as Hutton and Haque (2003), Mani et al. (2003), Sarker et al. (2003a), Baki and Gan (2012), Feldman and Geisler (2012), Penning-Rowsell et al. (2013), Kelman and Khan (2013), Islam and Hossain (2014), Paul and Islam (2015), Bhatta et al. (2015), Islam and Hasan (2016), and Islam and Shamsuddoha (2016). Most of these studies document that the post-disaster recovery is expected to be challenging in char lands due to isolation, insularity, marginalisation, small land size, small population size, and small

resource base, A number of studies itemize the problems in the char areas, such as lack of fresh water, food, and public services that are forced to relocate to the char people to another safer lands (either another char or mainland, for example studies by Mimura et al. (2007), Webb and Kench (2010), Rankey (2011), Younus and Harvey (2013), Connell (2013), Kelman and Khan (2013), Paul and Islam (2015), and Islam and Hasan (2016). Saroar et al. (2015) assessed the linkages between people's livelihood vulnerability and their intention for outmigration from the coast. They identified vulnerability reduction measures for which the implementation may significantly arrest the livelihood of forced migration. Their findings predicted that one in every three families would be forced to migrate; however, there was a clear linkage between mass displacement and livelihood vulnerability.

A number of authors such as Cutter et al. (2003), Hahn et al. (2009), and Shah et al. (2013), used economic, social, and natural factor indicators to measure vulnerability. A number of authors such as Turton (2000), Knutsson and Ostwald (2006), and Amos et al. (2015), used the Sustainable Livelihood Approach (SLA) to assess livelihood vulnerability compared with five livelihood assets, namely, natural, social, financial, physical, and human capital. Hesselberg and Yaro (2006) used ecological, socio-cultural and economic political perspectives to measure vulnerability. Ribot (1995) showed that social causality and physical processes are interlinked. Dilley and Boudreau (2001) argued that the extent to which people suffer from calamities of any kind depends on how their livelihood is exposed to hazards or shocks, and on their capacity to withstand these shocks. In agreement with this view, climate change vulnerability is shown to be dynamic and dependent on both biophysical and social processes (IPCC 2014; O'Brien et al. 2007). The above discussion clearly shows that vulnerability assessment must integrate and examine interactions between humans and their physical and social surroundings. This study considered a number of components related to ecological, socio-cultural and economic political perspectives to measure vulnerability. In particular, the study considered three main indicators. The first and second indicators are related to natural climate change and natural disasters, namely agro-ecological factors and hydro-climatic hazards, while the third and fourth indicators are associated with the socio-cultural perspectives, namely economic vulnerability and social vulnerability.

There are number of significant studies conducted in the char land areas in Bangladesh. These studies examined climate change and disasters, along with economic and social vulnerabilities that forced migration and human displacement. For example, CARE-Bangladesh and DFID-B (2002) reported that 25% of families living in the Brahmaputra River (northwest Bangladesh migrated three times over 10 years. Sarker et al. (2003b), and Paul and Islam (2015) found that char people had low levels of understanding about their rights, and they faced difficulties accessing have increased the risks for human habituation in newly emerged chars. The supports from government or other organizations were insufficient when compared to the char peoples' needs. Illiteracy, lack of social awareness, and lack of communication and transportation among the char people is very common in Bangladesh. Paul and Islam (2015) argued that many studies reported the poverty, natural disasters, climate change, and displacement of the char people, but rarely discussed their rights to development or to access public services. Islam and Hasan (2016) argued that climate migrants are displaced by the climate change induced environmental disasters as the result of incremental and rapid ecological change and disruptions that include increased droughts, desertification, sea level rise, and the frequent occurrence of extreme weather events such as hurricanes, cyclones, flooding, and tornados.

Perch-Nielsen et al. (2008), Islam and Hasan (2016), and Islam and Shamsuddoha (2016) presented a series of case studies which showed that migration is associated with sea level rise and river and coastal flooding. They outlined a conceptual model of migration decision-making in the face of natural hazards, disasters and social vulnerabilities. On the other hand, Penning-Rowsell et al. (2013) showed that 'push' and 'pull' factors affected hazard-related migration. They mentioned that the vulnerability of the rural population to hazards may be increasing due to their reduced savings. Islam and Herbeck (2013) found that in coastal areas, the livelihoods of fishing families is associated with endemic poverty and a series of vulnerabilities, both of which and contributed to migration decisions. From the above analysis, it can be concluded that most of these studies considered the issue or migration issue with physical instability such as housing and settlement, and agricultural damages such as flood and erosion, but very few have comprehensively examined climate change and natural disasters with the economic and social livelihood vulnerabilities that force the char land people in Bangladesh into migration decisions.

3 Research Objective and Methodologies

3.1 Research Objective

The main research objective of this study was to explore the nature and causes of the Bangladesh char peoples' migration decisions, and the association of these decisions with their livelihood vulnerabilities related to climate change and natural disasters. The specific objectives of the study were to-

1. know the situations of the socio-economic livelihoods and vulnerabilities of the char land people;
2. discover the types of climate change and natural disaster related threats that the char people face in the char land areas; and
3. show how the char people take migration decisions due to climate change, natural disasters and socio-economic vulnerabilities.

3.2 Research Methodologies

3.2.1 Study Area and Location

The study captured migration decisions in three northern riverine char land districts in Bangladesh Lalmonirhat, Nilphamari and Pabna. These char lands are identified as highly vulnerable areas of Bangladesh in which disproportionate numbers of extremely poor people struggle to generate their livelihoods. Around 40% of these people live in poverty, with a further 25% classified by government as 'extreme poor' and rarely able to take advantage of the productive opportunities emerging from economic growth.

3.2.2 Research Approach

The study used a mixed method approach of both qualitative and quantitative methods. A number of authors such as Islam and Hossain (2014), Islam and Walkerden (2015), Paul and Islam (2015), and Islam and Hasan (2016) have used a mixed method approach for similar studies. The fundamental rationale behind a mixed methodology was to combine

the strengths of qualitative and quantitative methods. The overall purpose and central premise of mixed methods is that combining methods would provide a better understanding of complex phenomena than either approach used alone (Azorin and Cameron 2010). In addition, within a mixed method approach there was an opportunity for the researcher to verify this investigation from different ontological and epistemological points of view (Paul and Islam 2015; Islam and Hasan 2016).

3.2.3 Respondents: Sample Design

The study used a multistage sampling procedure. A stratified cluster sampling was used for the quantitative investigation. Here, upazilas were considered as strata and chars considered as cluster. The size (n) of the sample was determined by using following a widely used statistical equation on conditions that the sample would be 95% likely to yield an estimate with a given level of precision (Fleiss 1981). Precision was defined as the tolerated margins of error in the estimate.

$$n = \frac{P(1-P)\left(Z_{\alpha/2}\right)^2}{(P-p)^2}$$

where n = Size of sample = 392, P = Proportion to be estimated = 0.5, p = Estimate of P, P-p = Margin of error in p = 0.05.

Using simple random sampling, this study considered 28 chars from 51 (more than 50%), with two chars from each union. In this regards, the study considered the population portion of char areas in each of the three districts, and on the basis of this calculation, the researcher selected two unions from each upazila. From char lands, each stratum of these two unions were selected with Probability Proportional to Size (PPS). From each union, two clusters (chars) were selected by using a systematic random sampling technique. Finally, by using systematic random sampling, 14 households were selected from each char for face-to-face interviews. The total number of respondents for the study was 392. This study included the Dimla upazila from Nilphamari district (56 respondents from 4 chars in 2 unions); Hatibanda, Lalmonirhat Sadar, Kaliganj, and Aditmari upazilas from Lalmonirhat (224 respondents from 16 chars in 8 unions); and Pabna Sadar and Bera upazilas from Pabna (112 respondents from 8 chars in 4 unions). Among the respondents, a large number of families had 1–2 members (43%), 49% were male and 51% female. From the selected households, 22% of households were headed by females. 57% of the sampled population were literate, and 62% household heads worked as day labours as their main occupation, 22% were unemployes, 13% were housewives, and 3% had other occupations.

3.2.4 Data collection Methods and Instruments

Given that the conditions of the char people in terms of understanding their livelihoods and socio-economic consequences required qualitative methods, data were collected using a structured interview schedule along with other methods such as focus group discussions (FGDs), participant observation, community mapping, in-depth case studies, and key informant interviews (KIIs) (Table 1). Purposive sampling was used to select participants for these qualitative techniques. Separate data collection instruments were employed, such as a structured interview schedule for interviews, guidelines for in-depth case studies, FGDs, and KIIs, and checklists for community mapping and participant observations. Data

Table 1 An overview of methodological tools

Data collection methods	Instruments	Sources of data	Total units
Community mapping	Checklist	Char community	28 chars
Participant observation	Checklist	Household	28 chars
Interview	Structured questionnaire	Char people	392 from 28 chars and 14 unions (equal number from each union and char)
FGDs	Guideline	NGO workers, school teachers, community people and community leaders from char	28 (1 from each char)
Case Studies	Guideline	Community people	28 (1 from each char)
KIIs	Guideline	GO officials	21 (7 from each district)

were collected for each individual (char people, community leaders, and NGO workers) using suitable instruments.

3.2.5 Quality Assurance: Data Analysis Techniques, Validity and Reliability

The study was pre-tested in the one char in the Bera upazila in the Pabna district, then the data collections instruments were further modified based on field experiences. Reasonable precautions were taken so that data collectors would be free from any temptation to benefit in any way from the concerned parties. Qualitative data were collected from FGDs, KIIs and in-depth case studies were carefully written and compiled immediately after returning from the field with the data collectors transcribing verbatim the recorded speech of their respondents. Data and information collected for each area were stored into separate files with a code number, and then compiled and triangulated according to the nature, type, and characteristics of the data and information.

SPSS (19.0 version) was used for quantitative data. The study considered three main variables: socioeconomic livelihood vulnerabilities; types of climate and natural disaster threats; and causal factors of migration decisions. A triangulation data analysis technique was used to examine qualitative and quantitative data based on thematic approach. This integrated and triangulation ensured the study could to find the interacts influences of variables from different dimensions.

4 Results

4.1 Socio-Economic Livelihood Situations and Vulnerabilities Among the Char People

Table 2 presents the livelihood situation of the char people on various livelihood indicators, such as socio-economic conditions, employment and income, housing and land, the

Table 2 Living conditions of the char people

Features of livelihoods	Nilphamari	Lalmonirhat	Pabna	Average
Socio-economic condition				
Average household family size	34% (2–3) members	38%	36%	36%
Literacy rate	33%	36%	38%	36%
Number of women headed families	21%	23%	25%	23%
Employment and income				
Working full time	40%	38%	36%	38%
Part time	41%	42%	44%	42%
Child employment	7%	9%	12%	10%
Average annual income	Tk. 38,201	Tk. 34,211	Tk. 31,322	Tk. 34,578
Unemployment rate	18%	22%	25%	22%
Housing and land				
Lived in own house	29%	32%	39%	33%
Lived in own houses without payment of rent	36%	42%	42%	40%
Lived in house built on khas land	20%	22%	36%	26%
Institutional access to khas land	21%	28%	23%	24%
Household owned land	26%	42%	39%	36%
Landless	74%	78%	82%	78%
1–5 decimal land	22%	18%	16%	19%
Small holder people with 6–15 decimal land	4%	4%	2%	3%
Food intake				
Three meals per day	21%	18%	18%	19%
Two meals per day	77%	76%	75%	76%
Access to local level public services				
Received UP services	53%	42%	47%	51%
Access to a toilet	22%	23%	18%	21%
Health servicers	35%	34%	36%	35%

local level public services, and food intake and food security. The findings indicate that there are no significant regional variations in these locations for most of the features are very poor in all three districts, though. Of the char people in this study, 36% had 2–3 members in the family which is consistent with the average family size in Bangladesh. The literacy rate was 36% and the highest literacy rate was in the Pabna district (38%) (compared with 56% nationally). The average number of families in this study headed by women was 23% (national 11% in 2011). The unemployment rate was 22% with the highest rate (25%) was in the Pabna district (national 9%). Thirty-eight percent of the char people were employed full time and 42% part-time. Ten percent of the children in the char areas were wage earners with the highest in the Pabna district (12%). The average annual income of the char people was Taka 34,578 (USD 410) (national USD 1,068), and the lowest average income was in Pabna district (Taka 31,322 (USD 368). The Pabna district had the lowest socio-economic status compared with other two districts.

Thirty-three percent of the char people lived in their own houses, 40% lived in their own houses without paying rent, 26% lived in a house built on khas land, 24% had institutional access to khas land, and 36% of households owned land. A large portion (78%) of the char people were landless (national 46%), and the highest (82%) number of people owning land was in the Pabna district. Nineteen percent of the char people owned only 1.5 decimal land, and the small holder people with 6–15 decimal land holders were only 3%. Eighty percent of the char people did not eat three meals each day, 76% could eat two meals a day. Regarding the local level public services, 51% of the char people received the union parishad services, 35% of the people in this study were covered by local public health services, and only 21% of the people had access to a toilet.

The living conditions and opportunities in char land areas are very poor. From the in-depth case studies and FGDs, it was evident that public services in the local areas were lacking, including education and medical care. One char dweller in the Dilma upazila in the Lalmonirhat district said:

> Currently there is no doctor and clinic in our char. Two years ago, I saw one nurse here, but after river erosion and displacement, I did not see her.

A community leader from a char in the Aditmary Upazila in the Lalmonirhat district said in a FGD:

> The main reason of the lack of education and teachers here is that no teacher wants to reside there. Everybody knows that the char is located in the remote area. There is no special subsidy or rental houses for the teachers here. As a result, no teachers want to go there. They consider chars as uninhabitable.

One farmer from the Bera Upazila in the Pabna district said:

> We have never seen any agriculture officer in our char. I have heard of them, but have never seen them with my own eyes. I also intentionally appealed to the government and NGOs to give us boats. This will ease our lives and help in emergency situations like transporting pregnant women to hospitals.

The data showed that the duration of settlement among the char people was not very long. On average, half of the people in this study had lived in the char land for less than 5 years, 28% for 5–9 years, and 14% for 10–19 years (Table 3). This finding indicates that the probability of migration among the char people is frequent. The highest number of people (7%) migrated from the neighbouring char (Table 4), which is a common feature in Bangladesh. Due to climate change and disaster related vulnerabilities, the char people tend to move from one char to a nearby char. Thirteen percent of the study participants

Table 3 Duration of household settlement in the chars by district in years

Year	Nilphamari (n = 56)		Lalmonirhat (n = 224)		Pabna (n = 112)		Total (n = 392)	
	No of HH	%	No of HH	%	No of HH	%	No of HH	%
<5 years	38	67.86	99	44.19	59	52.68	196	50.00
5–9 years	14	25.00	68	30.36	26	23.21	108	27.55
10–19 years	03	05.36	39	17.41	13	11.61	55	14.03
20–30 years	01	01.78	14	06.25	09	08.04	24	06.12
30+ years	00	00	04	01.79	05	04.46	09	02.30

Table 4 Place of origin of the households (by districts)

Place of ancestral	Nilphamari (n = 56)		Lalmonirhat (n = 224)		Pabna (n = 112)		Total (n = 392)	
	No of HH	%	No of HH	%	No of HH	%	No of HH	%
Mainland	07	12.50	30	13.39	15	13.39	52	13.27
Neighbouring char	38	67.86	169	75.45	78	69.64	285	72.70
Other district	03	05.36	06	02.68	05	04.46	14	03.57
Born in this char	08	14.29	19	08.48	14	12.50	41	10.46

migrated to their chars from the mainland, 10% of the people were born in the same char, and a small number (4%) originated from other districts. The highest number of people (75%) came from neighbouring chars in the Lalmonirhat district, which was 7% less than the Nilphamari, and 5% less than in the Pabna district.

Study participants reported in FGDs that living in the char land was a temporary arrangement, and they frequently moved from one char to another mainly due to flood, lack of employment, and low income. Thus, the char people moved in order to gain an income and for a safer environment. One community school teacher (who came from mainland to teach) said:

> I could find very few students in my school who could stay at school from class I to V because of their frequent movement from one char to another char.

An Assistant Upazila Education Officer (AUEO) said:

> We could not establish any primary school in the char lands because in some seasons we did not get sufficient number of students due to their continuous movement.

Many char land people advised that even they had to shift their houses due to their homelands being destroyed during the rainy season. During the in-depth case studies with the char people, a number of day labourers said that they had to go another char to get waged labour, which was sometimes 10 km from their house. If they worked in a location continuously for 6 months, then they moved to those chars with their families. One woman from the Kaliganj upazila in the Lalmonirhat district reported her own settlement and place of origin in the char land:

> I am now 42 years, and I have three children. So far, we [have] moved around 5 chars in this Bera upazila, and fortunately my three children were born in three different chars. Before, we lived in the Bera town. I was married forcedly by my parents when I was just 16 years old. My husband moved to this char due to the loss of his business. He has no capital or work [so we could not] live there. Due to the lack of wage labour, my husband moved one char to another. Finally, we returned [to live] in this char when my husband died last year due to high fever and jaundice. My eldest son moved to another char when he got married. I am now passing a very sever life with my two children. I make chanachur [spicy crispy food made my flower] and sell it throughout the char. But my average total sales per day is Taka 80 (less than USD1) and I cannot support my family. I am thinking I will move to Bera upazila.

4.2 Types of Climate Change and Natural Disaster Related Threats in the Char Land Areas

Table 5 presents the climate change and natural disasters vulnerabilities of char land areas on four indicators: agro-ecological, hydro-climatic hazards, economic, and social factors that the char people face. The findings indicate that natural and climate related changes and hazards, along with economic and social vulnerabilities had wide ranging impacts on char peoples' migration decisions. The most common reasons were river erosion (100%), flood (99%), food deficiency (99%), lack of employment (98%), sand deposition (92%), and low level of production and loss of properties during disasters (each 91%). Eighty-nine percent of the char people mentioned that they migrated due to debt, food insecurity (88%), untimely rainfalls (83%), and low levels of soil fertility (80%). Social vulnerability also was a significant cause of migration. Nearly half of the char people mentioned these issues as causes of their migration decision, and local conflict was the most frequent cause (65%) among migrants.

4.3 How Climate Change, Natural Disasters and Socio-Economic Vulnerabilities Lead to Migration Decisions

This study clearly showed that a number of climate change and natural disaster related threats along with economic and social vulnerabilities forced the char people to migrate from one char to another char. These findings were confirmed through qualitative methods. One local NGO worker from the Hatibanda upazila in the Lalmonirhat district explained migration decisions:

> I think both natural and economic causes are accountable for our migration decision, and it is really complex. These causes are completely different from the causes faced by the people of the mainland. I think no one wants to leave his/her own house if it can be avoided. I have seen that the char people lose their houses and properties due to natural disasters. Still they want to stay because they know many people and they have their own relatives here. But they are bound to leave when they did not have any work or income in the char.

One agriculture labourer from the Aditmari upazila in the Lalmonirhat district stated:

> Our main problems are flood and river erosion. The flood destroys our houses, homesteads and agricultural crops. Sometimes the alluvial agricultural lands are not available due to sand deposition, and then we do not have any work, we cannot even find any kind of work on a cheaper wage. Sometimes, we leave our houses and go to another char if we know there is some work [there].

A woman from the Bera upazila in the Pabna district said:

> Whenever we try to stand on our feet, flood throws us right back onto the ground. We have to relocate in every few days because we keep losing our homes to river erosion. It is very difficult to live like this, and to continue to send our children to school.

Another day labourer from the Pabna sadar upazila in the Pabna district urged:

> The Padma River forces us to relocate every year. I requested to the management of the river to build dams so that the households of our village would be saved. We

Table 5 Climate change and disasters that lead to vulnerability and migration among the char people

Variables	% People migrated[a]			
	Nilphamari	Lalmonirhat	Pabna	Average
Agro-ecological factors				
Soil	78	80	82	80
Moisture	65	68	72	68
Drainage	67	59	56	61
Temperature	72	74	75	74
Hydro-climatic hazards				
Huge rainfall	69	66	67	67
Untimely rainfall	86	84	78	83
Droughts	72	77	78	76
Heat wave	65	58	65	63
Cold wave	42	42	38	41
Flood	100	100	98	99
Fog	67	62	66	65
River erosion	100	100	100	100
Sand deposition	89	92	95	92
Hail storm	67	65	65	66
Tornado	65	67	66	66
Wind	72	68	65	68
Economic vulnerability				
Landlessness	78	82	84	81
Lack of employment	100	98	97	98
Fiscal deficit	100	98	98	99
Debt	89	92	86	89
Low level of production	92	96	84	91
Food insecurity	88	87	88	88
Loss of properties during disasters	92	88	94	91
Social vulnerability				
Local conflict	65	69	62	65
Political reason	43	52	42	46
Non-cooperation from neighbour	56	66	53	58
Mental shocks	44	49	34	42

[a] Multiple answers were possible

> want compensation for the damage due to climate change. We do not want relief. We just want to live safely as citizens of our country.

The char people do not have access to reliable income generation mechanisms, and r training. very few char people received any kind of training (Table 6). This may occur either due to a shortage of training facilities by government and non-government organizations in the char areas, or because these char people were excluded from training services due to their financial vulnerability or geographical isolation. The highest number

Table 6 People received training from the service providing organizations on different issues[a]

Type of training	% of people received training
Livelihood promotion	7.9
Crop production	19.3
Homestead gardening	77.8
Tree plantation	17.2
Fish production	3.9
Livestock rearing	59.8
Poultry rearing	64.0
Disaster preparedness	49.8
Group dynamics	24.8
Gender sensitivity	6.9
Social/legal rights awareness	13.9
Skill training (off-farm trade)	1.2
Product marketing	0.0
Hygiene behaviour	16.9
Community birth attendant training	3.0
Concepts on HIV/AIDS	14.2
Environmental awareness	3.6

[a] Multiple answers were possible. People received training from Concern Worldwide, Government organizations and local NGOs

of the char people received training on household gardening (78%), followed by poultry rearing (64%), and livestock rearing (60%). A significant number of the char people did not get any training on important livelihood aspects, such as livelihood promotion (only 8%), fish production (4%), community birthing attendant (3%), environmental awareness (4%), and off-farm skill training (1%). None of the char people received product marketing training. The number of people who received training on disaster preparedness was 50%, social and legal rights awareness (14%), gender sensitivity (7%), hygiene behaviour (17%), tree planation (17%), and concepts of HIV/AIDS (4%) were also lower. This evidence clearly indicates that the char people have less preparedness to face the climate, disasters and socio-economic vulnerabilities, which may play significant role in making migration decision.

5 Discussion and Conclusion

This paper reports the results of a mixed method study which examined the causes and nature of the char peoples' migration decisions due to their vulnerabilities to climate change and natural disasters in three Northern Districts of Bangladesh. There are a number of limitations and challenges for conducting this study. The remoteness of the study areas and local power structure of the char areas presented some barriers for data collection (Paul and Islam 2015; Islam and Hasan 2016; Islam et al. 2014; Islam and Siti Hajar 2013). Despite these limitations, the findings of this study present a rich picture of the migration decisions of the char people. These findings indicate that opportunities for a good livelihood in char land areas are very poor as indicated by a high illiteracy rate (64% compared with 38.5% nationally), families headed by women (23% compared with 11% nationally in 2011), unemployment rate (22% in char areas and 9% nationally), and that 10% of the children in the char areas were wage earners. This finding is similar to many previous

studies (Islam and Hasan 2016; Paul and Islam 2015; Amos et al. 2015; Simane et al. 2016; Hesselberg and Yaro 2006; Fussel 2007. Amos et al. (2015) and Combest-Friedman et al. (2012) mentioned that the socioeconomic characteristics of individuals for example their age, gender, education, level of income, and occupation, also has an important role in how people in the coastal areas in Nigeria perceive risks to climate change, and these perceptions affect their level of vulnerability. Due to low levels of education, the Bangladeshi char people would have little knowledge of climate change, disasters and vulnerabilities (Nzeadibe et al. 2012). Climate change vulnerability differs between places, sectors and communities (Panthi et al. 2016). According to the findings in this study, the average annual income of the char people was Taka 34,578 (USD 410) (national USD 1,068), 33% of the char people lived in their own house, and 26% lived house built on khas land. Seventy-eight percent of the char people were landless (national 46%), and 80% of the char people could not take three meals per day. The study results show that 49% of the char people do not receive services from the local union parishad. This kind of vulnerability is closely associated with poverty, but it can also arise when people are isolated, insecure and defenceless as they face risks, shocks or similar stresses (Paul and Islam 2015).

Due to climate change and disasters related vulnerabilities, the char people tended to move from one char to another. Half of the people lived in a char land for less than 5 years, indicating that the migration probability among the char people is very high. This study found that 73% of people migrated to neighbouring chars. This finding is consistent with a number of studies such as CARE-Bangladesh and DFID-B (2002), and Islam and Hossain (2014). CARE-Bangladesh and DFID-B (2002) reported that 25% of the char families living in the Brahmaputra River (northwest Bangladesh) migrated three times in 10 years. Slow economic growth can also increase the risks of human habituation in newly emerging chars. In these situations, support from the government and other organizations were insufficient to meet the minimum needs of the char people (Islam and Hossain 2014). Sarkar et al. identified that people displaced by char erosion have no alternative than to settle on accreting char land elsewhere, creating a typical social and economic char environment.

This study found that natural and climate change related threats, along with economic and social vulnerabilities had wide range of impacts on char peoples' migration decisions. The findings show that people migrated due to river erosion (100%), flood (99%), insufficient food (99%), lack of employment (98%), sand deposition (92%), low level of production and loss of properties during disasters (91% each). Eighty-mine percent of the char people said that they also migrated due to debt, 88% food insecurity, 83% untimely rainfall, and 80% low level of soil fertility. This finding is similar to other recent studies. Bhatta et al. (2015) and Islam and Hasan (2016) identified climate migrants as people who are displaced by climate change induced environmental disasters that result incremental or rapid ecological changes and disruptions due to increased droughts, desertification, sea level rise, and the more frequent occurrence of extreme weather events such as hurricanes, cyclones, flooding, and tornados. Perch-Nielsen et al. (2008), Islam and Hasan (2016), and Islam and Shamsuddoha (2016) found a positive relation between migration decision-making and natural hazards, disasters and social vulnerabilities. Islam and Herbeck (2013), and Bhatta et al. (2015) found that in coastal areas the livelihoods of fishing people are characterized by a series of vulnerabilities and endemic poverty, both of which contribute to their migration decisions. From the findings of this study, it is evident that natural disaster vulnerability is closely related to the economic and social vulnerabilities. This finding is similar to that from other studies. For example, Cutter (1996) described social vulnerability as including the susceptibility of social groups, or society at large, to potential losses (structural and non-structural) from natural hazard events and disasters. In this

regards, Morrow (1999) notes that natural disaster vulnerability is socially constructed, that is, it arises from the social and economic circumstances of everyday living. Bergstrand et al. (2015) argued that social systems play a prominent role in human vulnerability to hazards, and this is central to the idea of social vulnerability of individuals and communities.

The char peoples' vulnerabilities were severe due to their lack of income generation skills, and poor social and environmental education. A significant number of the char people did not receive training on important topics, such as livelihood promotion, fish production, environmental awareness, and skill training (off-farm trade). None of the char people received any training in product marketing. From this finding the migration decision making of the char people can be seen to be strongly connecte4d with the sustainable livelihood approach used in previous studies by Turton (2000), Knutsson and Ostwald (2006), and Amos et al. (2015). Dilley and Boudreau (2001) argued that the extent to which people suffer from calamities of any kind depends both on how their livelihood is exposed to hazards or shocks, and on the capacity of the people to withstand these hazards and shocks. However, the findings from this study clearly connect biophysical *and* social processes (IPCC 2014).

The findings of this study have great policy implications for nations such as Bangladesh. The findings have direct links with national policy agendas, such as poverty alleviation, development of the ultra-poor and char livelihood project, and special support for the socially excluded people. The extreme poverty in char areas is one of the major concerns in poverty reduction policy of the Bangladesh government (Islam and Hossain 2014). The government acknowledges that the char people are severely disadvantaged in terms of ownership of assets, inadequate access to institutional finances and other basic services, including quality education, healthcare, water and sanitation (Paul and Islam 2015). The Millennium Development Goals in Bangladesh have a very clear intention to reduce extreme poverty in the rural areas. The Perspective Plan 2011–2021 in Bangladesh targets the development of char peoples as an important part of rural development (Planning Commission 2010). In this regard, two important implications are crucial for Bangladesh. First, it is important to map climate change and disasters, as well as the socioeconomic vulnerabilities all risk factors that the char people face in order to develop their capacity for recovering and adapting to hazards (Bergstrand et al. 2015). Second, potential disaster resilience indicators should be developed in order to identify an organization's processes, procedures, and operating environment in the aftermath of disasters. The findings from this study clearly demonstrate that the char people have no alternative other than to migrate to the mainland or nearby towns due to their low level of human capital and financial vulnerabilities. However, increasing their resilience might be an effective way to improve their livelihoods. We should select the resilience indicators that are most important to the char people, and then allocate resources effectively (Chan et al. 2014).

This study explored the factors of the migration decision of the char people due to their economic and social vulnerabilities, and climate change and natural disasters in Bangladesh. The study did not examine the other factors that might influence their migration decisions, such as health vulnerability, psychological motivation, forced eviction, and social reasons such as invitations from relatives or international migration. This study did not investigate problem-solving criteria to improve the char peoples' natural and social vulnerabilities, such as the role the. Further research on the roles of government, local government and other community-based organizations in reducing the migration of char people is needed. Another research opportunity would be to explore how the local char

people could integrate their capacity and resilience to face natural and socioeconomic vulnerabilities and reduce their potential for frequent migration.

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