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Vulnerabilities of River Erosion–Affected Coastal Communities in Bangladesh: a Menu of Alternative Livelihood Options

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Abstract

In the context of generally limited research on the subject, this study aims to (i) unravel the nature, forms, and manifestations of socioeconomic and psychological vulnerabilities of the river erosion–affected coastal communities in Bangladesh and (ii) suggest a number of alternative livelihood options in order to reduce the vulnerabilities. It draws on a mixed-method approach. The fieldwork was conducted in three unions representing three upazilas (sub-districts) of the Bhola District. Quantitative data were collected using a structured interview schedule from 371 household heads, while the qualitative data were generated through in-depth case interviews, focus group discussions, and key informant interviews. The results show that the river erosion wreaked havoc on the communities' physical resources and increased their psychosocial vulnerabilities such as forced displacement, social insecurity, food insecurity, breakdown of socio-cultural bondage and networks, and decreased social esteem. The lack of livelihood options coupled with poor and fragile household conditions contribute to the reduced ability of the communities to cope with the post-disaster problems. The low level of participation of the river erosion–affected people in disaster construction, planning, and programs results in a weakened state of community resilience which further increases vulnerability in the future. Based on the overall observations of the study, a number of community-led alternative livelihood options are then suggested including adoption of innovative production and processing measures, formation of self-help groups, entrepreneurship development, priority basis livelihood options based on local context, and use of indigenous knowledge and skills-based coping strategies. The findings may provide useful lessons and ameliorative clues to the policy makers, and (disaster and development) practitioners.

Keywords Bangladesh · Coastal community · River erosion · Vulnerability · Social dignity · Alternative livelihood options

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Introduction

Bangladesh is a disaster risk hot spot, ranked fifth in the top 15 countries with the highest risks among 173 nations in the world (Shaw et al. 2013). Due to a unique geographical position, the country is highly vulnerable to regular and severe natural hazards, including river erosion, floods, tropical cyclones, storm surges, landslides, and drought. These hazards, combined with an extremely high population density and poor socioeconomic condition, are already leading to the partial or total destruction of housing, land and property, loss of livelihoods, and widespread migration and displacement across the country, where more than 50 million people live in poverty (Displacement Solutions and YPSA 2014). It is globally known that Bangladesh is a land of rivers. More than 700 rivers, with their tributaries and distributaries, crisscross the country forming a network of river system. It has about 2400 km of bank line. Along with the bank line, there are 283 locations, 85 towns, and growth centers that are

vulnerable to erosion (Islam and Rashid 2011). The Padma (the Ganges), the Jamuna, and the Meghna, major rivers of Bangladesh, erode several thousand hectares of floodplain, making thousands of people landless and homeless every year. Bangladesh is vulnerable to climate-driven hazards, including river-bank erosion causing the loss of land and associated natural resources of riparian households, which threatens the livelihood, health, and food security of these vulnerable communities (Alam et al. 2017). Gravgaard and Wheeler (2009) reckoned that 50–200 thousand people are displaced by the river erosions and 600 thousand people by the extreme impacts each year in Bangladesh, and further predicted that some 25 million people will be affected by the sea level rise alone over the next 40 years. Over the last decade, the rising sea levels, tropical cyclones, flash floods, soil salinity, and river erosion have emerged as the environmental or climatic push factors that prompt the vulnerable coastal communities to migrate on a large scale.

This study was conducted in the Bhola District located at the southern coastal zone of Bangladesh. Bhola is a delta island. The district is served by two major rivers: the Meghna and Tetulia. The Meghna is in the east and north side of the district and Tetulia is in the west side. The Bay of Bengal lies in the south of this district. The coastal zones in Bangladesh have been adversely affected by the impact of such extreme natural events such as tsunami, cyclonic storm surge, severe erosion, and increased sea surface temperature as a result of global climatic changes over the past century (Islam et al. 2015). These adversities are further exacerbated in the coastal environment owing to such phenomena as coastal erosion, flooding near river mouth and low lands, frequent shifting of channel courses, deterioration of water quality in estuaries and aquifers, uneven storm surge, and severe cyclones. The western part of the Meghna River estuary, including the islands of Bhola, Manpura, and Hatiya, shows higher trend due to huge sediment load with compaction-induced subsidence (Sarwar 2013; Islam et al. 2015). Bhola, the world's most dynamic estuary, is potentially vulnerable to accelerated sea level rise and associated calamities (Islam et al. 2015).

This study pursues a twofold purpose: to unravel the nature, forms, and manifestations of socioeconomic and psychological vulnerabilities of the river erosion–affected coastal communities and recommend some community-led alternative livelihood options with a view to reducing the vulnerabilities.

River Erosion and Vulnerability: a Review of Literature

River-bank erosion is a geo-morphological phenomenon that has been studied by various researchers (notably, Bordoloi et al. 2020; Akhter et al. 2019; Midha and Mathur, 2014; Thakur et al. 2012). It is a complex product of the exchanges between the water and sediment transport processes played upon by such factors as topography, lithology, active tectonics, soil, vegetation cover, land use, and human activities (Bordoloi et al. 2020; Akhter et al. 2019). It takes place at the time of flood or after the floods in the channels, while the size and shape of the rivers are transformed in the process of transporting the upstream contribution of discharge and sediments (Bordoloi et al. 2020). It is evidenced that every monsoon season, a large number of people become landless and experience loss of livelihoods. River erosion damages physical infrastructure (lands, households) and associated economic and social resources. As a consequence, the victim local inhabitants are uprooted from their original land and plunged into a host of socioeconomic and psychological problems and vulnerabilities. They are obligated to search new lands and shelters and essentially turned into neo-refugees. It is also evidenced that the community people of non-affected areas do not want to welcome the victims of river erosion (Thakur et al. 2012).

The word 'vulnerability' has emerged as a central concept for understanding the condition of people that enables a hazard to become a disaster (Tapsell et al. 2010). Although "vulnerability" is a difficult concept to define and operationalize, the term has been adopted as standard vocabulary in development and poverty studies, global environmental change literature, and hazard and disaster research (Hogan and Marandola 2005; Adger 2006). Vulnerability is more frequent in the field of hazard research. Vulnerability studies are now established as a dominant approach within a range of disciplines in the social sciences. The word vulnerability has been defined by a wide of range literature. According to Cannon (1994):

> Vulnerability is a characteristic of individuals and groups of people who inhabit a given natural, social and economic space. It is a complex characteristic produced by a combination of factors derived especially (but not entirely) from class, gender and ethnicity.

Wisner et al. (2004) mentioned:

> Vulnerability emphasize peoples' and societies' capacities, not just their inabilities and insufficiencies.

Kelly and Adger (2000) state:

> Vulnerability influences people's capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard (an extreme natural event or process). It involves a combination of factors that determine the degree to which someone's life, livelihood, property and other assets are put at risk by a discrete and

identifiable event (or series or "cascade" of such events) in nature or in society.

From the review of the above vulnerability literature, it is clear that vulnerability relates to the natural and geophysical events and later on social forces that render certain groups and societies more exposed to the destructive effects. Agriculture is badly impacted by the bank erosion (Uddin and Rahman 2011). Generally, it has been noted that bank erosion induces change in cropping pattern, decline of production, change in crop diversity, change in cropping intensity, and damage of crops (Uddin and Rahman 2011). Social scientists assessed that this kind of process has longer impacts which is "susceptibility to harm" (Gallopin 2006; Adger 2006) that are not simply the material damage rather all other factors that are subject to disaster assessments (e.g., Riede 2014, 2015; Wisner et al. 2004; Oliver-Smith and Hoffman 2002). However, vulnerability has tended not only to measure and describe the immediate negative consequences of the event but also to record the resolution of populations and cultural behavior, which must be assessed on longer time scales. It is again more important to consider the relationship of people with the environment and how the affected people are interacting with the social forces and institutions as well as cultural values that sustain or contest them (Oliver-Smith 2004).

In general, river erosion may prompt three major forms of vulnerabilities (Fig. 1) such as physical, economic, and psychosocial vulnerabilities. It is argued that most vulnerability literature has emphasized the physical and ecological vulnerability of coastal areas (Islam and Shamsuddoha 2017; Islam 2018). The natural hazard literature has tended to emphasize hazard assessment and has placed less effort on estimating economic or behavioral responses (Felsenstein and Lichter 2014). A significant number of studies have focused on climate change–related vulnerabilities (Kelly and Adger 2000; Hesselberg and Yaro 2006; Adger 2006; Snover et al. 2007; Füssel 2007; Amos et al. 2015; Bergstrand et al. 2015; Simane et al. 2016). From a socioeconomic perspective, the magnitude of the event is not so important; rather, the ability of people to cope with its results should constitute the core focus of the attention (Felsenstein and Lichter 2014; Islam and Khan 2018). Declining agricultural productivity is a common scenario in the river erosion areas (Baboule et al. 1994; Roose 1996; Dragicevic and Stepic 2006). Besides, a generally diminishing trend of the economy is noticeable in the erosion-prone area manifested by widespread poverty, unemployment, job shifting, and indebtedness (Uddin and Rahman 2011). Bank erosion severely impacts the vulnerable groups of the society and especially women (Rogge and Elahi 1989; Haque 1997). It has been noted that displaced women have higher level of perceived stress than the non-displaced counterpart (Canino et al. 1990; Lima et al. 1991; Keya and Harun 2007). River erosion also affects property belongings. When disaster strikes, poor people survive by selling off their belongings such as land, livestock, housing materials, and other personal belongings (Hutton and Haque 2003; Uddin and Rahman 2011). Some other social vulnerabilities observed in erosion-prone areas include breakdown of social bond and family relations, disruption of social services, degradation of social status, and increase in social injustice and oppression of the poor by the powerful and the rich groups (Islam and Rashid 2011).

A number of authors notably Hahn et al. (2009) and Shah et al. (2013) used economic, social, and natural factor-indicators to measure vulnerability. Another group of authors including 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

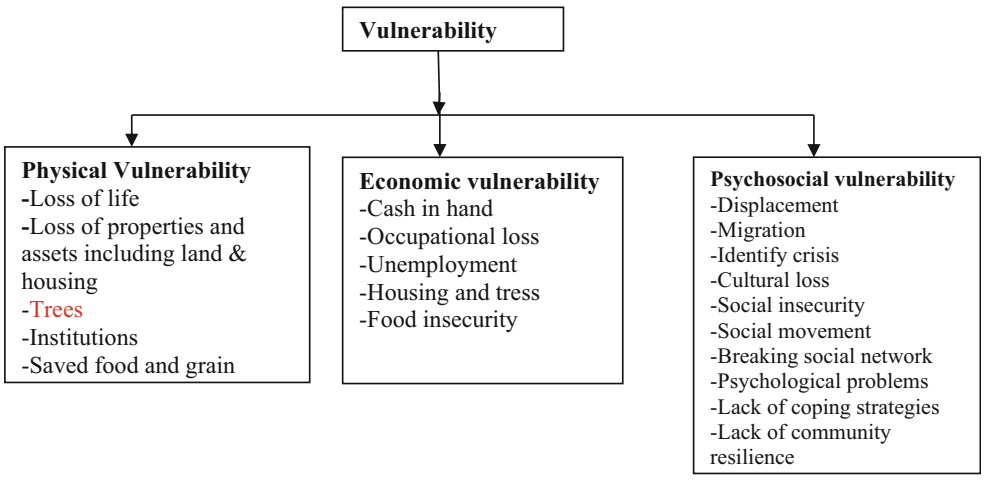

Fig. 1 A simplified view of the forms and nature of vulnerabilities. Source: Developed by authors. Note: the figure does not reflect the interconnections and nexus among and between the various forms and natures of vulnerabilities

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 (Islam 2018; Islam and Khan 2018).

As noted earlier, the past literature has addressed the nature and forms of physical and economic vulnerabilities of the disaster (including river erosion)-affected people, but there has been strikingly limited focus on the psychosocial sufferings of the lives and livelihoods of the affected people. This study attempts to contribute to this relative vacuum.

Islam et al. (2017) investigated that the local government provides important supports for disaster-affected communities through relief distribution, livelihood assistance, and reconstruction of major community services. Islam and Wahab (2017) showed that the coastal households use indigenous knowledge by taking various types of foods, searching alternative food, changing eating behavior (e.g., changes the food intake), storing/protecting food, and sharing food during cyclones. The literature about the application of social work/welfare is very scarce. The studies such as Pyles (2017), Dorlet et al. (2015), Tan and Yuen (2013), Dominelli (2015), Fulton and Drolet (2018), and Nikku (2015) recognized the importance and application of community social work intervention for the disaster-affected people. Most of these studies suggested immediate and long-term recovery such as psychological and community capacity building so that the affected people can mobilize their local resources and participate in different community-based initiatives. These studies basically outlined how the coastal communities are either using social capital or using indigenous coping practices reducing their disaster vulnerabilities or emphasized the community-focused initiatives, but none of the studies suggested any community-led intervention that can provide inputs to the policy particularly to formulate a community-led intervention to increase their coping strategies or community resilience or sustainable community development to reduce disaster vulnerabilities. In addressing this knowledge gap, this study seeks answer two research questions: (i) What are the physical, economic, and psychosocial vulnerabilities of the river erosion–affected people? (ii) What are the possible alternative livelihood options for mitigating such vulnerabilities?

The Methodological Considerations

The fieldwork was conducted on three unions, namely, Chandpur Union in Tazamuddin Upazila, Pakshia in Burhanuddin, and Bhabanipur in Daulatkhan of the Bhola District in Bangladesh. The study used a mixed-method approach where both qualitative and quantitative methods were employed. A number of authors such as Islam and Hossain (2014), Islam and Walkerden (2014 2015 & 2017), Paul and Islam (2015), and Islam and Hasan (2016) used such mixed-method approach for similar studies and associated contexts. This study used a survey method for quantitative data and a case study method for qualitative data. A structured interview schedule was prepared for conducting face-to-face interview, while separate sets of guidelines were prepared for focus group discussions (FGDs), in-depth case interviews, and key informants' interviews (KIIs).

This study used a multi-stage sampling procedure for data collection. For the survey, the fieldwork locations (as mentioned above) were chosen based on the following considerations: the high frequency of the occurrence of river erosion and river side location particularly susceptible to the possibility of large scale river erosion. For the selection of respondents, the study employed the sample method as deployed by Krejcie and Morgan (1970) where a total of 371 river erosion–affected vulnerable households were selected from three unions based on the last available Census 2011. The distribution of the sampled sized households and respondents is shown in Tables 1 and 2.

Most of the selected household heads (88%) were male. The highest (26%) number was found in the age group 31–40, followed by 22% 41–50 years and 20% 51–60. Married household heads accounted for 54% and unmarried 39%. In terms of principal livelihood, the highest 36% were involved in fishing, followed by 22%-day laborer and 10% housewife. As regards the level of literacy, the highest 51% of the household heads "cannot sign" (i.e., no literacy at all), 21% primary education, 14% can "only sign" (i.e., know how to put signature), 11% secondary school, and 6% with postgraduate qualification. The monthly average household income was found Tk. 13,803. The highest 29% of the households' income was Tk. 10,001–15,000, followed by 14% (each) Tk. 15,001 to 20,000 and Tk. 20,001–30,000 respectively, 12% Tk. 4001–7000, and the lowest 5% Tk. 1000–4000.

Collected quantitative data were analyzed using SPSS (version 23). A concurrent data analysis technique was used where a number of themes are categorized according to the research objectives, then a triangulation approach was used in the mixed method to increase the validity and reliability of the results. The study team took permission from the Upazila Nirbahi Officer (UNO—the executive head of the Sub District administration) from all three upazilas. A verbal consent was taken from the heads of the households before starting interview with them.

Table 1 Distribution of population and sample size

Upazila name	Union name	Total population (2011 Census)	Total households (2011)	Households below poverty line (40%)	Total sampled size
Tajumuddin	Chandpur	42,807	9280	3712	137
Burhanudin	Pakshia	23,681	5088	2035	145
Daulat Khan	Bhabanipur	5900	1209	483	89
Total		72,388	15,577	6230	*371*

Results

Physical and Economic Vulnerability

The targeted respondents were asked whether and to what extent they were affected by river erosion between 2013 and 2017. The highest number of households (41%) was affected in 2013, and after that, the number decreased gradually except in 2017 (26%) (Table 3). The data also showed that every household on an average faced one onslaught of river erosion each year. The statistical analysis shows that in 2013 and 2017, the associations are significant at 5% level of significance as p value < 0.05. In 2014, 2015, and 2016, the association was not significant. It is important to note in two significant years that in 2013, the percentage of affected was much higher for Burhanuddin compared with others, while in 2017, the percentage of affected in Burhanuddin is much lower than the others where nearly 50% of the households mentioned this as the catastrophic type of river erosion. Though the Government took massive initiatives, e.g., embankment recently, but a significant number of people were affected by river erosion in the recent times.

The data showed that between 2013 and 2017, 36% of the households' agricultural land was affected by river erosion; on an average, 56.37 decimal land area per household was affected, and its economic value was Tk. 1,85,885. On the other hand, 58% of the households mentioned that their homestead was affected by river erosion on that time, which is 28.48 decimal per household—with an estimated economic value of Tk. 3,40,094 (Fig. 2).

The "losses due to river-bank erosion" were reported as loss of homestead land (55%), loss of land (53%), loss of homestead infrastructure (52%), scarcity of pure drinking water (41%), crop loss (30%), and livestock loss (29%) (Fig. 3). Only 1% of the households mentioned "no loss" by river-bank erosion.

Among the upazilas (sub-divisions), 53% experienced loss of homestead infrastructures, 52% loss of land, 51% loss of homestead land, 46% scarcity of pure drinking water, 43% income loss, 36% livestock loss, and 31% crop loss which are 60% and 39%, 59% and 44%, 66% and 42%, 42% and 30%, 39% and 23%, 30% and 17%, and 38% and 15%, respectively, in Burhanuddin and Daulatkhan (Table 4). In terms of the monthly monetary value, the highest 47% of the households' (57% in Daulatkhan, 43% in Tazimuddin, and 42% in Burhanuddin) loss was between Tk. 100 to 20,000, followed by 29% of them Tk. 100,001 to 500,000 (Table 5). From the statistical analysis, p value is 0.052 > 0.05. So, at 5% level of significance, we may conclude that there is no significant association between upazila and economic loss due to river erosion between 2013 and 2017.

From a FGD session, many people reported to us about their vulnerability:

Ash is still there if it is fueled by fire, but nothing is left if anything is washed away by tidal/flood.

Table 2 Qualitative data: data collection instruments and respondents

Data collection instruments	Upazila	Union	Respondents	Total
In-depth case interviews	Tajumuddin	Chandpur	Aged male = 1, aged female = 1, parents = 1, Disabled = 1	4
	Burhanuddin	Pakshia	Aged male = 1, aged female = 1, parents = 1, Disabled = 1	4
	Daulatkhan	Bhabanipur	Aged male = 1, aged female = 1, parents = 1, Disabled = 1	4
FGDs	Tajumuddin	Chandpur	Community leaders and members of civil society	1
	Burhanuddin	Pakshia	Community leaders and members of civil society	1
	Daulat Khan	Bhabanipur	Community leaders and members of civil society	1
KIIs	Tajumuddin	Chandpur	UNO = 1, UzDMC = 2, UP chairman = 1, NGO worker = 1	5
	Burhanuddin	Pakshia	UNO = 1, UzDMC = 2, UP chairman = 1, NGO worker = 1	5
	Daulat Khan	Bhabanipur	UNO = 1, UzDMC = 2, UP chairman = 1, NGO worker = 1	5
Total				30

Table 3 Households affected by river erosion (%) and association between upazila (sub-division) and whether affected due to river erosion by each year

Year	Upazila	Yes	No	p value	Comment (at 5% level of significance)
2013	Tazimuddin	24	76	0.000	Significant
	Burhanuddin	68	32		
	Daulatkhan	31	69		
	Average	41	59		
2014	Tazimuddin	26	74	0.401	Not significant
	Burhanuddin	20	80		
	Daulatkhan	26	74		
	Average	24	76		
2015	Tazimuddin	26	74	0.517	Not significant
	Burhanuddin	20	80		
	Daulatkhan	21	79		
	Average	22	78		
2016	Tazimuddin	20	80	0.830	Not significant
	Burhanuddin	21	79		
	Daulatkhan	24	76		
	Average	22	78		
2017	Tazimuddin	33	67	0.002	Significant
	Burhanuddin	15	85		
	Daulatkhan	29	71		
	Average	26	74		

Bachu Mia Has Been Struggling with River-Bank Erosion Since His Childhood

Bachu Mia (55 years old) is living at Bhuiyakandi village under the Chandpur Union of the Tazimuddin Upazila. He is the fifth child out of nine siblings. From his childhood, he is facing river erosion massively. His grandfather had limited land, which was totally lost before his birth. His father was landless. He worked as a fishing and agriculture laborer and had to bear all expenses of the 11 members of his family. So, there was no scope for him and his siblings to get education due to extreme poverty. With other brothers, he had to start work as an agriculture day laborer from the age of 12 with a view to contributing to this big family. They had a tiny straw shelter for the 11 members. Though they were poor, there was happiness in their family. Moreover, river erosion in 1978 washed away everything of their household, which made them most vulnerable. Due to this erosion, they had to shift their house to nearby Sonapur Union. In 1983, they faced the same problem and shifted to another place of Sonapur. At that time, their father died and had to bury him at another's land, which gave them deep shock. He faced river erosion again in 1986, 1995, 1997, and 2001.

The data showed that 39% of the households in Tazimuddin, 27% in Daulatkhan, and 21% in Burhanuddin Upazilas did not have three meals regularly (Fig. 4). Result showed that the first and last month (Boishakh and Chotra) of the Bangla year were difficult months for the river erosion–affected people, where the numbers of two meals and one meal were found higher. The months of Joshtho and Falgun were also bad months for them.

Psychosocial Vulnerabilities

The study explored different psychosocial and cultural aspects including social dignity of the river erosion–affected people

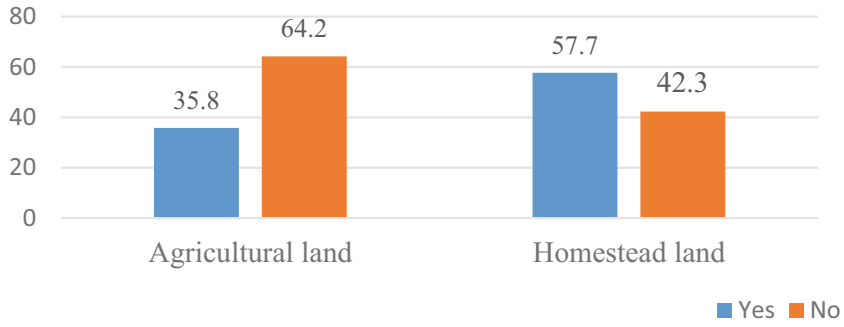

Fig. 2 Agriculture and homestead land damaged for river erosions between 2013 and 2017

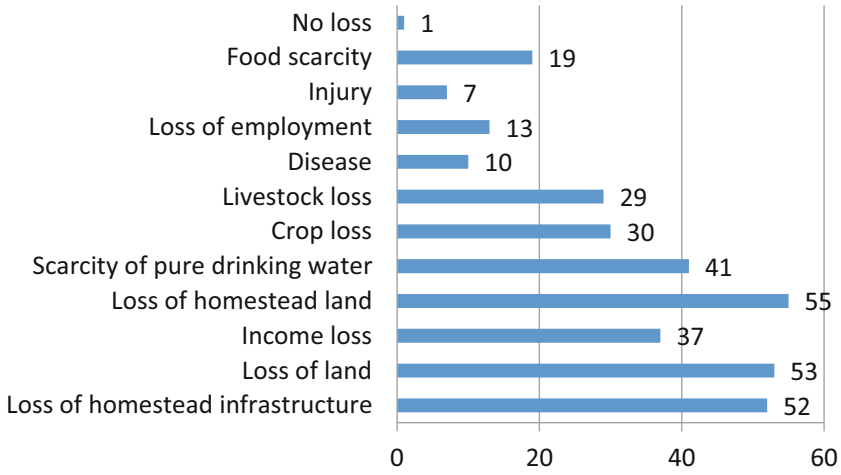

Fig. 3 Type of physical and economic losses (%)

by using the Likert 7 scale (Table 6). The findings showed that all respondents "strongly agreed" on different aspects of psychosocial and social dignity–related vulnerabilities and associated livelihood loss. Around 70% of the households "strongly agreed" on the statements that "river erosion has increased poverty in our community river" and "river erosion has forced the displacement of the household." Other notable realizations include "we feel insecurity because of river erosion" (64%), "we feel helpless during river erosion" (63%), "many schools and social institutions were damaged by river bank erosion" (63%), and "participation of river erosion victim in recovery process was controlled and manipulated by the political institutions and local power politics" (62%). The food insecurity, breakdown of socio-cultural bondage and networks, decreased social esteem, destitution, and displacement were mentioned by some 50 to 59% households. Seventy percent of the households strongly disagreed on "many people in our locality were involved illegal practices due to river erosion", followed by 16% on "child marriage has increased due to river erosion", and 15% on "my household occupation pattern has changed due to river erosion" who strongly disagreed with this comment.

The study also attempted to capture some aspects related to psychosocial vulnerabilities including loss of social dignity through qualitative methods. The following excerpts from field dairy, interview log, and/or FGD minute report on various observations from the Bhabanipur Union of the Daulatkhan Upazila:

On the predicament of displaced people:

> All of the river erosion affected people were staying in the embankment. They did not have any sense of hygiene. Sanitation system was extremely poor. Almost all of the families used 'hanging toilet', and many of them resort to open defecation. The children were suffering from severe malnutrition. The families did not have any knowledge about family planning; many families have eight to nine children, and some of them have as many as 14 children. They were living together in a single room within an incredibly congested environment.

Table 4 Types of physical and economic losses in each fieldwork locations (upazilas) (%)

Type of losses	Tazimuddin	Burhanuddin	Daulatkhan
Loss of homestead infrastructure	52.6	60.0	39.3
Loss of land	51.8	59.3	43.8
Income loss	43.1	39.3	22.5
Loss of homestead land	50.8	66.2	41.6
Scarcity of pure drinking water	46.0	42.1	30.3
Crop loss	31.4	37.9	14.6
Livestock loss	35.8	30.3	16.9
Disease	19.0	4.1	5.6
Loss of employment	19.7	4.8	14.6
Injury	9.5	1.4	12.4
Food scarcity	16.1	16.6	27.0
No loss	.7	1.4	.0

Table 5 Monthly monetary value loss caused by river erosion between 2013 and 2017 and its statistical significance

Upazila	100–20,000	100–20,000	50,001-100,000	100,001–500,000	500,001–1,000,000	1,000,001–1,500,000	1,500,000>	*p* value
Tazimuddin	43	4	6	38	6	1	2	0.052
Burhanuddin	42	5	8	27	6	5	7	
Daulatkhan	57	6	7	21	6	2	1	
Average	47	5	7	29	6	3	3	

There is hardly any room for personal life, space, privacy or security.

Rabeya, a 40-year-old woman in Bhabanipur Union, was very emotional when she was asked about the river erosion. She had witnessed massive riverbank erosion three times in her life. First time, she was displaced from Mathvanga to Kandir Bil about 25 years ago. Then her family was uprooted from Kandir Bil and was forced to move to Bhavanipur. They needed to move several times within Bhavanipur before ultimately losing everything to the river. Since the last ten years or so, they have been living on this embankment by constructing a shanty. Bibi Rabeya said, "When the river bank erodes, there is a feeling of soullessness in our life. When we see the next flood and cyclone (*tufan*), we [are] always in a fear and think what will happen in our life"?

On social dignity of a widow:

Monju (35), a widow, lives at the Chadpur Union in the Tazumuddin Upazila. Her family consisted with four members. Monju's family had faced river erosion for seven times. She lost her husband in 2015, and was forced to became a house maid in well-off households. She stopped her elder son's education and sent him to the nearby city in search of any source of income. She faced huge economic hardship during river erosion as there was no paid work in the locality. She lamented: "The life of a widow is punishment from the Almighty … I tried to secure three meals for my children, but I cannot; even I do not get the government's allowance for widows, because they say I am not old enough to get this, and that I should work. With every passing day, I feel more helpless".

One participant, echoing several others, in one of the FGD sessions in Bhabanipur Union commented:

We do not have any social dignity and honor left in our social life in the community. We are called names as "river erosion victims" (*Gange vanga lok*): … we get less wage from our work compared to others, when we visit a tea stall, people would feel uncomfortable in our company, we are look down upon by the urban dwellers … Do you like to hear more?

On life and dignity, Zakir (aged 47) in Daulakhan shared the following life story:

I hailed from a rich farming family and I lost my 30 acres of land by river erosion. I have realized that nobody is interested to listen to my sufferings. The affected poor people can appeal for relief and other assistances from the local government and administration, but I cannot do this. I feel ashamed and guilty. My self-respect gets hurt. The time truly is stressful for me. I have no properties - not even a hectare of land. I saw three kilometers of land damaged by river erosion within 22 days in 2009. I saw the village Bazar was engulfed by the river in just two days; there were some 244 shops in the Bazar and hundreds of families – all gone without a trace! These people and their inheritors lived here for

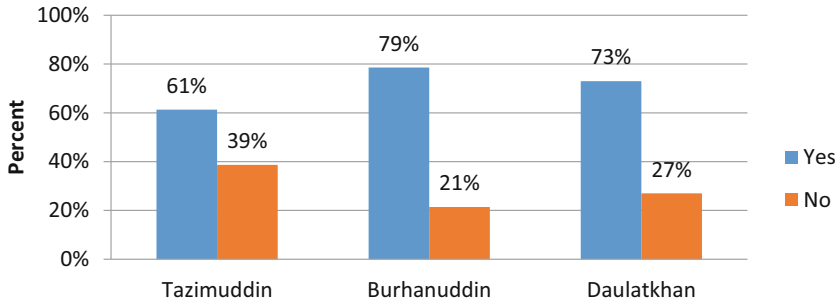

Fig. 4 Have three meals a day regularly

Table 6 Psychosocial vulnerabilities and social dignity (based on respondents' views)

Forms and manifestations of psychosocial vulnerability[a]	SA	A	SoA	SoD	D	SD	NC
"My family member (s) are suffering from physical or mental disability because of river bank erosion"	48.8	24.0	7.8	1.9	11.1	6.5	00
"My social and cultural bondage has been broken due to river bank erosion"	55.0	33.7	6.7	1.1	2.7	0.8	00
"My networking has been broken down due to river bank erosion"	50.1	30.7	12.7	2.7	3.0	0.8	00
"My household occupation pattern has changed due to river bank erosion"	23.0	18.1	15.6	6.7	14.8	15.4	1.3
"River bank erosion has increased the inequality among the society"	49.9	32.3	11.6	3.2	2.7	0.3	00
"River bank erosion has decreased our social esteem"	51.2	24.3	13.2	3.0	6.2	1.1	1.1
"River bank erosion has created psychological problem"	34.0	36.4	19.7	4.6	3.5	0.3	1.6
"We feel helpless during river bank erosion"	63.1	23.2	5.4	4.3	3.8	0.3	00
"We face tremendous challenges with our older people, pregnant women, disabled people, widow and children during river bank erosion"	50.7	29.1	15.1	2.4	2.4	0.3	00
"Many of our relatives, neighbors and community people moved to another place because of river bank erosion"	59.0	28.3	7.8	2.4	2.4	00	00
"We feel lack of association in the community due to river bank erosion"	46.6	32.6	12.4	3.8	3.5	1.1	00
"Our mental stress, depression, and anxiety are associated with river bank erosion"	45.3	35.0	15.9	1.6	1.9	0.3	00
"Gender-based violence has increased due to river erosion"	25.9	14.6	17.0	9.7	22.1	7.0	3.8
"Child marriage has increased due to river erosion"	29.9	20.8	12.1	8.4	10.8	16.4	1.6
"We feel social distance due to river bank erosion"	40.2	35.3	14.0	4.6	4.6	1.3	00
"We feel insecurity because of river bank erosion"	64.2	26.1	5.9	0.5	2.2	1.1	00
"Many people in our locality were involved illegal practices due to river bank erosion"	28.0	17.3	7.8	3.8	23.7	16.7	2.7
"We did not find any job/work during river bank erosion"	31.5	26.4	14.6	5.7	15.6	5.7	0.5
"River bank erosion has increased poverty in our community"	71.2	21.8	5.7	0.5	0.5	00	0.5
"We do not get any loan facility from NGOs during river bank erosion"	34.5	22.4	13.2	2.7	13.2	8.6	5.4
"Many schools and social institutions were damaged by river bank erosion"	63.1	22.1	4.3	3.0	6.2	1.1	0.3
"River bank erosion has created food insecurity among the HHs"	51.5	34.2	10.0	2.2	2.2	00	00
"River bank erosion has forced the displacement of the HHs"	70.1	20.8	6.2	1.9	0.5	0.3	0.3
"Participation of river erosion victim in recovery process has controlled by the political institutions and local power politics"	62.3	20.5	12.4	1.9	1.1	1.3	0.5

Index is based on the Likert scale: *SA* Strongly agree, *A* Agree, *SoA* Somewhat agree, *SoD* Somewhat disagree, *D* Disagree, *SD* Somewhat disagree, *NC* No comment

[a] The indicators used here have been developed and improvised on selected studies (notably, Islamic Relief, 2018; Islam and Islam 2020)

more than 100 years. Some of the families including mine were highly respectable, and had dignity and titles such as Chowdhury, Bhuiyan, and Mia. The farming households lost everything; the River Meghna converted land owning farmers to fishing laborers. I am passing my days with many untold sorrows that I cannot express to anyone. I lost all of my good memories, even my parents' and grandparents' graveyards are gone to river bed. Not sure if I could ever buy a decimal of land for my own graveyard!

Discussion

Drawing on a mixed-method approach, this study generated both quantitative and qualitative data to dwell on the nature, forms and manifestations of socioeconomic and psychological vulnerabilities among three rural communities of the Bhola District in Bangladesh. This study explored the nature and forms of the physical, economic, and psychosocial vulnerabilities of the affected people. In line with the theoretical view (see "River Erosion and Vulnerability: a Review of Literature"), this study revealed that physical and economic hazards trigger new forms of vulnerabilities—notably psychosocial ones; these in turn set in motion a vicious process of correspondingly complex and newer vulnerabilities. In the process, ultimately, the capacity of the affected people gets severely compromised, and it becomes impossible for them to address such vulnerabilities without developing and resorting to alternative livelihood options. The study reveals that the loss of land by river-bank erosion is a crucial problem that impacts on community employment opportunities leading to social poverty and insecure livelihood. The livelihood conditions of the households in all three studied river erosion–prone upazilas tend to follow a vicious circle from low

livelihood opportunities through increased poverty to a host of associated psychosocial vulnerabilities. We conclude that the lack of livelihood options coupled with poor and fragile household conditions contributes to the reduced ability of the communities to cope with the post-disaster vulnerabilities. The low level of participation of the river erosion–affected people in disaster construction, planning, and programs results in a weakened state of community resilience which further increases vulnerability in the future: here, we see the working of, what may be dubbed as, a cycle of disaster vulnerability.

The study captured a number of comments about the feelings and sufferings of the river erosion–affected people through qualitative investigation. It presented several case studies and insights and comments derived from in-depth case interviews, FGDs, and KIIs regarding principal issues of vulnerability, livelihood, and the associated contexts in the river erosion–affected communities including social inequality, social networking, social bondage, happiness, mental stress, child labor, forced displacement, neighborhoods, gender violence, social distance and insecurity, poverty, NGO services, and local political perspectives. These findings may be helpful to understand the contextual realties and condition of the affected communities and their livelihood patterns. In line with other major research (e.g., Paul and Islam 2015; Islam 2018), this study found that such vulnerabilities are most often associated with poverty where people are isolated, insecure, and defenseless in the face of risk, shock, or stress. Here, vulnerability is the 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. The observations suggest that psychosocial vulnerabilities are typically presented as a condition of three inter-related factors: exposure to impacts, sensitivity to impacts, capacity to adapt to impacts (Simane et al. 2016; Reed et al. 2013; Islam 2018). On the other hand, due to psychosocial vulnerabilities, the social dignity of the affected people was seriously degraded. The study presented a case study on Malek (aged 60) who had been separated from his family but could sever his relations with rivers as there was no alternative working option for him except to survive as a fishing laborer. The case of Rabeya (40 years old) showed how her family was trapped in the rivers' life because of financial and job insecurity outside. The study also captured events and instances concerning various forms of exploitation and vulnerability of the river erosion victims in the hands of the rich and powerful. The case of a 70-year-old widow Fazilat shows how these people are trapped into the rivers and consider their predicament as fate. In another example, Abedin (aged 60) demonstrates how he plays "hide and seek with rivers", which can be compared with observations of Islam and Shamsuddoha (2017). The sensitive implications of river erosions for social dignity of the victims are reported through the cases of Zakir and Monwara.

To sum up the discussion: first, we observed that the river erosion–affected people's physical and economic vulnerabilities are exposed to adverse effects of hazards where the affected people are unable to adapt to its impacts (cf. Gain et al. 2015). Secondly, psychosocial vulnerabilities have become a particularly grave concern towards their survival and adaptation, as such vulnerabilities make the affected communities further susceptible to the processes of social inequalities and exploitation (cf. Siagian et al. 2014). Finally, we have seen that the vulnerabilities are not solely dependent upon their exposure to a hazard, but also on their demographic and socioeconomic characteristics that further influence their capacity to prepare for, respond to, and recover from newly created hazards or disasters (cf. Mucherera and Mavhura 2020).

Concluding Observations and Possible Alternative Livelihood Options

Within some limitations (e.g., broad scope of the subject matter, limited cases), this study explored and revealed a detailed account of the physical, economic, and psychosocial vulnerabilities of the river erosion–affected people in the Bhola District. Based on the concurrent mixed-method approach, the research captured the sufferings and realities of the affected communities and the surrounding context. Some of the salient observations of the study include the process of losing lives and physical and economic assets such as housing, land, roads, social and economic institutions, market; a detailed account of some twenty-four psychosocial vulnerabilities (e.g., affected people's negative feelings, unhappiness, frustration, social isolation, breakdown of social network and bond, human displacement, and other social problems like child labor and child marriage); and intriguing case studies elucidating the realities and contextual meaning of the affected people' lives and livelihoods.

A Menu of Possible Alternative Livelihood Options

This section suggests some possible alternative livelihood options that may be considered by the river erosion–affected people for mitigating their physical and economic losses, averting displacement, and reducing psychosocial stresses. The recommended options are mainly based on fieldwork consultations, the authors' empirical observations and practicing insights, and views expressed in selected past studies (noted below) (Fig. 5). It may be noted here that this menu of options is not meant to be universal or infallible; each option needs to be carefully evaluated and adjusted to the particular contextual and territorial realities. It is also imperative to consider this menu for another important reason; the findings of the study and this menu of options have relevance to, and implications for, several of the Sustainable Development Goals (SDGs), notably goals 1 (addressing

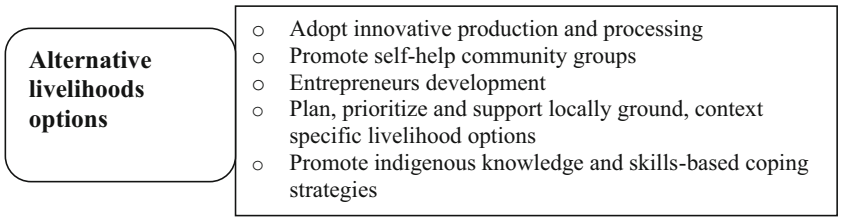

Fig. 5 Alternative livelihood options. Source: developed by authors

poverty) and 13 (combatting climate change and its impacts) and 15 (halting land degradation and associated adversities). Addressing the vulnerabilities of the river erosion–affected people may in turn contribute to poverty reduction and livelihood improvement. As river erosion has links with the process of climate change and land degradation, any effort to check erosion or degradation and support the affected communities would contribute to reducing adversities ensuing from climatic and land degradation processes.

- Adopt innovative production and processing

It is evidenced that the river erosion–affected people are poor in terms of their economic and social conditions, and they immediately need alternative production and processing that can help to overcome their vulnerabilities. The coastal communities have assets, e.g., skills and land, which could be leveraged to create new income streams (Islam and Hasan 2016; Islam 2018). The fish processing and ship recycling industries could be developed in the coastal areas (Islam and Walkerden 2014) such as Bhola. However, the policy strategies should reflect the typical geographical setting such a way so that the local institutions can clearly identify the users and resources (Reddy 2000; Islam and Hasan 2016).

- Promote self-help community groups

The formation of self-help groups, also known as mutual help, mutual aid, or support groups, is important for disaster–affected people (Ahmadi 2018). Self-help groups are important for two reasons. First, such group-based initiatives are often locally grounded, cost-effective, and draw on indigenous knowledge and innovative practices. Secondly, compared with individual efforts, these groups have greater chance of leveraging other community supports such as loan, training, and local resources to start any project for sustaining their livelihoods. From a BRAC experience, Akter (2014) noted that raising cow or goat is the most preferred alternative group–based livelihood options followed by small (mostly grocery) shop, tailoring, and poultry farming.

- Entrepreneurship development

Although the affected people expect immediate relief such as cash money, food, and water and treatment facilities after disasters, there is now growing recognition of the limits of a relief and charity-based response to disaster; the evidence suggests that relief distribution alone is not enough to enable people to cope with, and subsequently recover from, disaster situations in a resilient manner (see, Mallick et al. 2005; Islam 2018; Islam and Hasan 2016). The vision of disaster response policies should concern building the capacity of the local communities to reduce their dependency on relief and enhance their own resilience (Islam and Walkerden 2015). Our findings showed that owing to the lack of livelihood options (e.g., employment, homestead, cash, and social networking), the affected people migrated to the nearby places and cities. Entrepreneurship development can be an innovative and effective initiative towards stopping such displacement and migration (Haltiwanger et al. 2013; Lucas and Boudreaux 2018). We found that a disaster like river erosion substantially hampers the ongoing entrepreneurship efforts and makes it difficult for owners to return to normal operations (cf. Grube and Storr 2018). In addition, large-scale production networks (Carvalho 2014) and firm productivity are likely to decrease in the aftermath (Boehm et al. 2019). Galbraith and Stiles (2006) and Monllor and Murphy (2017) argued that new entrepreneurial opportunities and increased entrepreneurial intentions hold great promise for disaster through facilitating new ventures and encouraging the rebuilding of affected post-disaster community environments.

- Plan, prioritize, and support locally ground, context-specific livelihood options

Locally specific and contextually peculiar livelihood options should be discussed and planned; local government and other community organizations may facilitate the process. We found that a significant number of people changed their occupation due to river erosion, and some migrated, either on temporary or permanent basis, to other places due to the absence of livelihood options in the community. Such shifts can be reduced by enlarging the livelihood options. In the context of Bhola, we found that most people make a living by fishing and related activities (Masud-All-Kamal 2013). Along with the such primary livelihood avenues, some secondary occupations can be particularly helpful in this regard. In Bhola, for

example, such secondary options may include small business, netting, vegetable gardening, and homestead forestry.

- Promote indigenous knowledge and skills-based coping strategies

The role of indigenous knowledge and skills to strengthen the coping strategies used by the disaster–affected people is well established in the literature (i.e., Thapa et al. 2009; Okoroji 2018; Kelman et al. 2012; Shaw et al. 2009). This indigenous knowledge-based coping strategies may span over river erosion precaution, preparedness, and rehabilitation phases. We recommend that the local government and non-government service providers should promote community-specific indigenous habits, wisdom, and practices in planning and administering recovery and resilience building programs during and after river erosion. Makwana (2019) recently reviewed a volume of literature on the psychological coping strategies that enlarged the individual's capacity while encountering negative situations. It also helps better disaster preparedness and contributes to community empowerment.

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Compliance with Ethical Standards

Conflict of Interest The authors declares that they have no conflict of interest.

Informed Consent This study was approved by the Islamic Relief Bangladesh, and we followed their protocols related to informed consent for participation in this research. Each participant in this study was spoken to, and given a document about informed consent, explaining their rights as participants at the time of the interviews and contact information if further questions or concerns should arise.

All participants signed a written informed consent form, or, if they were illiterate, were read the consent form and provided their fingerprint with a witness signature.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Islamic Relief Bangladesh and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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