Progress in Disaster Science 6 (2020) 100079

Contents lists available at ScienceDirect

Progress in Disaster Science

journal homepage: www.elsevier.com/locate/pdisas

Climate change induced extreme flood disaster in Bangladesh: Implications on people's livelihoods in the Char Village and their coping mechanisms

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ARTICLE INFO

Article history:
Received 30 October 2019
Received in revised form 28 February 2020
Accepted 2 March 2020
Available online 21 March 2020

Keywords:
Climate change
Flood
Livelihood impact
Coping mechanisms
Char Village

ABSTRACT

This study is an attempt to explore the impacts of floods on the livelihoods of people in Char Village, particularly on the income, occupation, and also explores their coping strategies. Data have been collected from three villages in Fulchari Upazila (sub-district). The study is predominantly qualitative. At the same time, quantitative data have also been used. As a result, a mixed approach has been followed to make this research meaningful, where respectively quantitative and qualitative data have been collected through a household survey, and focus group discussions (FGD), in-depth interviews, and ethnography observation. The results disclosed that floods make individuals more vulnerable, as such char land people face work loss, two-thirds of their earnings is decreased, which bounds their competences of preparedness, response, and recovery to posterior flood. In regard to this people deal with the situation by taking a sizable loans from various Organizations and loss of valuables assets. These outcomes would be of significant importance for the disaster policy-makers and civil society delegates.

1. Introduction

Bangladesh is one of the most disaster-prone countries in the globe, and the effect of climate change enlarges the governing factor of the disasters [1]. It is deliberated to be the country most exaggerated by climate change; the risk is swelling for main hydro-meteorological disaster to happen [2]. The geographical location of this country makes it more prone to various frequent disasters such as floods, cyclone, earthquakes, etc. Flood and cyclone are reoccuring phenomenon's likely to trigger massive losses of lives,damage to assets and people's livelihood, . Bangladesh is one of the largest deltas in the earth, it is mostly known as a flood plain country with an entire area 147,570 sq.km; and in which around 6.7% consists of river and island water bodies [3].In fact, the rivers of Bangladesh are the utmost noteworthy features of its landscape. With the network of 250 rivers still alive in this county, Bangladesh occupies most of what is known as "Bengal Delta." Besides this, almost 80% of the country consists of the flood plain of the GBM basins (Ganges, Brahmaputra, and Meghna), and some other minor rivers [4]. Almost 80% of rainfall happens in the GBM basins during the summer monsoon and it's prevailing from June to October [5]. Every year, on average a total runoff of 1,281,400 Mm^3 flows through Bangladesh and emerges into the Bay of Bengal. The actual cause of floods in Bangladesh are as a result of monsoon precipitation in the vast catchments of GBM basins; besides due to snow and freezing ice melting with monsoon rain in the Himalayas is generated a heavy local rainfall [6].The approximate per annum discharge is 1,369,000 m^3 in which more than 90% instigated from outdoor of the country, which is creating colossal floods in Bangladesh [7,8]. Every year during the monsoon season normal precipitation causes 20–30% of the country inundation [9], when the inundation occurs 33% or more of the country is categorized as a catastrophe [10] as those floods of 1988, 1998, [11] 2004, 2007 and 2017 [12]. Based on historical records, it is evident that the frequency, magnitude, and duration of floods have enlarged considerably during the last few decades. For instance, all of major floods covered more than 30% of the country occurred after 1974 (Fig. 1).

1.1. Climate change and extreme flood in Bangladesh

Climate change is the most unpredictable intimidation in the twentieth-century to our globe. The scholars appealed that global hydrological rotations are anticipated to speed up by climate change. Due to amplified precipitation and decreased evapotranspiration, the river dischrge will expand on a worldwide scale, which points out intensify the frequency of floods in many areas of the world. The researchers also claim that the extreme flood will increase in the period of the 20th century [15]. Besides, the climate has been under continuous change over the last century, it is also one of the acute challenging issues at this moment. From the IPCC in

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http://dx.doi.org/10.1016/j.pdisas.2020.100079

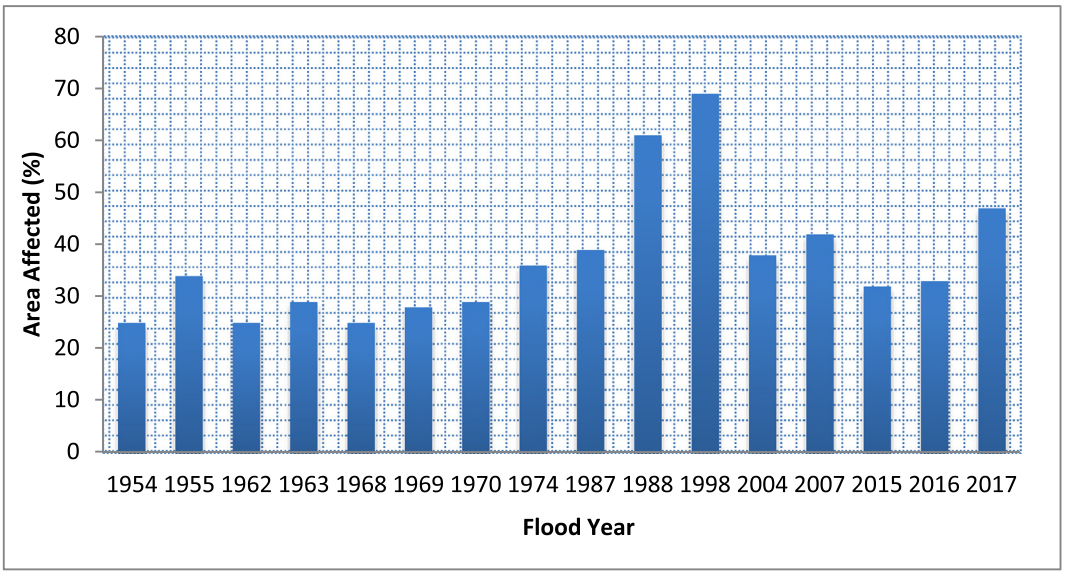

Fig. 1. Extent of flooding in Bangladesh [10,12–14].

2007 working group II fourth assessment report revealed that coastal zones, especially overpopulated mega delta areas in south, east and south-east Asia, will be the highest risk owing to increased flooding from the sea and, flooding from the rivers [16,17]. This is a shocking prediction, particularly in the mega deltas in Asia region, predominantly the GBM river basins (Ganges, Brahmaputra and, Meghna) will be at risk owing to enlarged flooding in the future. The report also forecast that there are many millions of more people estimated to be flooded every year because of sea-level rise by 2080 and, especially those overpopulated and low-lying regions where adaptive aptitude is comparatively near to the ground [17].

On the other hand, they are some scholar predicted that climate change significantly impacts developing countries, and those developing countries will sufferer tremendously as a result of climate change. Climate change is also a burning issue for Bangladesh because this country is the most vulnerable to climate change [18]. Meanwhile, Bangladesh is a low-lying under developing country; it is deliberated as one of the most vulnerable countries to climate change [19]. Moreover, every year, a flood can submerge between 30% to 70% of the country [20]. Besides, due to climate change, these regular flood character will lead to an amplification of the world water cycle with a resulting amplify in flood disaster [21]. Over the last 30 years, flood hazards have already been swelling internationally. In the changing perspective of climate, Bangladesh is similarly facing this aggregating inclination of the flood. Almost 60% of the landmass of Bangladesh is less than 6 m above the average sea level. The researchers believed that climate change would change the nature of flood disaster, and this kind of change is not only the severity, but also exaggerate the duration and enormousness of floods in the globe, predominantly Bangladesh.

However, as a result of climate change, Bangladesh faces further recurrent extreme flood events [17,22]. For example, in the 1988 and 1998 respectively, floods wreaked havoc and submerged 61 districts totalling approximately 68% of the area [10]. Besides, the duration of the extreme flood in the 1988 lasted nearly 90 days [23,24]. One scholar predicts that Bangladesh will be 0.5–2C warmer by 2030 [25], if the emissions carry on at the current rate [26]; also, the climate model indicate that the mean monsoon rainfall will probably rise by 10–15% by 2030 due to climate change [27]. Therefore, Changes in different types of nature, and the extreme of floods would trigger considerable loss to homestead settlements, agriculture, public infrastructure and also the livelihood and lives of people.

1.2. Char Village Dweller's way of life with the flood

Char land is such kind of area which consists of continuous process of riverbank erosion and deposition of sediments in the main rivers and coastal zones, and it forms in 2–3 years. Almost 10% of the population lives in these islands (*chars*) of the world [28,29]. Besides there is an estimation that approximately 4–5% of the population in Bangladesh lives in the chars land which covers almost 7200km^2 [30–32]. There are 56 big, and 226 small chars in this country [33]. Due to the diversity of environment, the char land in Bangladesh is frequently susceptible as a place of multi- disaster [31] and the dwellers of these places are the most vulnerable. About 12 million char dwellers in Bangladesh are massively affected due to annual floods, erosion, and striving against poverty [5]. As flood disaster induced by climate change and its impact didn't influence equally of the society, most researchers' statement of the effect of disasters are detrimental on the char land people. Comparatively the char land is isolated and brittle, and the dwellers of char land, about 80% are living under ultra-poor, and have no land of their personal [34]. It has already been proved that the poor community suffers more by the disaster [35–37]. Thus, it has been released that the vulnerable char land poor people are anticipated to be hit most stringent by flood disaster; individuals belonging to this category don't have adequate protective measures and also no capability and capacity to cope with the losses from the flood disaster [4].

Most of the chars in Bangladesh, the inhabitants have very few economic assets; don't have available ability to meets minimal access to basic service. More than 70% of the char land people are farmer and fisherman. On the other hand, there are some poor indicators of the income of these households such as share-cropping, agricultural day labor, and livestock rearing, etc. However, the flood and riverbank erosion is continuing the process to destroy their crops, crops lands and homesteads. Besides, the vulnerable char dwellers are getting more vulnerable due to the insecurity of food.

Nevertheless, it has been proved that living with flood and struggling against the floods is part and parcel of the life of char inhabitants. In the char dwellers period of life at least once time they are displaced from an original char, as a result of individual and household's displacement it is very likely short-term, and long-term movement is part of the common phenomenon in the regions. Due to lack of communication [38], massively dependency on seasonal income, low income, high household growth and consumption [39,40], fragile agriculture, insufficient nutrition, and also inadequate help from organizations [31] are

the main features to push them as a vulnerable people. Besides, 6.5 million char dwellers are struggling for living without the necessary infrastructure to meet proper education, healthcare, and sanitation [34]. The availability of pure drinking water is a great problem of the char dwellers due to frequent flood.

However, the present study focused on delineating the cause of flood disaster in Fulchari Upazila (sub-district of Gaibandha district) in Bangladesh. And at the same time, the study also examines the impact of flood disaster on the livelihood of the char land households and their coping strategies.

2. Materials and methods

2.1. Study area and location

Almost every year Bangladesh faces a high or low flood, and it has well-known as a regular phenomenon of this country predominantly the riverside areas [20,41]. The present study has been conducted in three char villages, namely, Kalur Para, Baje-Phulchhari, Pepulia of Fulchari union at Fulchari Upazila (sub-district, total area 306.53 sq. km) in Gaibandha district, which is located (respectively in between $25^0$06` and $25^0$23`, $89^0$34` and$89^0$34` north latitudes and east longitudes) northern part of Bangladesh (Fig. 2). These zones are almost 287 km from the capital city of Bangladesh. These areas (three villages) consist of natural disaster-prone and geographically most vulnerable and isolated riverine places. These are also the womb of Brahmaputra River and highly well-known for riverbank erosion and flooded recurrently in every year. Besides, the inhabitants of these char are friendly, and most of the households are dependent on agriculture and fishing directly or indirectly. But the matter of despondency is that only 27.7% is the literacy rate [42] of this area. On the other hand, the selected villages average literacy rate is below 20%. The study area has been selected purposively concerning flood disaster intensity, based on gathering data from various sources such as literature reviews, available reports, expert opinions, and newspapers.

2.2. Methodological approach

There are several flood-prone areas in Bangladesh in which Fulchari Upazila of the Gaibandha district is one of the most vulnerable Upazila (sub-district). This sub-district has been selected as the case study area to examine the impacts of flood disaster on the livelihood of the Char village affected people and to know about their coping strategies. This empirical study based on rigorous field investigation, where sampling has been taken from different char villages that were the most ruthlessly affected by the catastrophe flood in 2017. One hundred seventy-five (175) households from the three char villages have been randomly selected for the household questionnaire survey. However, the mixed-method approach has been adopted for doing this research meaningfully, where qualitative data have been collected from the key-informant interview, focus group discussion, depth interview, and ethnography observation, on the other hand, quantitative data have been collected from questionnaire field survey. The respondents have been selected in terms of head of the family, and almost 80% of respondents were male persons within the age of 20 to 70 years. Bangladesh is a male dominating country, to know the flood disaster phenomenon of this area, the head of the family is the best choice because he knows well regarding his family.

As mentioned, the key informant interview were carried out to collect colossal information from individuals with knowledge regarding flood disasters such as school teachers, community leaders, and member of Union Parishad and officials of GOs and NGOs experts. On the contrary, focus group discussion (FGD) has been conducted at the village level with the help of pre-assigned checklist with a view to finding flood impacts and their coping strategies to an extreme flood disaster. Every each of the FGDs group had 6–12 number of people participated. This study has also been used as an ethnography technique tobetter understand the respondent's perspectives. This technique helped the researchers to observe and interact with the respondents in their real-life scenario and flood disaster losses. After ending the data collection, interview sessions have been scrutinized analyzing according to the objectives of the study. IBM Statistical Package for Social Science (IBM-SPSS) software version 20 has been

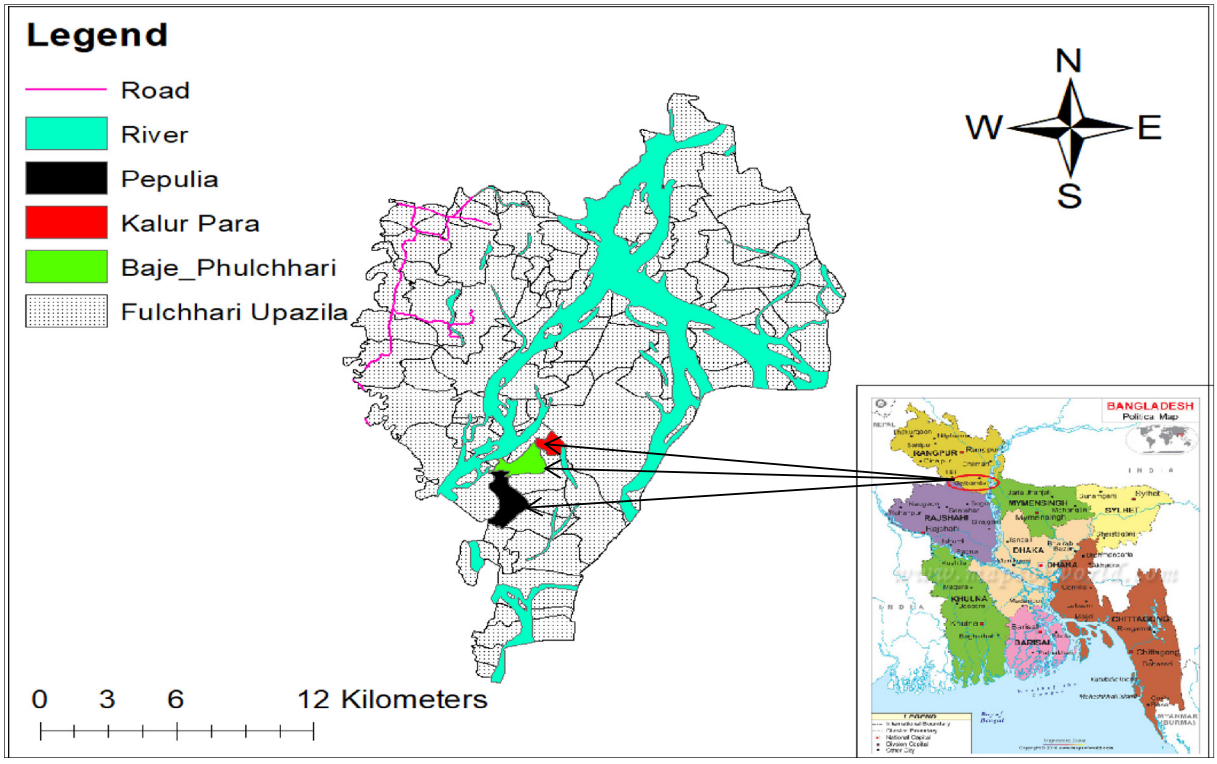

Fig. 2. Study area location (Using Arc GIS 10.5).

used for analyzing quantitative data together with MS Excel. The collected secondary data have been accomplished, scrutinized, verified, and reviewed by the researchers to get around the overlapping, inconsistency.

3. Results and discussion

3.1. Flood impact 'flow' in the study area

The impact of flood in the study area is devastating, and it has already proved that flood has an extensive range of confrontational impact on the people's livelihood. It is a common characteristic due to frequent flood in the study area, particularly in the monsoon season. The flood intensity and inundation of this area have been increasing over the last few eras. Before investigating to uncovering the flood impact on livelihood, the present study has attempted to identify the direct and indirect impacts of flood in the study area by making a flood disaster flow 'Fig. 3'.

As like impacts of the previous flooding in the study area which occured in1988, 1998 and 2007; the flood in 2017 also caused much sufferon the char land people in Fulchari Upazila. In spite of some positive impact of flooding most of the cases, the flood has been bringing an enormous impact on the most vulnerable people who have already suffered previously from a similar flood disaster. The study revealed that during the flood in 2017, most of the farmers in the char area were massively affected and their crops land almost 100% washed awaydue to the flood. Besides most of the houses were submerged and generated enorous lost such as household's liquid assets, livestock, and poultry etc. Farmers pass their daily life without substitute occupation during the flood in 2017, and also, they could not manage their families' basic needs as in the char area were water stagnated for about two or three months. As a result of this, the farmers could not facilitate crops production during this time. In addition, the people of others occupation such as agriculture day labor, small businessman, general labor, service, they also faced difficulties with running their activities. They have been lost a considerable amount of finances, while suffering physical and psychological problem. On the other hand, school children could not attend school due to the inundated roads and institutions. In this process, due to financial hardship and long stagnation, most of the children dropped out from the school. During the flood, pure drinking water and sanitation are the supreme issues for the char dwellers, they suffer more to get available water and sanitation facilities. As a result, people suffer many kinds of health issues such as diarrhea, fever, cold, etc. Beyond these issues, one of the shocking news is that during the flood, adolescents, pregnant women, aging people, and disabled people face gigantic problems. From the survey, it was found that there were deaths during the flood in 2017, with most being elderly people and children. Most of the respondents stated while conducting the focus group session, in the flood season at least 3–4 months they do not find proper work and this kind of phenomenon happens every year due to long term stagnation. Therefore, the poor community always were seeking money for their family needs, as a result of the scarcity of money they are faced poorer conditions due to a lack of incomeand damage of property. Sometimes, there are some people who became sickness during and after the flood. It is regretful to say that the rehabilitation provided by authorities was not sufficient for the affected people; for this reason, every so often they have to sell their rearing livestock and jewelry. They became dependent on local money lender to borrow money to overcome this situation but the interest rate is so high it produced an impossible situation of repayment by the affected people . Consequently, the affected people take time around one year for repaying the money. Then again, they take preparation for the coming flood. Therefore, it has documented that this flood impact flow is dynamic and make the char land people fragile.

3.2. *Impacts of Flood on Livelihood and People's Coping Strategies*

It has already documented that Bangladesh is the most flood-prone country in the world, and millions of people are being affected, and hundreds of people displaced literally almost every year. There are some scholars who claimed that the unique geographical location is the main reason for a recurrent flood disaster. Bangladesh is such a country where the highest number of people are exposed to floods [43]. People of Char areas in Bangladesh are mainly most vulnerable to flood disaster, and they are living under poverty and striving their entire life to fight against floods. The people of this area, they seemed that flood is the main cause to be poor, and the community anticipated that flood always hit on this poor person.In addition,they lost their income and assets due to the regular floods, while having a limited capacity to combat the flood. Many kinds of research already have uncovered the impact of flood in extensive range on people's livelihoods [3,4,44,45]. Fig. 3 also unbolting a flood impact

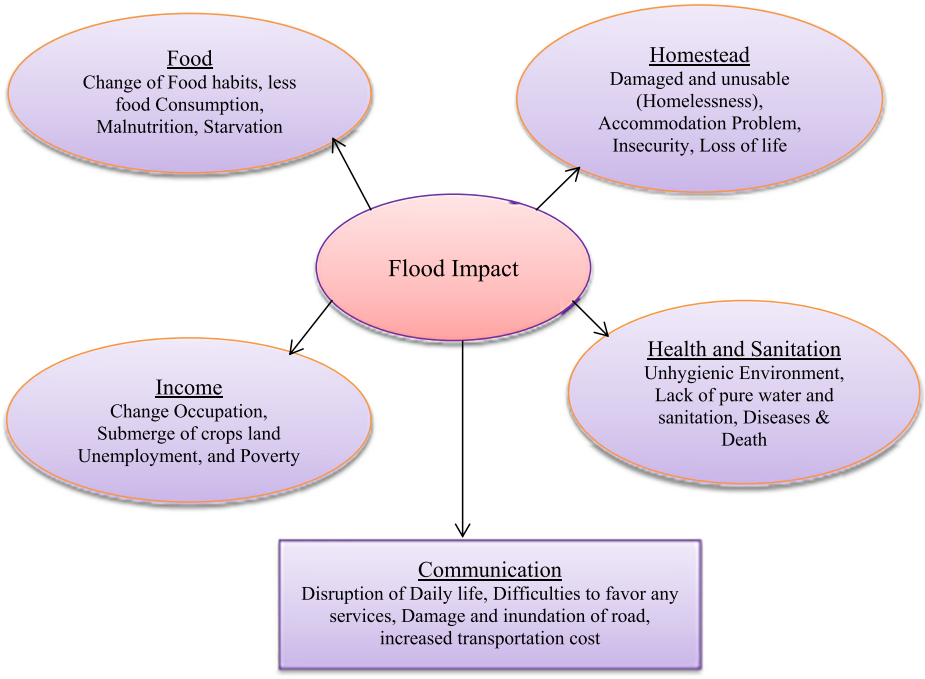

Fig. 3. Flood impact flow on char land households.

scenario of the study area. However, this study tries to explore the flood impact on people's livelihood especially focus on occupation and income.

3.2.1. Impact on occupation and income

The occurrence of flood disaster is always a ferocious threat, especially for the char village poor people households in Bangladesh. There are some salient indicators of char poor people; occupation and income are one of them. The poor people have an inadequate capacity to cope with the loss of income associated with the floods. Basically the char land people occupation is mostly reliant on the enormity, frequency, and duration of the disaster [3].

This study area is one of the most vulnerable regions of the Gaibandha district. People can't live here comfortably owing to a frequent flood disaster. The intensity of flood impact depends on the kind of occupation. In this area, most of the people directly or indirectly rely on agriculture. According to the field survey, 64.6% people of the study area are involved in agriculture, 13.7% are engaged as day labor, on the other hand, 9.7% people engaged in fishing activities and 8.8% respondents are involved in business-related purposes. Only 3.2% of respondents are involved in a service. Almost 80% of the households of this union are living under extreme poor. Most of the family belong nuclear family, and the average size of the family is 4.87 people. Besides, the literacy rate is very low (about 20%), which is the lowest within this district. As mentioned households are getting vulnerable day by day due to poverty, large family size, and a low-level education.

Agriculture is the principal source of economic activity in the study area. The common flooding phenomenon in the study area is crop damage, loss of income, work less, etc. According to the Fulchari Union Parishad, during the flood in 2017 almost 100% of crops damaged due to flood. And, nearly the same levels of loss happened in the other Upazila of Gaibandha district.

Due to siltation after flooding in the study area, the soil of the char land is increasing more barren, and day by day the production is becoming lower than the land which were not affect by the flood. In addition, riverbank erosion is one of the main intimidation of char land people, every year, people are losing agricultural land massively because of this.Due to flood of this area, the char dwellers have been forced to convert their normal occupation for their livelihood. 51.4% of people had become jobless, and 24.6% of people had changed their occupation owing to the flood in 2017. Since the majority (64.6%) of people were engaged with agriculture, and they depend on this profoundly. They were the most affected people because they lose their income and occupation. There were 39.7% of agricultural-related occupation people who become jobless due to the flood in 2017 (Fig. 4). During the flood they have changed the occupation and started as a rickshaw puller, boatman, fisherman, day laborer. 5.1% of day labor had diminished their occupation due to flood in 2017. Respectively, 4.8% and 1.5% of small business and service holder people decreased their occupation due to interruption of the communication system and marketing chances.

Flood is such kind of natural disaster, that not only force people to alteration their occupation but also undesirably affected people's income. From the field survey, the study revealed that before the flood, the people average income was around 3650 BDT per month, 92 people earned an income was around 2000–4000 BDT per month. On the other hand, the household

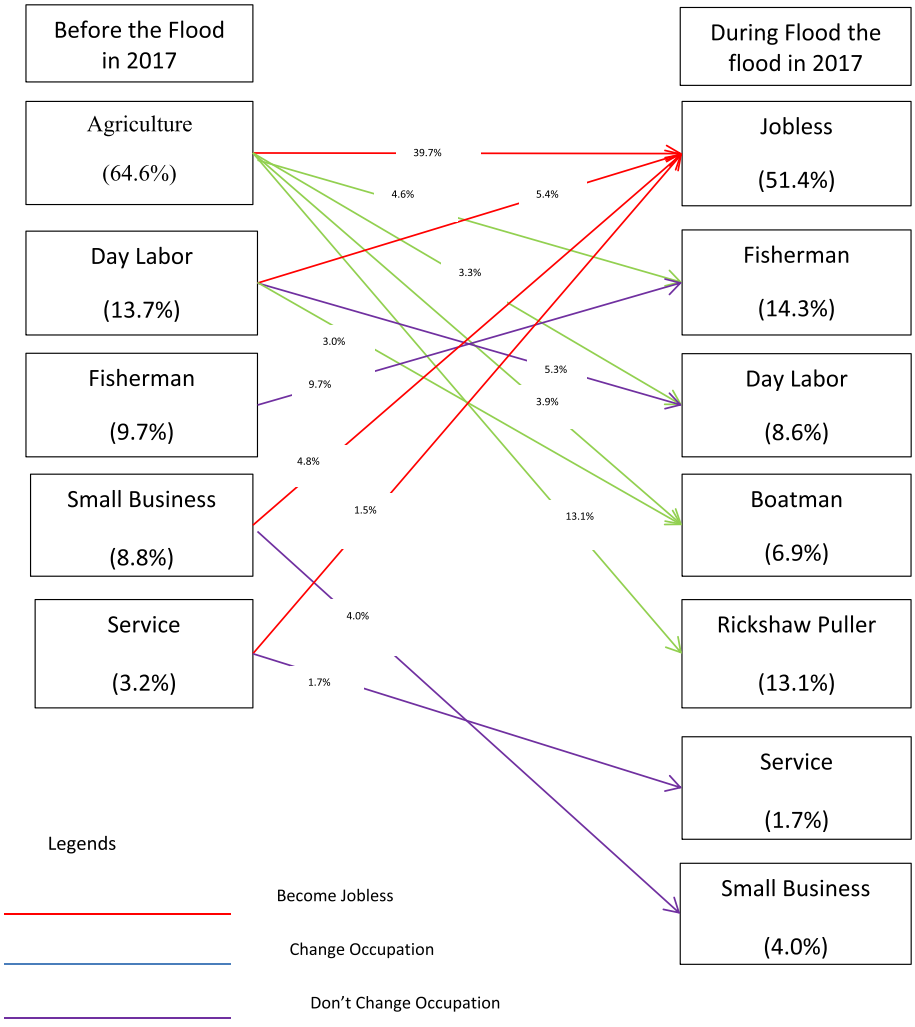

Fig. 4. Shifting of occupation due to flood in 2017.

Table 1
Income distribution of household before and during the flood in 2017.
Source: Field Survey, BDT = Bangladesh Taka, approximately Tk. 84 = US$1 in these years.

Before the flood in 2017			During the flood in 2017		
Income range of households (per month in BDT)	Frequency	Percentage (%)	Income range of households (Per month in BDT)	Frequency	Percentage (%)
1–2000	27	15.4	No income	90	51.4
2000–4000	92	52.6	1–1000	31	17.7
4000–6000	35	20.0	1000–2000	26	14.9
6000–8000	15	8.6	2000–3000	19	10.9
8000–above	6	3.4	3000-above	09	5.1
Total	175	100.0	Total	175	100.0

income was about 150 BDT per day per person during the flood. 31 household earned an income between1–1000 BDT per month. The income has reduced about 2080 BDT due to catastrophe flood in 2017. Table 1 showed the comparative picture between before and during the flood disaster income of the char land household.

Table 1 also showed a picture of people financial hardship. Most of the people live below the poverty level due to their less income. During the field survey, 68% of the respondents claimed that they usually earn less than 4000 BDT. Even this type of income is not enough to conduct the family properly. During the flood, the household income drastically decreased owing to the scarcity of available opportunity to get work or continuing of prior work . There were 51.4% of households had no income during the overwhelming flood. Therefore, the affected people were totally depended on the organizational help, sharpen money from a money lender and the selling the property. Only 5.1% income was above 3000 BDT during the flood, and before the flood, 52.6% of people income was above 3000 BDT. Thus this picture has given a clear warning of the intensity income interruption and vulnerability to the char land people understanding.

The present study has been taken an attempted to explore the household income loss. The empirical findings uncovering that almost 93% of respondents face a household's income reduction due to the havoc flood in 2017. Besides the Fig. 5 showed that 37.2% of income has also been reduced enormously more than 1000 BDT. On the other hand, 40% of household also face income reduction more than 2000 BDT. Only 7.4% of household didn't change their income. Therefore, it clearly shows that during the flood, the impact of flood on char land poor people is destructive , and this kind of phenomenon make or force them to be vulnerable.

Fig. 6 revealed the overall scenario regarding the income reduction on the basis of a particular occupation before the flood in 2017. Fig. 6 also showed that agriculture is the most vulnerable occupation due to the household involved in this occupation, their income has reduced more than the other occupation. Almost 41% of agricultural involving respondents reduced their income more than 1000 BDT, and 25% respondent also reduced their income more than 2000 BDT. However, small business and day labor has also faced income reduction in which day labor is the most affected due to flood because 54.2% of respondents income reduced more than 1000 BDT.Respectively, 20% and 13.3% of small business faced income reduction more than 1000 BDT and 2000BDT. On the other hand, fisherman and service holder had also faced little income reduction, but the percentage is not heavy to affect their daily life. It has already been documented that during the flood disaster, the most vulnerable household are those who engage with agricultural related activities in Char area. For this reason, the char land poor people suffer more due to income reduction.

3.2.2. Approaches to financial coping

The frequently affected people due to flood in the study area, mostly take different initiatives including loans, saving, change of consumption pattern, and selling and mortgaging of valuable property to adapt in response to the decline the income. Due to financial hardship, the people of this area in the normal periods can't save money for combating the coming flood because they are living under poverty. As the people of this area during the flood, they lose their occupation as well as income-generating activities. Most of the households try to cope with a flood by reducing their consumption of food and daily primary needs. The household income is not adequate to deal with the flood. Therefore, money is the most vital need in most of the crisis period. Char dwellers are poor people in Bangladesh and who are like suffer more due to circumstances [46,47]. The people of the study areareported during field survey, that almost 75% of the households reduced that the amount of food consumption extremely during a flood disaster in 2017. Along with this situation, it also noticed that owing to reduced incomes due to valuable property losses, the affected the char land people experience cumulative troubles with the food that make extensive health and nutrition problems [48]. For this reason, the people of this area have taken several financial initiatives to cope with the situation due to the flood in 2017. These coping strategies are shown in the below table which has similarities to measures taken by the Gulsan Ara Parvin et al. and Jahan, Sarwar [49,50] (Fig. 7).

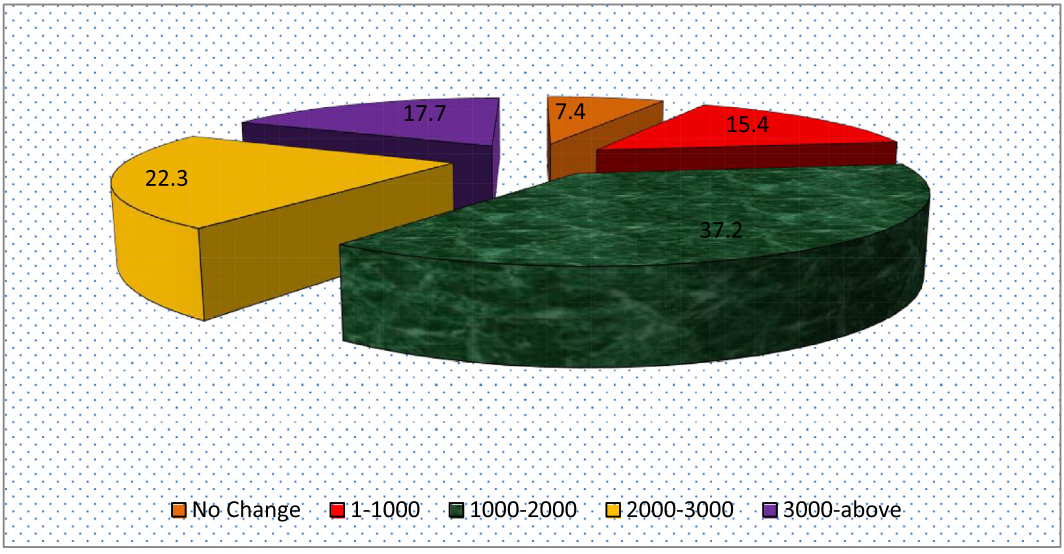

Fig. 5. Income change of household due to flood.

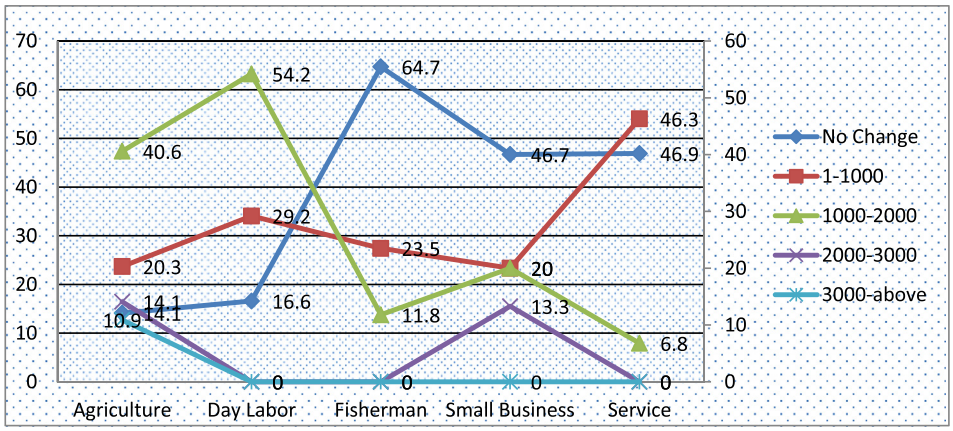

Fig. 6. Household income reduction due to flood in 2107 on the basis of occupation before flood.

In Bangladesh, flood is one of the most cogitation of flood-prone area's people, especially who are living in the char land. In response to floods by the households regarding financial coping strategies, they usually take loans and borrow money from their nearby moneylender, relatives or neighbor. During the flood, people generally take loans and/or borrow money to facilitate primary needs like rice, salt, oil, and other emergency

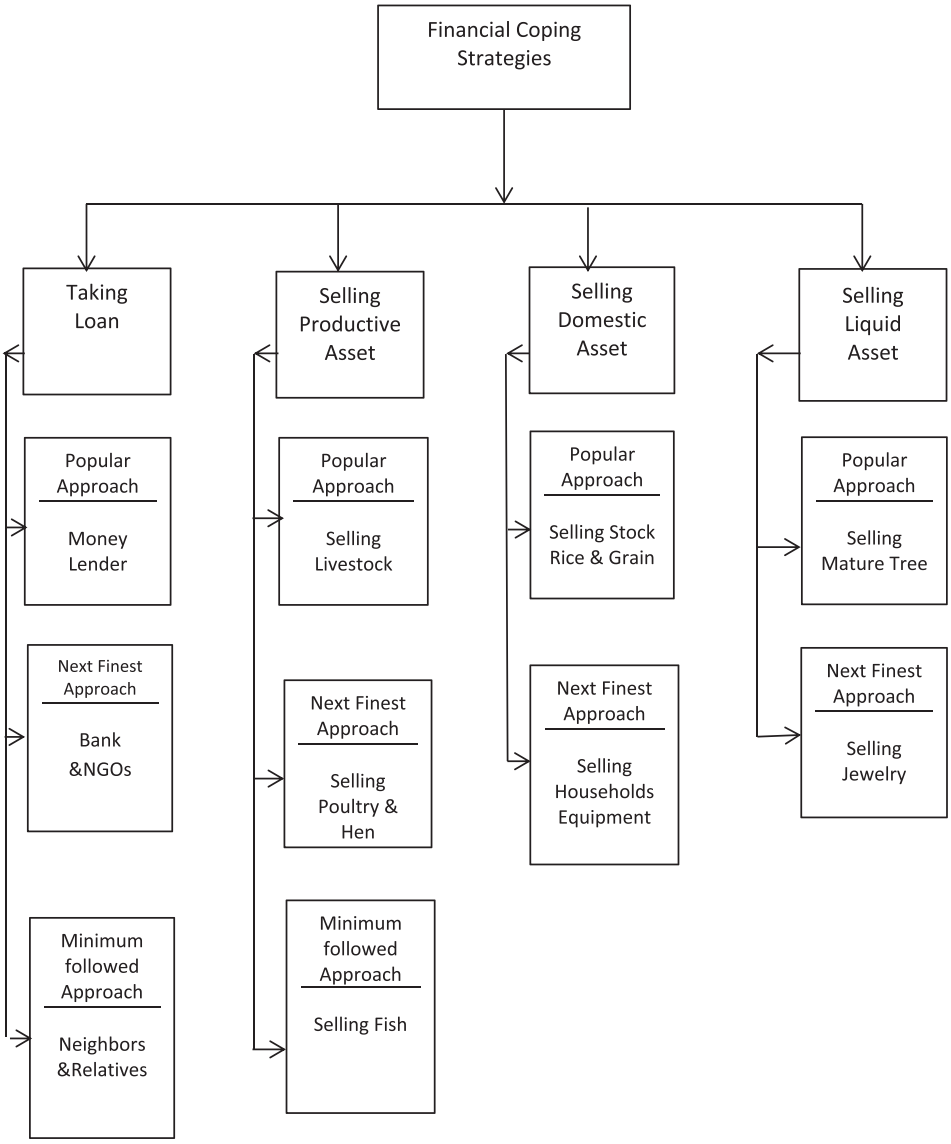

Fig. 7. Approaches to financial coping strategies followed by char land people.

elements to the family. Actually the char dwellers usually take loans due to their financial crises, because during the flood people don't have income-generating facilities. The present study exposed that almost 45% of the households borrowed money from a nearby moneylender with accompanying high-interest charges, and 10–30% interest has to pay while repaying the entire money to the money lender. At the moment of crisis, it is not possible to receive money as loans from other sources such as relatives, neighbor, NGOs, and Banks. The key problem was that the neighbor and relatives also faced flood disaster at the same time which is why they could not able to borrow the money.

On the other hand, the people of the study areareported that they had to receive money as a loan with high-interest rates from moneylender due to massive official formalities and compound procedures of dealing loans from Banks and non-government organizations (NGOs). Besides, the massive amounts of people sold their productive assets to cope during the emergency period of the flood. The study uncovered that almost 61% of entire households sold the dynamic property; also, 11% of households mortgage their valuable property in response to the flood. Therefore, these kinds of strategies make defenseless people more vulnerable. As mentioned earlier, there are many families in the study area who are suffering to repay the loan during the entire the year to the moneylender . So, this kind of situation confines them to saving, conducting a healthy life, and devoting to boost them above the poverty mark (Fig. 8).

During the field survey, the respondents shared their experiences of the previous flood disaster regarding the financial coping strategies; various GOs and NGOs extended help to concerned persons to facilitate their coping strategies and to alleviate the intensity of lives during the flooding. Most of the organizations play a very effective role for the emergency food and medicine supply to the affected households. Besides, along with this help, cash supply kitchenware supply, emergency medical treatment, and awareness programs were also untaken by the NGOs employees. Most of the households were damaged fully and partially owing to flood in 2017. The present study revealed thatonly 41.1% of households got emergency food supplies, which were less than what wanted from the organizations. On the other hand, the rest of the other organizational support for the flood-affected people was very bad (Ranges from 10.9% to 36.6%). During the interview session, there were some respondents who claimed that they just received one or two types of organizational supports, but the support was not as significant as they needed. However, most of the respondents of the study areawere not pleased regarding the organizational help; because they needed more assistance to combat the havoc flood.

At the end of the discussion, it is cleared that climate change is accountable for the increased flood risks worldwide. The contemmporary scholars have claimed that upcoming echelons of flood risks are hypothetically delicate to climate change [51]. Bangladesh has already been noted as one of the most susceptible countries owning to climate change, and flood disaster is also very much concentrated in Bangladesh. Thus, the time has come to learn more about the adverse impact of floods on the people's livelihood in the char area, and also know their coping strategies because it's very essential for effective adaptation to the climate change in Bangladesh. Poverty is the root cause and key element for the char land poor people vulnerability to flood, and recurrent floods lead to escalations in poverty followed by more vulnerability. Actually, flood impact on the people's livelihood has been the main issue, especially in the Char; where people are dependent on agriculture and aquaculture [4]. In the char areas poor people, loss of income and occupation have been recognized as one of the main antagonistic impacts. Therefore, char development enterprises have begun to focus on diversification of livelihoods, which includes rural micro-finance cooperative production and marketing and increasing the value associated with rural production through local skills training. However, there are only some organizational programs running in the study area, which is not accessible for a minor division of the community. One scholar revealed that vulnerable poor people couldn't improve a resilient coping strategy due to the lack of organizational support [52].

It is said that Bangladesh is a completely different country from that which was considered in the formulation of the flood action plan (FAP) 30 years ago [9]. Subsequently, socio-economic and climate and population changes are necessary to document the upcoming flood assessment maps and policies for flood control and water management. One scholar has suggested that the government should try to increase both economic income and employment in other sectors of the national economy in the absence of effective flood protection interventions. However, in order to tackle escalating industrial production and improve education and skills development, service sector investment is most needed [53]. Appropriate use of government grants and other finances assistances must also be confirmed. Therefore, the Government and other pertinent organizations should spread their helping hand to defend the char land community from the havoc impact of flood disaster as well as should facilitate care for the disadvantaged community towards sustainable development through well-organized supervision of floods disaster.

4. Conclusion

The peak discharges in the future under climate change point out the probability of more severe floods in Bangladesh. The flood-prone zones of Bangladesh would be more vulnerable in terms of complexity and area of flooding owing to rises in a massive peak discharge of the GBM basins.People have been living in this area for many years,flood disaster is a relevant occurance in the lives of the dwellers of Flulchari. Every year various degrees of the flood have a main impact on this area. As a result of the impact

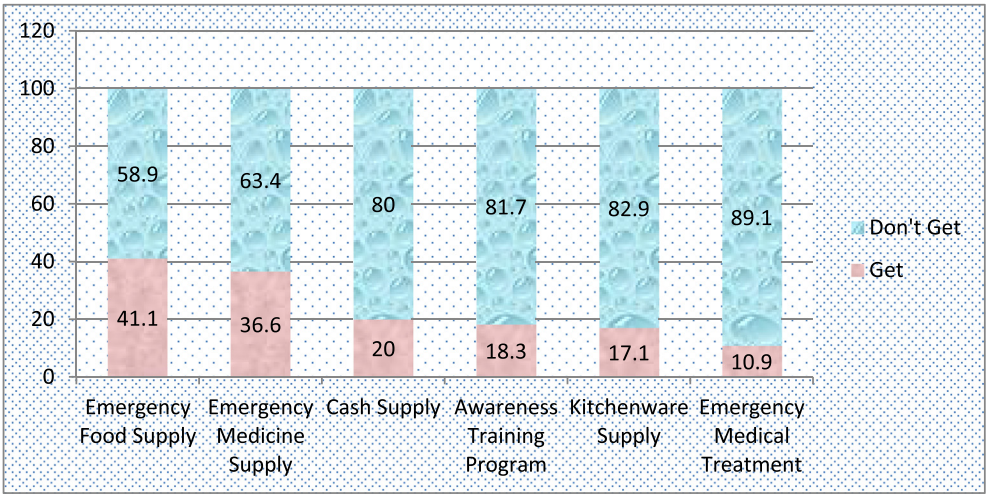

Fig. 8. Organizational Support of households to the flood-affected people.

of flood, people suffer more and disrupt their income-generating activities, agriculture, infrastructure, food supply systems, and other parts of the livelihood. The people are passing their entire life while striving against flood in char, and the main interesting matter is that the char dwellers, directly and indirectly, depend on rivers and floods for their livelihood. So, in spite of having a flood in this region, most of the vulnerable people are eager to live in here. As most of the char landpeople are living under poverty, it is universal that these poor dwellers can't leave this susceptible to frequent flood area. Therefore, this char land poor people sustain their difficult lives with the possible flood impacts, and face multitidues of hunger and food problem, sufferlose of income and occupation. Apart from this, they are not capable of coping with the flood, for this reason, to alleviate the impacts of the flood disaster; they usually take a substantial loan with high-interest rates and manage money by selling the productive property. This kind strategy often pushes them towards the long period of poverty and vulnerabilities, which bound their capability to prepare a response and recover from the next floods disaster.

The char people claimed that low access to food, water, and health amenities and fragile social network are the core drivers of livelihood venerability in the char land, as well as inadequate access to agriculture and non-agricultural property, and money. From the interviews session, it is indicated that a long term initiative for developing char plan would be very accommodating to build alleviate against the vulnerability such as capacity building, road construction, employment facilities and social forestry etc. To attain the SDGs (Sustainable Development Goals) and to confront climate change, flood disaster and its adverse impacts on the people's livelihood of char land poor people would be the uppermost-priority issue of apprehension in developing countries like Bangladesh where flood is the regular phenomenon. With the vulnerable community, GOs and NGOs should intervene with more significant solution to diminish the confrontational impacts of the flood on the people's livelihood of char land poor dwellers, and also develop an appropriate coping strategy that won't push them to further vulnerability.

Declaration of competing interest

Authors declare that there is no conflict of interest.

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