

Flood Resilience, Social Capital and Livelihood: A Study of Few Selected Villages of Labpur Block of West Bengal

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ABSTRACT

Rural communities face many crises due to flood. Among the rural community, the poor and the low income group people are the most vulnerable to flood. In contemporary literatures, community resilience is a key factor for understand the flood hazard management. In studying the resilience, social capital is a significant contributor for the analysis of disaster preparedness among the people who faces shocks and difficulties due to flood. During crisis, it is the critical role of social network and relation which enhances the coping and adaptability strategy among the people affected by flood. This paper aims to evaluate few selected villages of Labpur block of West Bengal to explore the role of household resilience and social capital with respect to flood risk management and mitigation. Household resilience and social capital were measured based on household survey using five point Likert scale and Factor analysis. The study finally concludes that food security, income generation and learning new techniques for livelihood transformation, neighborhood attachment with food and money are some of the important factors of resilience for disaster response and recovery.

1. Introduction

1.1 Background of Research

Community faces many crises frequently in the form of natural hazards or disaster. The notion of enhancing community resilience is a key concept to reduce risk and vulnerability of natural disaster now a day. Considering lose human life and assets recent development of disaster management policy reorienting more towards resilience power of the community. Consequently, increasing emphasis is put on the notion of "living with risk" rather than simply trying to prevent the occurrence of hazards (Tania López-Marrero & Petra Tschakert, 2011). This approach focuses on the ways and means to anticipate, prepare, mitigate and cope with the present and future occurrence of hazards and disaster. Thus the central idea of resilience is not only to control but also to manage disaster by following a bottom up approach. Shift in policy framework, community resilience mechanism is of great interest among the scholars and practitioners for the contemporary thinking of disaster management. Looking at the attitude and policies towards flood risk management, the role of communities and individuals' flood perception is considered to be key elements for management and mitigation of external shocks.

1.2 Flood management and concept of resilience

The concept of resilience owes its origin from an ecological context defined by Holling in 1973. Contemporary literature highlights the fact that resilience is a significant concept in the studies of adaptation behavior to natural hazards like flood. In the fields of disaster and flood risk management, the idea of applying resilience as a way of understanding how individuals and communities cope with and recover from external shocks (Mileti, 1999; Petak, 2002; de Bruijn, 2004; Rose, 2004). Adger et. al (2002) defined

resilience as the ability of communities to absorb external change and stress, while maintaining the sustainability of livelihoods . Resilience in the context of living with flood is defined as the capacity of households to learn, cope with and benefit from floods (Nguyen Van Kien, 2011). Livelihood diversification, sustainable livelihood framework and resilience are very much interrelated for risk mitigation strategy (Ellis, 2000). Ellis defines livelihood diversification as the process by which households construct an increasingly diverse portfolio of livelihood activities and assets in order to survive or improve living.

1.3 Flood and social capital

Understanding social capital has now become a significant concept in the context of social resilience study of environmental hazards. Broadly, the term describes how social ties generate norms of reciprocity and trust, allow collective action, build solidarity, and foster information and resource flows among people (Portes, 1998). Researchers have identified three different types of social capital: bonding, bridging, and linking (Putnam, 2000; Szreter & Woolcock, 2004). Bonding social capital identifies relations among close family and friends. In this type of capital persons have similar racial, socioeconomic, cultural, demographic, and other characteristics. These close relationships result in strong social support and in-group attitudes (Beggs, Haines, & Hurlbert, 1996). Bonding social capital, for example, provides affected residents with immediate assistance, strategic support (Hawkins & Maurer, 2010), and emotional, administrative, and resource assistance in the midst of a crisis (Beggs, Haines, & Hurlbert, 1996). According to Bourdieu (1985) social capital can be actual or potential resources for group members and it can be formed by formal or informal relationship. Maintaining a social relationship is the key to developing social capital.

Neighbours are vital to lend money or goods, to evacuate or repair house, to share knowledge to cope with during flood. Good relationship with the neighbours helps to mobilize resources such as food, shelter or income insecurity during flood. Mutual assistance and reciprocal help among the flood affected households are of much important to combat with flood disaster.

2. Research objectives

The main objective of the present research is to explain the resilience mechanism of the household especially among the low income groups to cope with flood. The specific objectives are:

- To examine the relationship between livelihood adaptation and household resilience to flood.
- To understand the relationship between household resilience to flood and social capital.
- To make an overview of flood impact assessment among the rural households.
- To investigate the relationship between flood and migration as a strategy to cope with flood.

3. Materials and Methods

For the present study, flood perception and impact of flood among the low income group of people have been targeted through structured, semi-structured and open ended questionnaire survey. Both the quantitative and the qualitative approaches have been employed to carry out the present research. Field observation and in depth interviews were also followed in the study. Quantitative techniques such as factor analysis have been used for understanding household resilience mechanism and as well as for constructing the status of social capital of the households. On the basis of proportion of respondent who answer Five-point Likert scale questions, Factor analysis was done through SPSS Software. Factor analysis is also used to assess the responsible factors among many variables to study the flood resilience. KMO statistics were used to assess the set of variables used in correlation matrix is suitable for the analysis in the present research. For rotation of component matrix, Varimax method is implied to minimize the number of variables that have a high loading on a factor and to maximize the interpretation of factor. The eigen value for this factor analysis is considered is as greater than 1.

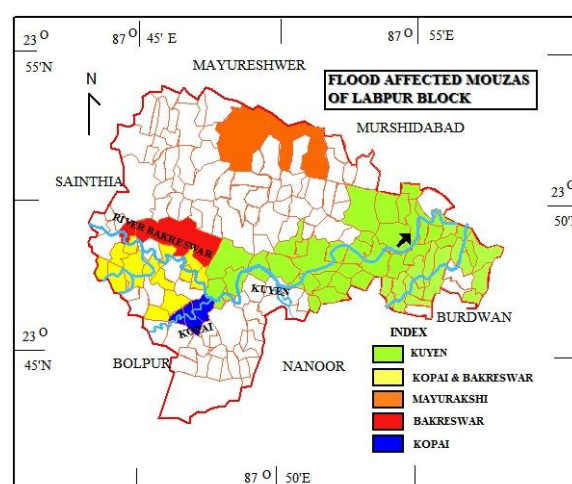
Community is used to judge the variables for explaining the variance (N. Van Kein, 2011).

Located in the eastern part of the studied block, villages were taken on the basis of purposive sampling. These villages are well known for flooding almost every year and they frequently becomes the headline story of many news papers and Government reports during rainy season.

4. Results and Discussion

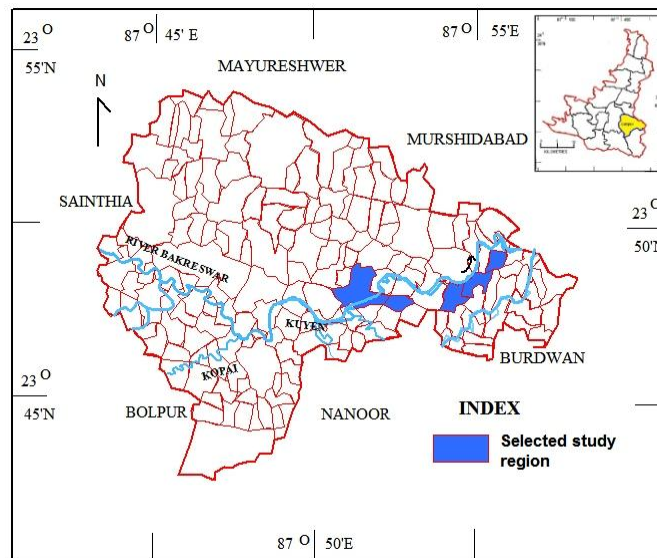
4.1. Regional flood factors of Labpur block

Labpur, located in the south eastern part of the district of Birbhum, is one of the most flood-prone block having an extension of 23° 42'44" N to 23° 53'46" N latitude and 87° 43'06" E to 87° 58'02" E longitude. Flood is well known in Labpur, especially in southern and south eastern part. The total numbers of villages are 217 of which 114 villages are flood prone. According to the multi hazard district disaster management plan of Birbhum, 2017-2018, the population affected by flood prone areas is about 70, 000 and the total cultivable land under flood-prone areas is about 9000 acres. Among 179 mouzas of Labpur block, near about 98 are flood affected. According the study of Das and Mukhopadhyay (2017), that 52 per cent of the total area of the block is experiencing flood risk from very high to moderate magnitude. People are very much vulnerable to the impact of flood due to loss of life, crop damage and damage to property. Flood records of last three decades reveal the fact that almost every year this block have experienced flood situation due to draining of river Mayurakshi, Bakreswar, Kopai and Kuyen. The combined flow of river Bakreswar and Kopai is locally known as river Kuyen is flowing in the south central part of this region. Out of 11, 5 Gram Panchayets i.e. Thiba, Indus, Jamna, Kurunnahar and Labpur-1 GP are flood affected by the river Kuyen. Out of 98 mouzas, the flood situation for 63 mouzas, are contributed by the river Kuyen. Therefore, it is no doubt that River Kuyen is one of the prime contributors of flood in Labpur. This research has been done to make an over view of how people, mainly the low income groups, are living with the flood to make their livelihood sustainable and external shock absorbing. For putting our study into perspective the present research was carried out on six villages namely Haripur, Joychandrapur, Chaturbhujpur, Khanpur, Parabad and Sitalgram located very close proximity of river Kuyen.



Source: Multi-hazard District Disaster Management Plan, Birbhum, 2017-2018

4.2 Why this region?



Almost every year, the villages such as Joychandrapur, Chaturbhujpur and Haripur are flooded by river Kuyen. People have to struggle throughout the year to live with flood. During the flood of July, 2015, the aforementioned three villages, located in the Thiba panchayet, remained water locked for three weeks (Bartaman 2015). The road, at a stretch of 3kms connecting Chaturbhujpur with Joychandrapur submerges every year into the water with the advent of rainy season. Dhurbati secondary school also remains disconnected from the pupils of Chaturbhujpur and Joychandrapur. According to the Madhyamik examinee Soumyadip Ghosh, Sudip Ghosh and Rima Mondal (Field survey, 2018) that how they will be able to continue their study due to their long absence from school. It is very hard for them to continue their study in this school as the school gets detached every year due to flood in river Kuyen. The death of Satabdi Bazigar (a woman of 23 years of age) of Sitalgram village due to the enormous flooding of river Kuyen was very dismal when her body was found in the midst of sugarcane field after three days missing. The villagers of former president of India Mr Pranab Mukherjee guarded their river embankment many a nights during flood 2017. The villagers of Mirati such as Palash Bagdi, Juyan Mondal and others told that without any sleep they are guarding the local river embankment from the last Saturday. They are apprehending that if the embankment breaches, there will be no stress of their village and it will be swept out (Field survey, 2018). Physiographically, the three villages namely Haripur, Joychandrapur, Chaturbhujpur are surrounded by river Kuyen, Langalhat *bil* and Jamna *bil*. According to Anandabazar Patrika report (4.07.2018) that during rainy season these three villages remained water locked for more than five to six months. During flood, boat or *Karai* (a container made of iron) is the only means of transportation. Saikat Ghosh of Chaturbhujpur, Dushasan Pal of Joychandrapur and Ranjit Mondal of Haripur village told that (2018) for four to five months they have to use *Karai*, the only means of transport, for move. Arun Bagdi of Joychandrapur, Krishnapada Mondal of Haripur and Jaban Mondal Chaturbhujpur village pointed out that if someone gets ill during flood, *duli* is the only means of transport to reach to primary health centre. In doing so, life risk due to this hazardous move is found to be common. Participatory survey

also reveals that near about 50 % students have to go out from these villages to avail education in the Dhurbabati Secondary school located at a distant place. Subhas Mondal, the head master of Joychandrapur Primary school, told (Field survey, 2018) that for most of the time in a year "I have to use towel instead of pant and shirt to walk two to three kilometers distance daily to reach my school because of inundation, flooding and poor road communication". He also added that "due to poor road linkage nobody wants to join this school easily". According to the survey, the last severe flood happened in Labpur block was in 2017. A report published by the District Disaster Management cell of Birbhum district (2017) depicts the fact that near about 2285 people of 184 villages were affected by flood during 2017 flood. During flood 225 houses were found totally damaged and 297 houses were partially damaged. During 2017 flood, two boys and one girl of Sitalgram village were flashed out by the river Kuyen. Among the three the death of Arnab Chattopadhyay (11 years of age) was very pathetic (Field survey 2018). Considering the different facets flood impact among the people of the selected villages, flood indeed imposing a great challenge among them which annihilates almost all spheres of life.

4.3 Flood and Household resilience

Enhancing community resilience is the key to reducing vulnerability in the face of natural hazards (Tania López-Marrero & Petra Tschakert, 2011). The concept of social resilience not only concerns the ability to respond positively to stress but also addresses the innovative aspect of resilience or the capacity to learn and transform (Walker et al. 2004). However according to Marshall and Marshall (2007) capacity to change positively depends on the well-being of the household. As per as the present study is concerned the average family income varies up to Rs 3500 per month and they belong to the low income group. The selected households experience flood almost every year and their ability to cope with or to gain benefit from flood reflect their resilience. Present study used respondents' answers on five point Likert scale, varies from strongly disagree (0) to strongly agree (4) and all total nine variables were used for the present research to unfold the resilience trajectories. After getting responses from the

households regarding their perception, data base were checked and tabulated for factor analysis.

The percentage value of different factors among the respondent have shown that most of them are responding for 'one' in Likert scale i. e. the 'disagree' scale. As the target population belongs to the poor and low income group, their nature of response to five points Likert scale is more or less same and there is no significance difference in responses (Table-1). For this, to identify the underlying significant factors of resilience, factor analysis is used. Factor analysis indicates that four out of nine variables significant contribution for measuring livelihood resilience. The first component representing 25 % of the variance consisted to the statement related to the variables that (1). I Can replace quickly when my

house affected by flood and (2). I am confident that my household will not need to borrow rice or money from informal sources. This resilience represents the capacity of household to secure their homes and households own stock of fund or resources to cope with crisis. The second component represents 13.36 % of the variance consisted to the statement related to the variable (4). I am confident that my household has enough rice to eat during flood which includes the resilience factor of securing food and money during flood. The third component, representing 12.66 % of the variance consisted of mainly one statement (9). I want to learn new farming practices to cope with flood such as fishing, prawn culture etc. or new agricultural practices reveals the interest of learning new techniques among the households.

Table-1
Perception (%) of research participants based on five point Likert Scale (Nine questions)

Item	Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	I Can replace quickly when my house is affected by flood	60.17	36.44	2.54	0.85	0
2	I am confident that my house will not submerged in near future	41.53	52.54	5.08	0.85	0
3	I am confident that my house will not collapse in future flood	28.81	49.15	14.41	7.63	0.85
4	I am confident that my household has enough rice to eat during flood	17.8	52.54	28.81	0.85	0
5	I am confident that my household will not need to borrow rice or money from informal sources	16.95	57.63	24.58	0.85	0
6	I am confident that my household can find a safe place to evacuate in future flood	16.1	63.56	17.8	2.54	0.85
7	I am confident that children and elderly people will be safe during flood	14.41	55.93	24.58	5.08	0
8	I am confident that health of my family members will not be affected by flood	16.1	53.39	25.42	5.08	0
9	I want to learn new farming practices to cope with flood such as fishing, prawn culture etc. or new agr. practice	4.24	30.51	18.64	28.81	22.03

Source: Field Survey, 2018

(Five point Likert scores: 0 for strongly disagree, 1 for disagree, 2 for neither agree nor disagree, 3 for agree, 4 for strongly agree)

Table-2
Rotated component matrix for household resilience

Survey items	Factor loading			Communality
	Factor 1	Factor 2	Factor 3	
I am confident that my household can find a safe place to evacuate in future flood	0.68			0.51
I am confident that children and elderly people will be safe during flood	0.70			0.63
I am confident that my household has enough rice to eat during flood		0.74		0.56
I want to learn new farming practices to cope with flood such as fishing, prawn culture etc. or new agr. practice			0.81	0.72
Eigen values	2.205	1.202	1.139	
% of variance	20.71	16.76	13.05	

Source: Extracted from SPSS and prepared by authors

4.4 Social capital and Resilience to Environmental Hazards

Neighborhood attachment is an important aspect of social capital. Neighborhood attachment means the degree to which people are attached to their neighbor (Li et al, 2005). Social capital is a resource which is embedded in every community and it has been observed that it plays an important role in different stages of a disaster (Sanyal and Routray, 2016). Social networks provide financial (e.g., loans and gifts for

property repair) and nonfinancial resources (e.g., search and rescue, debris removal, child care during recovery, emotional support, sheltering, and information) (Aldrich and Meyer, 2014). Bonding social capital is the most commonly found social capital available to individuals in any area distressed by disasters (F. Norris, et al, 2008).

The percentage value of different factors among the respondent have shown that most of them are responding for 'four' in Likert scale i. e. the 'Agree' scale (Table 3). As the target population belongs to the poor and low income group, their nature of response to five points Likert scale is more or less same and there is no significance difference in responses. Factor analysis reveals (Table 4) that four out of eight variables have significant impact for calculating social capital of the respondent households. The first component representing

26.62 % of the variance consisted of two statements i.e. 2. Advice is available from neighbour when we face difficulties and 8. Help my neighbour out with money or rice when they are affected by flood. The second component representing 15.94 % of the variance includes the statement that 9. I am regularly invited for conflict resolution of my neighbor. The third component analysis, representing 15.37 % of the variance includes: 6. I regularly participate in cultural and religious activities with neighbor.

Table-3
Perception (%) of research participants based on five point Likert Scale for measuring social capital

Item	Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	My neighbour mean a lot to me	0	0.85	2.54	61.02	35.59
2	Advice is available from neighbour when face difficulties	0	2.54	3.39	56.78	37.29
3	I regularly have tea	0	5.93	11.02	67.8	15.25
4	I discuss way of living with flood with my neighbour	0	2.54	7.62	69.49	20.34
5	Regularly participate in recreational activities with	0	4.24	19.49	66.1	10.17
6	I regularly participate in cultural and religious activities with neighbour	0.85	3.39	26.25	67.75	2.51
7	I regularly participate in hamlet meeting	0.85	4.24	14.41	67.8	13.56
8	help my neighbour out with money or rice when affected by flood	3.39	2.54	6.78	62.71	27.97
9	I am regularly invited for conflict resolution of my neighbour	0	4.24	42.37	33.9	19.49

Source: Field Survey, 2018

(Five point Likert scores: 0 for strongly disagree, 1 for disagree, 2 for neither agree nor disagree, 3 for agree, 4 for strongly agree)

Table-4
Rotated component matrix for households social capital

Survey items	Factor loading			Communality
	Factor 1	Factor 2	Factor 3	
Advice is available from neighbour when we face difficulties	0.68			0.50
Help my neighbour out with money or rice when they are affected by flood	0.70			0.50
I am regularly invited for conflict resolution of my neighbor.		0.70		0.61
I regularly participate in cultural and religious activities with neighbor.			0.83	0.71
Eigen values	2.130	1.28	1.23	
% of variance	26.62	15.94	15.37	

Source: Extracted from SPSS and prepared by authors

4.5 Perceived impact of flood on households' livelihood

Floods have both positive and negative impact. Poor people are the most vulnerable group to experience flood consequences. Most of the respondents thought that floods have much negative impact in the moderate to high flood prone zone. The respondents experienced negative consequences such as anxiety about floods (83.90 %), loss of jobs during flood (61.02%), Crop loss (66.10%), animal death (58.47%) etc

(Table 6). at a very high magnitude. However, perception survey also shows that submergence of houses (61.86%), home damage (61.86%), income reduction from fishing (71.17%), lack of availability of job locally (59.32%), and house totally submerged (61.86 %) have some moderate impact (Table 5) on the livelihood of the poor respondents. Around 37.29% of the respondents experienced moderate impact on shortage of rice during flood.

Table-6

	Items	Low	Moderate	High
1	Submerged houses	5.93	61.86	32.20
2	Anxiety about floods	0	16.10	83.90
3	Shortage of rice to eat during floods	52.54	37.29	10.17
4	Loss of jobs during flood	4.24	34.75	61.02
5	Home damage	6.78	61.86	31.36

6	Educational disruption	3.39	60.17	36.44
7	Crop loss	0.85	33.05	66.10
8	Job seeking in areas far from home	14.41	59.32	26.27
9	Reduced income from fishing	8.47	71.17	20.34
10	Temporary evacuation to other places	10.17	69.49	20.34
11	Houses totally submerged	6.78	61.86	31.36
12	Animal death	22.03	19.49	58.47

Source: Field Survey, 2018

The positive impact that people responded are increase agricultural productivity (69.49%), reduction in input costs (80.51%), income generation from collection of snails, crabs (72.03%) and fish (72.03%) have wider significance on livelihood of the poor in this region.

Table-5

	Items	Low	Moderate	High
1	Higher yield in the winter and spring paddy	2.54	27.97	69.49
2	Reduction of input costs for winter and spring paddy	4.24	80.51	15.25
3	Collecting snails and crabs during flood	18.64	72.03	9.32
4	Capturing fish during flood	4.24	42.37	53.39

Source: Field Survey, 2018

4.6 Flood and migration

Flood and migration are very much interlinked to each other. People seek migration as an alternative strategy to reduce the consequences or the negative impact of flood on them. In our present study we tried to understand community response to migration as an adaptive strategy to cope with flood. The study reveals (Table 7) that people are willing to migrate desperately in few villages due to fear of flood (89.47 %). The factors such as lack of job opportunity (42.16), crop

damage due to flood (66 %), poor transportation or disruption of transportation network during flood (35 %), poor financial condition (69.38) have some significant impact from high to very high magnitude. However, factors such as less demand for purchasing land due to recurrent flood in the region (56%), migrating in a new area and high land value (42.42%), paternal attachment (39.67 %), and anxiety due to not having any work in the area also have some critical impact to act as distinctive causes that hinders peoples' willingness to migrate.

Table: 7

	Factors	Very Low	Low	Moderate	High	Very High
1	Fear of flood	0	0	5.26	10.52	89.47
2	Lack of job opportunity	0	7.84	29.42	42.16	20.59
3	Crop damage due to flood	0	4	8	66	22
4	Transport problem	0	0.99	30.69	35.64	32.67
5	Poor financial condition	0	1.02	8.16	21.43	69.38
6	Less demand for purchasing land	4	6	15	56	19
7	High land value elsewhere	1.01	9.09	25.25	42.42	22.22
8	Paternal Attachment	3.31	0	26.45	39.67	30.58
9	Anxiety to be accustomed in new environment	7.07	20.2	34.34	28.28	10.1
10	Anxiety due to not having any work in new area	0	21.43	27.55	29.59	21.43

Source: Field Survey, 2018

Participatory survey reveals the fact that many households have migrated due to facing the severe impact of flood. In order to augment our understanding we calculated the growth rate of the six studied villages. It shows the fact out of six villages, three villages namely Khanpur, Parabad, Purba Haripur, have shown negative growth of population within twenty year of span in between 1991-2011 (Table 8). But, from 1971-1991 the growth rate of these three villages had some positive value. The dichotomy of behavior may be due to the recurrent flood impact among these villages. However, the villages such as Sitalgram, Chaturbhujpur and Jaichandipur

have a very low or insignificant growth rate in comparison to 1971-1991.

Table-8

Name of the villages	1971-1991	1991-2011
Sitalgram	15.8	18.16
Khanpur	1.24	-14.34
Parabad	5.70	-47.90
Purba Haripur	5.29	-9.55
Chaturbhujpur	12.27	17.49
Jaichandipur	23	15.41

Source: Census of India, 1971, 1991, 2011

5. Conclusion

The empirical study made an attempt to highlights different dimensions of flood hazards among the poor households. Factor Analysis clearly depicts the fact that households with low income groups, securing food and income has a significant impact on households' resilience. Therefore, stocking of food and some money during flood is an important strategy of the poor. The people are also concerned about the safe evacuation of their family. However, for the livelihood transformation and to find new way of living with flood, the analysis also states the fact that people are willing to learn new type techniques to enhance their income during flood. As per as the present study area is concerned, the findings do not

confirms that borrowing of money from some informal sources is a significant household resilience strategy. Social capitals have a significant role as resilient factors. The present study reveals the fact that the helping the neighbour with rice or money during flood, or taking advice from the neighbour during flood crisis are important attributes of social capital for flood management. In search of options to cope with negative impact of flood, willingness to migrate is a significant factor. The growth rate of population in the studied villages clearly demonstrates that out of six, three villages have shown negative growth. So, livelihood diversification during flood can be an important approach to minimize the flood risk.

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