Community based flood adaptation mechanisms in highland areas of Kerala

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***Abstract*: The present study is a maiden attempt to conduct a comprehensive back-of-the envelope analysis of different coping strategies adopted at the community level in highlands of Kerala. For the research, out of the 14 districts of Kerala, Idukki and Wayanad districts have purposively been selected for the analysis of coping strategies in highland. Adimali and Vellathooval panchayats were selected for coping strategy assessment in Idukki district and Panamaram and Meppadi panchayats were selected from Wayanad for the study. Using proportionate sampling, 257 respondents has been selected for the study. For the analysis Community based Coping Strategies Index for highlands of Kerala was developed. Highest mean value was obtained for the component food security, and the component with higher number of strategies greater than the mean value also belongs to food security followed by housing and shelter. The component with the lowest number of strategies above the mean value belongs to the component of means of livelihoods. Documentation of community based community strategies throws light on the different ways, different communities behave at the time of disasters. The study concluded that in the case of community level coping mechanisms, most of the coping mechanisms were implemented during the disaster phase, and the component given the most attention was food and security. This study therefore can be used by the policy makers to formulate relief and rescue measures as per the strengths and weaknesses of the community.**

***Index Terms:* Community, Highland, Flood, mechanism, coping strategies**

I. INTRODUCTION

Kerala, a southern state of India in the Indian subcontinent has a tropical monsoon climate with seasonally excessive rainfall of around 3000 mm and hot summers. The state has drawn attention in the recent past due to significant alterations in the characteristics of the SW monsoon, resulting in severe flooding and landslides. The 2018 flood was the worst of its kind in a century since the 1924 floods. It can be understood as a climate-induced natural disaster, with more than 56% precipitation falling from multi-day extreme rainfall episode between July and August.

Kerala state, which covers only 1.18 per cent of the total land area of India, supports over 3.5 per cent of the country's population. The state has a population density of 819 persons per sq. km. being the highest in India (GOI, 2013). Amidst much potential in agriculture sector, Kerala state witnesses countless challenges and risks impairing its growth. Directorate of Economics and Statistics (DES) reported that the year-on-year growth rate of agriculture and allied activities were negative from 2012 to 2016. Thereafter, the sector witnessed growth of 2.5 per cent in 2016-17. However, the share of Agriculture and allied sectors in total GSVA of the State has also declined to 10.5 per cent in 2016-17 from 13.7 per cent in 2012-13. Preventing the occurrence of natural hazards or keeping the state secure from disasters is impossible. However, life and property loss due to such extreme events can substantially be reduced by adopting proper coping measures (ADPC, 2005).

Coping refers to a process through which households attempt to smooth the consequences of the disaster, and recovery includes the restoration, and improvements where appropriate, of facilities livelihood and living conditions of disaster affected communities, including efforts to reduce risk factors. According to White et al., 2004, disaster is a severe disruption to the survival and livelihood system of a society or community, resulting from their vulnerability to the impact of one or a combination of hazards and involving loss of life and/or property on a scale which overwhelms the capacity of those affected to cope unaided (UNISDR, 2015)

Moreover, as far as the community based coping strategies are concerned they are the source of first line of relief when disaster strikes. Moreover, Bardsley and Harris (1987) highlighted that, a community can help in the restoration of houses, sanitation facilities in each household, water supply facilities at community levels, commuter roads/ bridges/culverts/electric connections, educational activities, and health care facilities. Local community is the main focus of community based flood preparedness programme as it is the community which is adversely affected by a flood and, more importantly, it is the first responder to the event. Moreover, Chaliha *et al.*, (2012) (2010), conducted a study in the flood prone areas of Assam and highlighted that the community based flood management approach with a view to preserving the crop and other agricultural resources at household levels communities also helps to reduce the financial loss by harvesting premature standing crops (viz., vegetables etc.) if there is a threat of such crops being inundated.

However, even though these grassroot mechanisms have remained neglected for a long time in disaster relief and rescue measures, it is now emerging as a major strategy for many disaster management agencies. Therefore, the study is a maiden attempt to conduct a comprehensive back-of-the envelope analysis of different coping strategies adopted at the community level in highlands of Kerala.

2. Methodology

2.1.Location of the study

Kerala located between 10.8505° N and 76.2711° E can be physio graphically divided into high lands (above 75m + MSL), midlands (7.5 to 75 + MSL) and lowlands (less than 7.5m + MSL)(GoK, 2010; GoK, 2011). For the research, out of the 14 districts of Kerala, Idukki and Wayanad districts have purposively been selected for the analysis of coping strategies. Idukki, a hilly state with an area of 4358 km^2 is one among the worst- hit district during 2018 disaster.

Hence, Adimali (AD) and Vellathooval (VT) panchayats has been selected for coping strategy assessment in Idukki district. Wayanad district has also suffered serious setbacks in the landslides of 2018 and 2019. Therefore, panchayats *viz*. Panamaram (PM) and Meppadi (MD) has been selected from Wayanad for the study. Using proportionate sampling, 257 respondents has been selected for the study.

2.2 Community based Coping Strategies Index for highlands of Kerala (CCSI)

CCSI has been developed in line with the methodology developed by Sheheli and Khan, 2015. The steps for the construction of CCSI is given below

I. Steps for constructing CCSI

a. Identifying locally relevant coping strategies
b. Frequency: scoring the statements on the basis of frequency
c. Categorizing and weighting the categories (weightage for each statement have to be made in advance)
d. Scoring (1 to 4) [1= least frequency, 4= most frequency]
e. Weighted score = Frequency x weight
f. Interpreting the CSI
g. Triangulation

Flood coping ability at three levels will be measured by considering six dimensions of livelihoods. These dimensions are: Food security, housing and shelter, crop production, livestock and poultry rearing, health and sanitation, means of livelihoods

3. RESULTS

In this section, the coping strategies adopted at the society or community level has been analysis. For this, farmer respondents were asked to identify those coping strategies which were implemented in the community they reside in.

3.1. Coping strategies at community level in highlands (n=257)

Coping strategies specific to the regions of highlands has been identified and they have been scored and ranked to calculate the Coping Strategies Index at community level. Table 1 shows the different mechanisms identified and their scores obtained. In the case of community level coping mechanisms, most of the coping mechanisms were implemented during the disaster phase, and the component given the most attention was food and security.

Table 1: Coping strategies at community level in highlands (n=257)

Food security	Providing relief materials including food, medicines, blankets and clothes.	744	1
	Provisions for availability of drinking water	702	2
	Sharing of food and food materials between neighbours	433	8
	Mean	626.33	
	Standard deviation	168.74	
	Standard error	97.42	
Housing and shelter	Arrangement of temporary shelters	720	3
	Evacuating the people, especially the children, pregnant women and elderly to safer places	582	5
	Restoration of communication facilities	403	10
	Cleaning of houses and roads	418	9
	Mean	530.75	
	Standard deviation	149.97	
	Standard error	74.98	
Crop production, protection and livestock	Arranging feed for cattle and poultry	335	16
	Transferring livestock and poultry to safer places	391	13
	Bunding and terracing	434	7
	Redirecting active streams from the landslide site	362	15
	Afforestation	384	14
	Mean	381.2	
	Standard deviation	36.72	
	Standard error	16.42	

Health and Sanitation	Providing medicines at the relief camps	514	6
	Evacuating people with serious health conditions to hospitals	656	4
	Distribution of safety gears for those who are involved in rescue operations	267	20
	Distribution of medicines after the disaster	299	19
	Moral support to the victims	319	18
	Mean	411	
	Standard deviation	167.61	
	Standard error	74.95	
Means of livelihoods	Sharing of labour	398	12
	Repairing and construction of temporary roads for emergency services	402	11
	Distribution of seeds	334	17
	Mean	378	
	Standard deviation	38.15	
	Standard error	22.03	

In the highlands, as the table depicts, distribution of relief materials and ensuring the availability of drinking water has been the priority. During the time of disaster, for the inmates at the evacuation centres, poor households and people trapped within their homes, local people ensured that they received food and water. At the community level, relief and rehabilitation is mostly implemented through local people, volunteers, and members of Self Help Groups and NGO's. This is similar to the results of Paul (1998), who conducted a study in the drought prone areas of Bangladesh and reported that when the Government response was delayed, members of the community organized themselves as volunteers and led the relief works. Distribution of free food, clothes, medicine and other relief has been the most appropriate public response to those affected by drought.

Mean, Standard error and Standard deviation was calculated. Highest mean value was obtained for the component food security, and the component with higher number of strategies greater than the mean value also belongs to food security followed by housing and shelter. The component with the lowest number of strategies above the mean value belongs to the component of means of livelihoods.

4. Conclusion

Documentation of community based community strategies throws light on the different ways, different communities behave at the time of disasters. The study concluded that in the case of community level coping mechanisms, most of the coping mechanisms were implemented during the disaster phase, and the component given the most attention was food and security. This study therefore can be used by the policy makers to formulate relief and rescue measures as per the strengths and weaknesses of the community.

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