

REDUCING THE VULNERABILITY OF THE POOR BY BUILDING RESILIENCE: A CASE STUDY FROM SOUTH SIKKIM

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ABSTRACT

The impacts of climate change and the vulnerability of poor communities to climate change vary greatly, but generally, climate change is superimposed on existing vulnerabilities. Many sectors providing basic livelihood services to the poor like agriculture, livestock rearing, fishery etc. are under threat due to climate change. There is an intrinsic link between poverty and vulnerability. Poor usually have limited resources / assets to cope with changing climate. During crisis they have to rely on their limited resources/ assets that they had accumulated after years of hard work. Although they may be able to withstand the initial impact of climate change but they can never bounce back to their original form, thus accentuating their existing vulnerabilities and further reducing their resilience to change. The work presented here is a case study from Sikkim, a small beautiful mountain state of India in the Eastern Himalayas. Studies have already reflected that the impact of climate change will be greater in the Eastern Himalayan region, than in other regions of this extensive mountain chain because of the poor socioeconomic development of the region. In Sikkim, too, continued climate change is predicted to lead to major changes in fresh water flows with considerable impacts on people and their livelihoods. In this context, the focus of this study was to assess the degree of social vulnerability of rural mountain communities to the impact of climate change on water resources. The study emphasizes on reducing vulnerability of the rural community by building their resilience to any unforeseen events. Increased resilience means increased resources and adaptive capacity that a community can utilize to overcome the problems that may result from change. It strengthens the inherent capacities of a community, rather than only relying on external interventions to overcome vulnerabilities.

KEYWORDS: *Resilience, Poverty, Climate change, Vulnerability*



Alternative livelihoods: floriculture (feasible on small stretch of land)



Participatory assessment of climate change related vulnerability is vital for better planning of Climate Change Adaption programmes

It is now widely agreed by the scientific community that climate change is already a reality. The Intergovernmental Panel on Climate Change (IPCC) has concluded that human activities are altering our climate system and will continue to do so. Although the impact of climate change will be felt by all, but the poor who have the least resources and the least capacity to adapt, are the most vulnerable (IPCC 2001). Poverty and vulnerability has an intrinsic link as it has a direct association to access to resources which affects both baseline vulnerability and coping from extreme events (Adger & Kelly 1999a). They are the most marginalized population and live in most hazardous areas. Livelihoods of poor depend directly on climate dependent resources. Variability in these resources has a direct impact on their livelihood. Due their limited access to resources, their capacity to cope with any extreme event is always weak, which puts stress on their livelihood.

It becomes very difficult for the poor families or communities to bounce back from ever-changing, inconsistent climate change which affects their livelihoods, and many have been forced to sell livestock or remove children from school, as this is the only way that could cope with the change which further increases the cycle of vulnerability. Hence climate change poses a serious threat on the poor and their livelihood. In such a background, enhancing their resilience could be an appropriate productive adaptive response to reduce their vulnerability to any natural disaster or extreme event due to climate change.

Although traditionally resilience means, the capacity of a system to ‘bounce back’ to its original form and structure, but in this study we define resilience as the capacity of the community to be able to quickly adapt to the changes caused by an unforeseen event. It is about strengthening the inherent capacities of a community, so that they do not have to rely solely on external interventions to overcome vulnerabilities. Hence, going by this definition, enhancing resilience would mean enhancing the capacity of the community to adapt by reducing their vulnerability. This means that to enhance resilience it is necessary to have a good initial understanding of what the determinants of vulnerability and resilience are.

The work presented here is a case study from Namthang block in South Sikkim. Namthang block is one of the eight drought prone areas of Sikkim. The block is located in the south-central part of Sikkim and lies in the watershed of the Teesta River. It is a drought prone area, falling in the rain shadow of Darjeeling Himalaya. There is a physical scarcity of water in the region, and the continued climate variation has further accentuated the situation. The focus of this study was to assess the degree of social vulnerability of rural mountain communities to the impact of climate change on water resources. An in-depth study was undertaken to understand the underlying factors behind weak resilience which exacerbate their vulnerabilities to climate change and water scarcity.

CONCEPTUAL FRAMEWORK - POVERTY, VULNERABILITY AND RESILIENCE

The conceptual framework that has been developed in this paper revolves around the interlinkages between poverty, vulnerability and resilience. There is a strong linkage between the capacity to adapt and the baseline exposure and resilience to stresses that people possess. The paper discusses how climate change accentuates the baseline vulnerability of rural community thus reducing their capacity to absorb stress. If people have high resilience to stress then their capacity to adapt to any external stress will be high and to a large extent they will be able to bounce back to their original form or can successfully adapt to the changed circumstances without

any external support. Hence interventions have to be planned keeping in mind the level of vulnerability and resilience to stress people possess. It is a well understood fact that poor are vulnerable and are less resilient to stress.

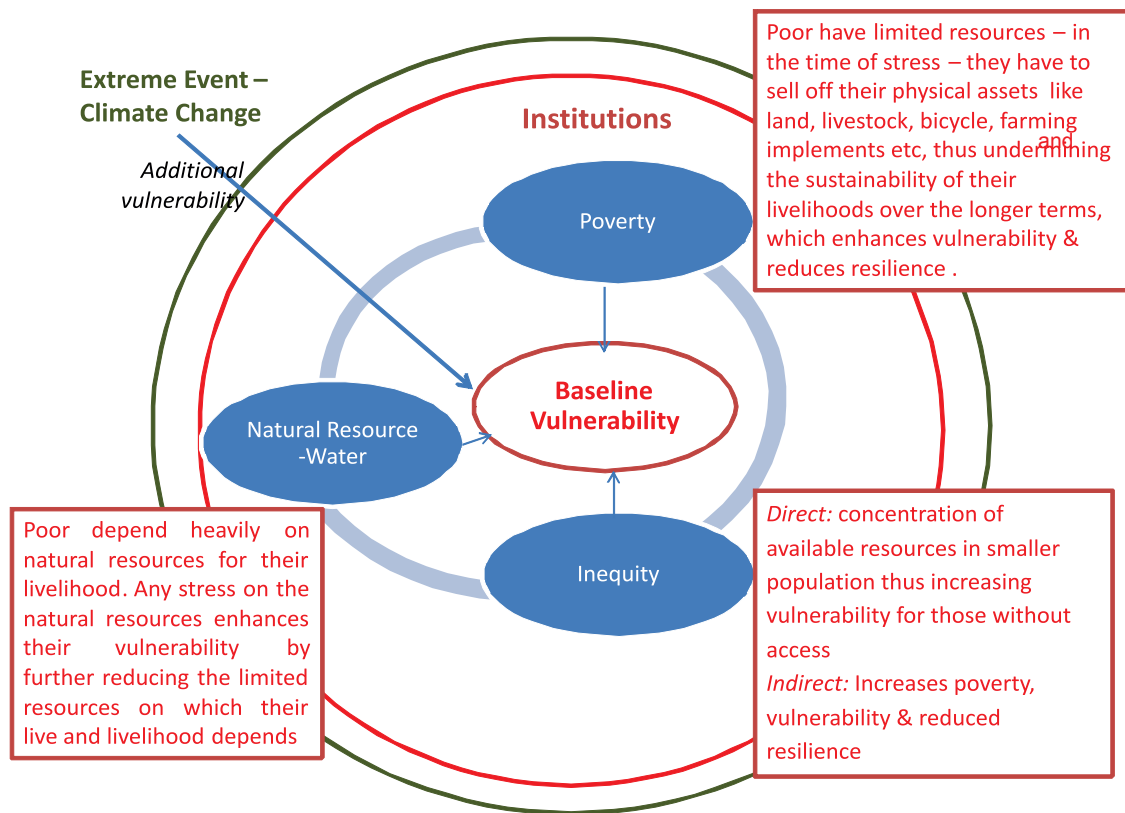


Figure 1: Link between vulnerability, institutions & climate change

Figure 1 above explains the underlying factors behind their vulnerability, the role of institutions and additional vulnerability superimposed by climate change. It shows how poverty, inequity and excessive dependence on climate sensitive sectors for livelihood (e.g. agriculture, livestock and fishing) increase the vulnerability of the rural community. Inequity has both direct and indirect relationship with vulnerability. Inequity increases vulnerability of those who have limited resources and due to access to limited resources, inequity also increases poverty. Hence the existing baseline vulnerability has made the poor community highly sensitive to any change and their vulnerability is further accentuated by extreme events like climate change by jeopardizing the limited resources on which their lives and livelihood depends. Institutions play an important role here. Institutions can enable or constraint adaptation depending upon how responsive, adaptive and effective they are. Institution is kept outside the circle of baseline vulnerability because a responsive institution can help reducing vulnerability by reducing poverty, inequity and also by increasing livelihood option for the community. But it is kept inside the extreme event circle because even institutions have to adapt to changing conditions posed by extreme events.

Here a clarification is needed regarding vulnerability. Vulnerability could be physical and socio economic vulnerability. While physical vulnerability describes the state of exposure of a region to natural disaster which is determined by the bio physical characteristics like the topography, location, environmental conditions, land cover and other physical characteristic of the region, socio – economic vulnerability is primarily focused on the political, economic and social conditions that make human societies susceptible to damage from environmental stress (Vincent 2004; Adger & Kelly 1999a; Cutter 1995; Liverman 2001). Here vulnerability is not only a function of the physical characteristics of climate events, but more importantly an inherent property of a society determined by factors such as poverty, inequality, gender patterns, access to health care and housing etc (Books 2003). Hence the impact of climate change on a particular region is determined by both physical and socio-economic vulnerability also called social vulnerability.

<p>High social vulnerability + High physical vulnerability = Impact1</p> <p>Low social vulnerability + High physical vulnerability = Impact2</p> <p>But, impact 1 > impact 2</p>

Table 1: Link between Impact and social and physical vulnerability

The table above describes that the physical vulnerability of the region is difficult to reduce as long term mitigation measures are needed for that, but there is always a potential to reduce the social vulnerability of the region. Although climate change will have an impact on the region but the impact of high social and physical vulnerability will be much higher than the impact felt by a region with low social and high physical vulnerability. Hence to reduce social vulnerability it is important to understand the factors behind it and one such factor is poverty.

Let us now look at poverty. A closer look reveals that both inequity and excessive dependence on natural resources are also the causes of poverty. This is like a vicious circle which needs to be broken through adequate intervention. Poverty and vulnerability has an intrinsic link as it has a direct association to access to resources which affects both baseline vulnerability and coping from extreme events (Adger 1996b). Livelihoods of poor depend directly on climate dependent resources. Variability in these resources has a direct impact on their livelihood. Due to their limited access to resources their capacity to cope with any extreme event is always weak, which puts stress on their livelihood, increases vulnerability and reduces resilience.

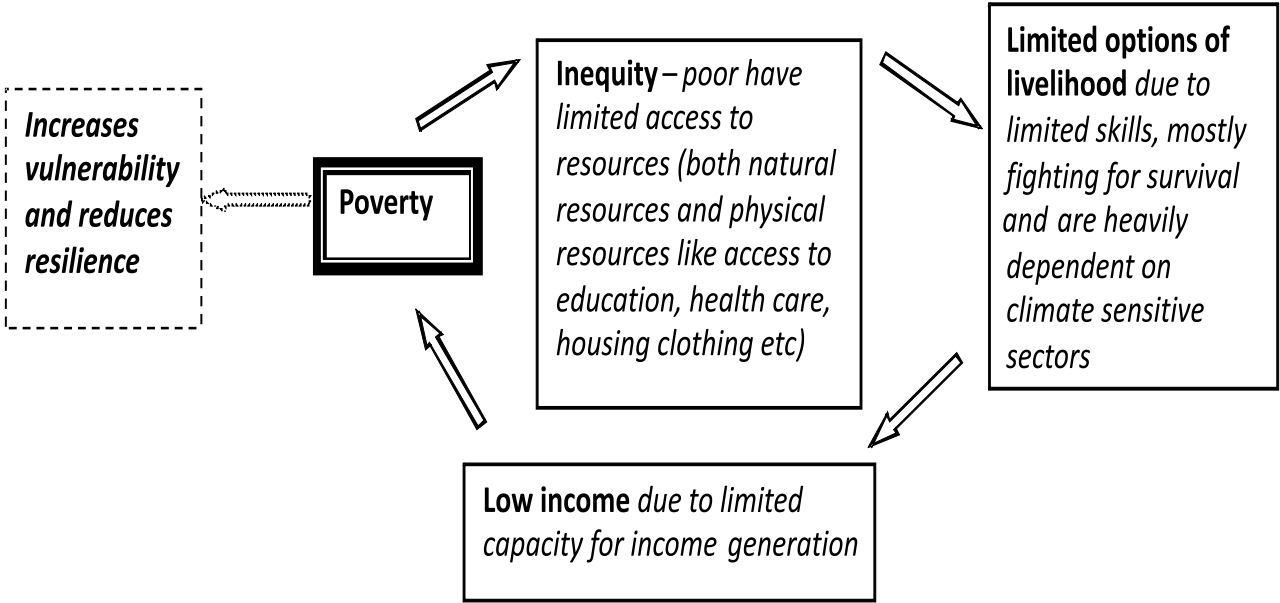


Figure 2: Vicious circle of poverty

Figure 2 above shows that to increase the resilience of the poor, planned interventions are needed to break the vicious circle of poverty so that their existing vulnerability is reduced and at the same time their capacity to adapt to stress and change will increase.

This brings us to the concept of resilience. ‘Resilience can be understood as capacity to absorb stress or destructive forces through resistance or adaptation, the capacity to manage, or maintain certain basic functions and structures, during disastrous events, the capacity to recover or ‘bounce back’ after an event (Twigg 2007). In everyday usage, ‘capacity’ and ‘coping capacity’ often mean the same as ‘resilience’ However, it is important to understand that ‘Resilience’ is generally seen as a broader concept than ‘capacity’ because it goes

beyond the specific behavior, strategies and measures for risk reduction and management that are normally understood as capacities. Resilience has therefore much broader definition than capacity. It has been defined as (1) the amount of change that a system can undergo while still maintaining the same controls on structure and function; (2) the system's ability to self-organize; and (3) the degree to which the system is capable of learning and adaptation (Carpenter et al. 2008). Subsequent work, both on ecosystems and societies, has identified the potential for multiple equilibria and the possibility of successfully adapting to changed circumstances by developing a new state. Thus, resilience includes both an element of recovery and an element of change. It is this latter definition that this study adopts.

Hence, going by this definition of resilience, enhancing resilience would mean enhancing the capacity of the community by reducing their baseline vulnerability so that they can adapt to climate change or any unforeseen event. However, to develop resilience we need to know the nature of community vulnerability (who and what are vulnerable, what stresses in what way and why) and what capacity exists to cope with change. Only once this is assessed, the lack of resilience of community to changes could be understood. This means that to enhance resilience, it is necessary to have a good initial understanding of what the determinants of vulnerability and resilience are.

In this paper the focus has been on the social vulnerability of the community to climate change as it would reveal community's ability to prevent or cope with the impact of natural disaster and that will enable to frame appropriate strategies to enhance the resilience of the community to these unforeseen natural disasters. While looking at the socio- economic vulnerability, poverty has been kept at the centre of the discussion as the study considers poverty as an important indicator of community's vulnerability to climate extremes and climate change, as discussed above. But it is important to understand here that poverty itself is a multidimensional issue as there are number of factors which lead to poverty – limited livelihood options, poor health, poor education, weak institutions, poor market access etc. Therefore to break the vicious circle of poverty (*see figure 2*), to reduce vulnerability and to enhance community's resilience to deal with climate change impacts, it is important to address the issues of poverty with a multidimensional lens. Hence in this study, a Multidimensional Poverty Assessment Tool (MPAT) has been used to assess the underlying factors behind vulnerability with special focus on poverty, based on which suggestions have been made to enhance the resilience of the rural community in the study region to withstand climate hazards.

METHODOLOGY

State Profile

Sikkim is located in Himalayan ranges of India and shares international boundary with China, Bhutan and Nepal. It is geographically a small state and constitutes merely 0.22 per cent of the total geographical area of India. A provisional estimate of the total population of Sikkim as per census of 2011 is 6, 07,688. Situated in the Himalayas and endowed with rich natural resources, Sikkim is a hotspot of biodiversity. There are altogether 84 glaciers covering an area of about 440 km² with the total extent of permanent snow fields being 251 km² (SAC 2001). The annual rainfall varies from less than 150 cm in the north to more than 300 cm in the south eastern parts, with the river Teesta and its tributaries being the main drainage.

Region's economic activities which mostly comprise of tourism and agriculture are very sensitive to climatic conditions and any changes in climate conditions can therefore threaten the livelihood security of the people. The state's population relies primarily on subsistence rain fed agriculture. Continued climate change in Sikkim has already led to major changes in fresh water flows with considerable impacts on people and their livelihoods.

District Profile

Sikkim has four districts, viz. North District, East District, West District and South District as shown in figure 3a. The Namthang block where the study was conducted is shown in figure 3b. A brief geographic and demographic profile of the four districts is shown in the table 2.

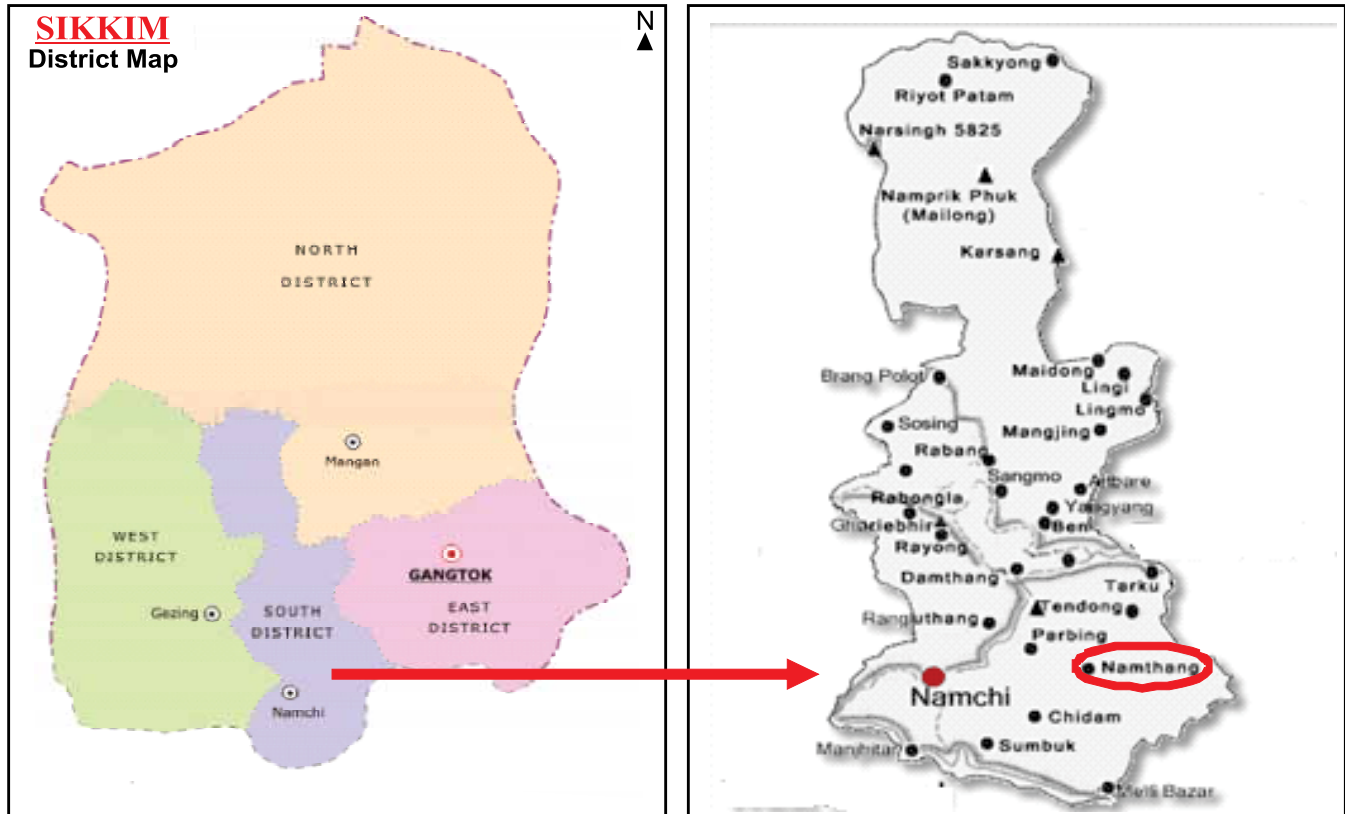


Figure 3a: District map of Sikkim

Figure 3b: Map of South Sikkim district depicting the study area Namthang



Traditional crops like finger millet are resilient to the vagaries of weather

Table 2: District profile of Sikkim

SI No.	District	District Headquarters	Area (sq. km)	Population *	Literacy* (%)
1	East Sikkim	Gangtok	954	281293	84.67
2	North Sikkim	Mangan	4,226	43354	77.39
3	South Sikkim	Namchi	750	146742	82.07
4	West Sikkim	Geyzing	1,166	136299	78.69

*Provisional estimates as per Census of India 2011

Source: Government of India, 2010.

Sikkim has diverse weather conditions in all its four districts. The South district is the driest of the state because it is in the rain shadow of the Darjeeling Himalaya, with the West District following closely. There is almost no rainfall in the winter months of November to March. Eight drought prone blocks across the four districts in Sikkim have been identified by the Rural Management and Development Department (RMDD), Government of Sikkim which is shown in figure 4a below (highlighted in black). These blocks are, Namthang, Melli, Jorethang, Namchi, Sikkip, Duga, Soreng and Kaluk. Five out of these eight blocks are located in South District making the district most drought-prone and water scarce in the state; Duga falls in East District and Soreng and Kaluk belong to West District. Within these blocks, the regions highlighted in red as shown in figure 4b, are the area with acute water shortage (70-100% households without access to adequate water in winter).

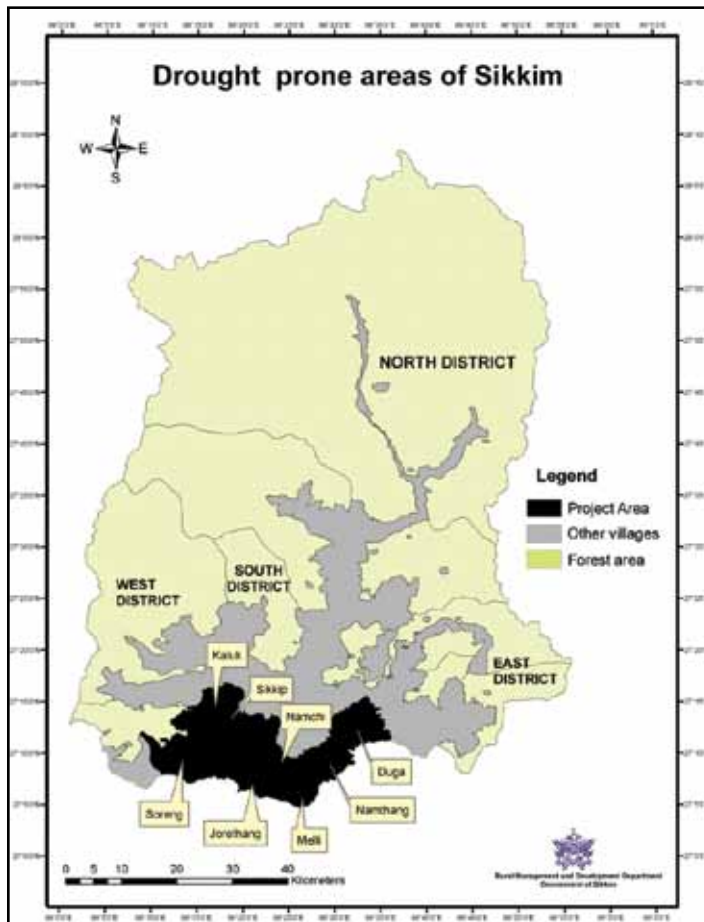


Fig- 4 (a)

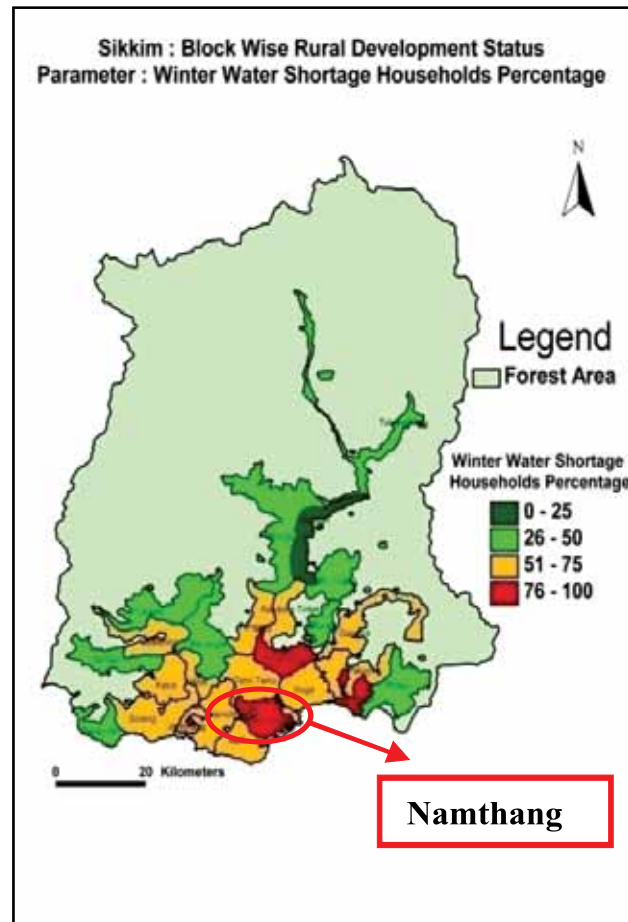


Fig- 4 (b)

Source: Rural Management and Development Department, Government of Sikkim

Block profile

For this study Namthang block which is located in the South district was identified as the study site (*shown in fig 3b*). It was selected on the criteria that it is one of the eight drought prone areas of Sikkim which faces acute water shortage during winter. The Namthang Block is 5817 ha in area, which comprises of seven Gram Panchayats, 2,752 households having a total population of nearly 16,000.953 of these households are classified as BPL as per the Socio-Economic Census, 2005 and the poverty rate is 35%. The average annual rainfall in Namthang block is only 1,370 mm which is substantially less (54%) than the state average of 2,534 mm (shown in figure 5 below). As can be seen from the figure 5 below, in Namthang block winter (October – March) is the dry season with little or no rainfall received for almost six months. Consequently there is acute drinking water shortage during winter in the area.

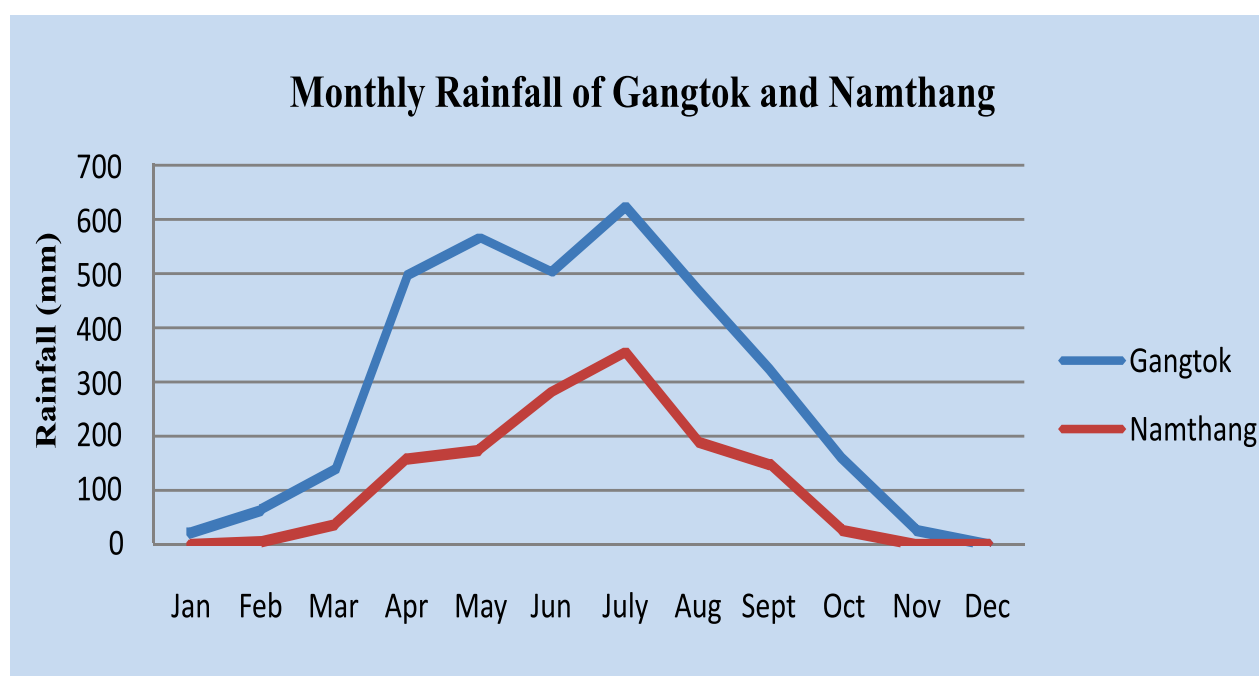


Figure 5: Comparative rainfall (in mm) : Namthang, South Sikkim compared to Gangtok in 2004

Source: *Meteorology Department, Gangtok, Sikkim*

With increased climate variability, the rainfall patterns in this region have become erratic, monsoons are usually late and in general torrential rainfall has replaced the monsoon drizzle. This has further aggregated the situation and has resulted in drying up of springs i.e. discharge of springs has reduced and many of them have started becoming seasonal. This has a serious implication on livelihood as 80% of the rural households in the region depends on spring water for both domestic and as well as for livelihood related activities (agriculture, livestock rearing). Although water supply pipes have been laid down by the rural development department and coverage is almost 80% but rural people mentioned that they do not receive water throughout the year as water in the source has started drying up. Scarcity of water along with high levels of poverty and limited options for alternative livelihood has further reduced the resilience and increased the vulnerability of the people in the region to cope with extreme events, particularly drought.

To get an in-depth understanding of the situation two wards within the Namthang block were selected. Figure 6 below shows the process of selecting the wards for study.

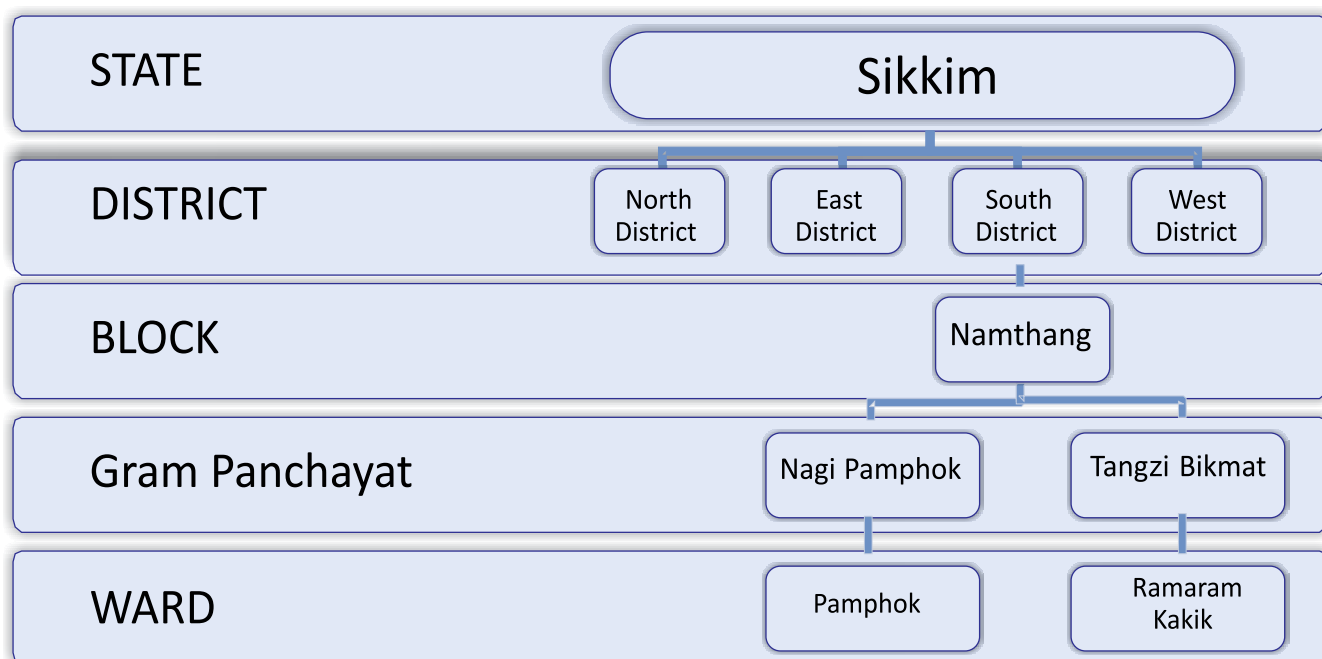


Figure 6: Selection of the study area in Sikkim

The wards Ramaram Kakik and Pamphok were selected for detail analysis, after extensive discussions with the Block Development Office of Namthang block and with the Rural Management and Development Department (RMDD). The Pamphok ward falls under Nagi Pamphok GPU and Ramaram Kakik falls in Tangzi Bikmat GPU.

Data Collection and Analysis:

Data was collected from both primary and secondary sources. Primary data was collected through focus group discussion and key person interview. Secondary data mainly consisted of the socio – economic profile of the study area. They were obtained from various government documents and also from Rural Management and Development Department (RMDD), Govt. of Sikkim. To assess the social vulnerability of the rural communities and the resilience capacity to adapt and recover from the shocks induced by climate change, a thematic multidimensional framework ‘Multidimensional Poverty Assessment Tool, was adopted for the study (IFAD 2010). Figure 7 below shows the themes considered under the framework.

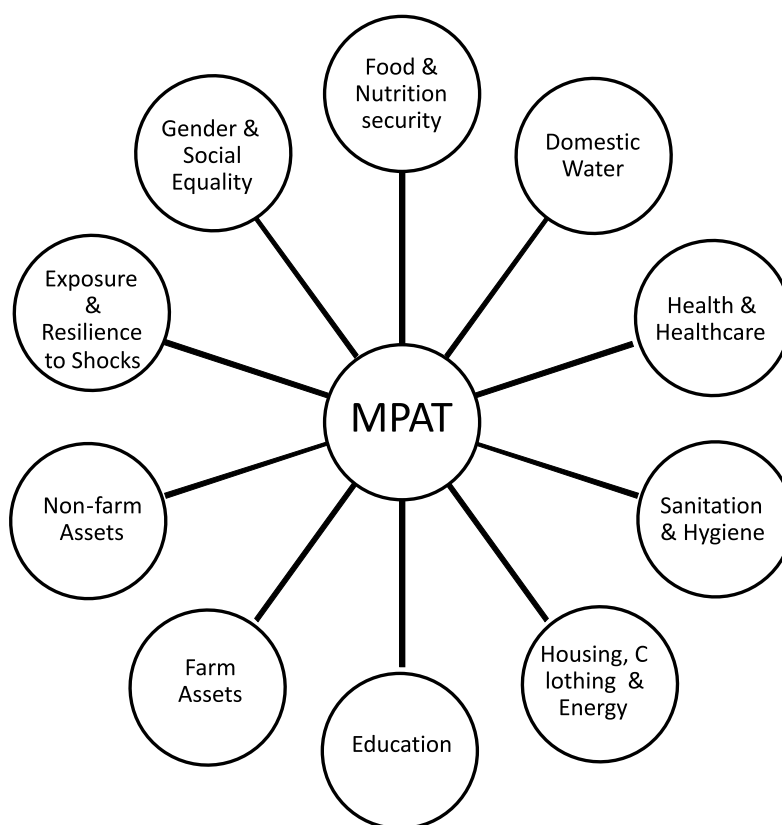


Figure 7: Components of Multidimensional Poverty Assessment Tool

Table 3: Description of the selected sub components under each component

S.No.	Components	Sub-components
1.1	Food and Nutrition Security	Consumption of various food types (amount and the expenditure incurred per household)
1.2		Nutrition Quality (comparison with the Recommended Dietary Allowance (RDA))
2.1	Domestic Water	Availability & Storage (Scarcity of water in summer, water use where consumption is highest, water storage facility)
2.2		Quality (Main source of water for drinking & cooking)
2.3		Access (piped water supply, time taken and distance covered to collect)
3.1	Health and Healthcare	Health status (chronic illness, disability)
3.2		Access and affordability (time taken to travel to the nearest health facility, affordability of the treatment)
3.3		Healthcare quality (Availability of doctors)
4.1	Sanitation and hygiene	Sanitation option (functioning toilets in the premise of the households)
4.2		Hygiene (hand washing practice)
4.3		Waste management (garbage collection system, dustbins)
5.1	Housing, Clothing and Energy	Housing structure quality (type of material used)
5.2		Clothing (household expenditure on clothing and footwear)
5.3		Energy sources (Access to electricity, source of fuel for cooking, expenditure)
6.1	Education	Status (Highest level of education attained)
6.2		Quality (No. of full time teacher)
6.3		Access (Average distance to the institution)
7.1	Farm Assets	Land Tenure (Extent of ownership, leasing arrangement)
7.2		Crop Inputs (Source of irrigation, farm machinery, type of seeds)
7.4		Livestock/aquaculture inputs (ownership of assets and the stock)
8.1	Non-Farm Assets	Employment & skills (Primary and secondary occupation)
8.2		Financial services (Provision of borrowing money and debt)
8.3		Fixed Assets and Remittances (Ownership of assets (TV, vehicle, etc.); Financial assets)
9.1	Exposure & Resilience to Shocks	Exposure (Kinds of hazards they are exposed to)
9.2		Coping Ability (measures taken to cope with the hazards)
9.3		Recovery Ability (ability to recover from the shock)
10.1	Gender & Social Equality	Access to education (Highest level of schooling achieved- gender-wise analysis)
10.2		Access to health care (Medical treatment gender-wise analysis)
10.3		Social equality (differences as a result of belonging to a particular social class, ethnic group & gender)

Source: Adapted from International Fund for Agricultural Development, 2010

Note: Secondary data for all the parameters were also collected so that the analysis is not drawn only from stakeholder responses but also from actual data published in govt. documents.

Under these ten crucial themes or components, few sub components were identified under each component. The sub components that were selected for this study and the questions that were asked are given in Table 3.

To assess the relative importance of these dimensions, stakeholders interaction in the form of Focus Group Discussions and key person interview were held; the stakeholders were representatives of Ramaram and Pamphok villages; and Rural Management and Development Department (RMDD), Govt. of Sikkim, respectively. RMDD’s perception was taken in the study to understand the role played by institution in the region to enable adaptation to climate change.

As the Multidimensional Poverty Assessment Tool (MPAT) is a thematic tool, the analysis of each of the ten themes (which is also called as the components) is done for each of the themes individually without collating the information on these ten themes into one value. Further, the ten themes are not compared quantitatively as the analysis on such dynamic themes has to be done with caution and outcome could be misleading if not approached carefully. Hence, the themes were compared based on pair-wise comparison on a five point scale as used in the first step of Analytical Hierarchy Process (AHP) and is described in Figure 8. Then the responses of the three stakeholder groups (representatives from Ramaram; Pamphok; and Rural Management and Development Department (RMDD), Government of Sikkim) were compared to determine the order of preference.

Analytical Hierarchy Process (AHP) is a multi-criteria decision making tool established by Saaty (2003) to conduct analysis on multiple aspects simultaneously. As the analysis in this research study requires analysis of multiple criteria (here referred to as the sub-components identified under each of the ten themes or components) the methodology of AHP was apt. AHP involves four steps – pair-wise comparison; preparation of the comparison matrix; deriving the priority vector and lastly to calculate the consistency ratio.

The pair-wise comparison is done on a five point scale as shown in the Figure 8, where the stakeholder groups were asked to rank the components in terms of development required by both the community and the government as the involvement of the private sector is limited in rural areas. Each component is compared with all the other components by asking the stakeholders groups to choose the component of preference among the pair and then selecting the extent to which the preferred component is important. In Figure 8, domestic water is strongly more important than the food and nutrition security. Same process was followed for comparison of the sub-components under each of the ten components/themes.

The comparison matrix is prepared and solved to derive the priority vector as a result of which the relative weights are obtained. As subjective responses are being quantified in this exercise there is variability in responses by the same stakeholder group on sub-components of the same component. To accommodate the variability (equivalent to up to 10%) and check the consistency in responses, the process involves calculation of the consistency ratio.

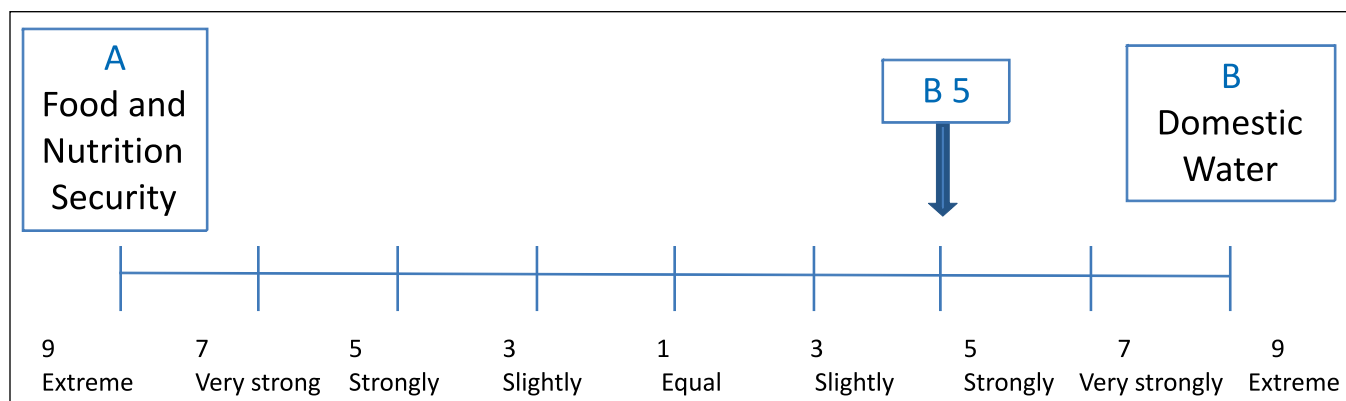


Fig 8: Scale used for conducting the pair-wise comparison



Focus Group Discussion: with the representatives of Pamphok ward (the chart on the ground is the scale on which the pair-wise comparison for AHP was done)

RESULTS AND ANALYSIS

Analysis based on stakeholder's response

The relative weights assigned to the components and sub-components determined through Analytical Hierarchy Process (AHP), based on the responses gathered from the representatives from Pamphok and Ramaram village, and representative of RMDD are discussed below.

S.No.	Component/ sub-component	Weights	S.No.	Component/ sub-component	Weights
1.0	Drinking water		6. 0.	Food and nutrition	
1.1	Access	61.30%	6.1.	Consumption	50.00%
1.2	Availability and storage	30.80%	6.2.	Nutrition quality	50.00%
1.3	Quality	7.90%	7.0.	Housing , clothing and energy	
2.0	Exposure & Resilience to Shocks		7.1.	Housing	57.87%
2.1	Recovery ability	52.80%	7.2.	Energy	32.38%
2.2	Coping ability	39.50%	7.3.	Clothing	9.75%
2.3	Exposure	7.70%	8.0.	Sanitation and Hygiene	
3.0	Non farm*		8.1.	Toilet facility	50.77%
3.1	Market access	60.40%	8.2.	Hygiene	41.94%
3.2	Employment & Skills	33.70%	8.3.	Waste management	7.30%
3.3	Fixed Assets and Remittances	5.90%	9.0.	Social and gender equality	
4.0	Education		9.1.	Access to education	33.33%
4.1	Access	53.20%	9.2.	Access to healthcare	33.33%
4.2	Status	40.40%	9.3.	Social equity	33.33%
4.3	Quality	6.40%	10.0.	Farm assets	
5.0	Health and healthcare		10.1.	Crop inputs	48.50%
5.1	Access and affordability	53.90%	10.2.	Livestock	44.00%
5.2	Healthcare quality	39.70%	10.3.	Land Tenure	7.50%
5.3	Health Status	6.40%			

Table 4: Weightage assigned for sub components

Note: Non farm asset, sanitation, farm assets and social and gender equity weightage has been derived only from the response of Ramaram and Pamphok.

The Table 4 shows the ranking that each component received based on the preferences stated by all the three stakeholders (RMDD, Ramaram and Pamphok). The table also highlights the relative ranking of the sub component derived from AHP. As an average of the responses of all the three stakeholders have been considered here, which reveals little about the differences in the stakeholders perception and experiences we will be discussing these differences and similarities in the next section where a comparison has been made on the responses of the stakeholders to understand the priority assigned to each sub-component by each stakeholder.

1. Domestic water:

Domestic water supply has been considered to be the most crucial component needing attention and enhancement in both Pamphok and Ramaram. This was very much expected, as mentioned earlier, Namthang block where the study was conducted lies in the rain shadow area. There is a physical scarcity of water and with continued climate variation the situation is getting worsened. Within the domestic water supply component accessibility (61.4%) is the most crucial sub-component, followed by availability and storage of water supply (30.8%) and then the quality of the water supplied (7.9%) in the present context.

2. Exposure and Resilience to risk:

The villages are periodically exposed to landslides and droughts. Few people are able to recover from these shocks completely as it requires continuous investment and sufficient amount of financial reserves. However, there is a lot of uncertainty in the impacts of the climate change and the burden falls disproportionately on different sections of the population. So the respondents felt that exposure and resilience to risk also a very important component so adequate attention is needed so that their resilience to such risk and shocks can be built. Ability to recover from a shock (52.8%) is of prime importance as both the villages are frequently exposed to extreme events; coping ability (39.5%) which is an indicative of the resilience of the community is second most important and exposure to the shocks is least important (7.7%).

3. Non-farm:

The most surprising result was non- farm asset getting a rank higher than farm asset. The main source of livelihood in both Ramaram and Pamphok is agriculture. But villagers are looking for diversification of income as farm asset only is not able to provide them livelihood security mainly in time of crises. So there was an emphasis from the respondents that investment in non-farm activities, like setting up small scale industries, market linkages, skills and training, etc. would be more beneficial as it will provide livelihood and financial security to tackle the impacts of climate change. Access to market is most important aspect of sustainable livelihood so it received maximum weightage (60.4%) followed by employment opportunities and skills (33.7%) and fixed assets and remittances (5.9%).

4. Education:

Respondents attached a lot of importance to education. They feel that they have less livelihood opportunities because they are not educated enough. The community realizes that education is the foundation of a secure livelihood which is not vulnerable to adversities posed by the climate; it also aids in effective management of resources, generates awareness and strengthens the knowledge base to resolve matters and creates resilient societies. The stakeholders attached relatively more importance to improving the access to education institutes (53.2%) as compared to the status (40.4%) and the quality (6.4%) of education being imparted.

5. Health and healthcare:

Accessible, affordable and relevant healthcare facilities are crucial for the wellbeing of people and that's why respondents felt that it needs to be given a high rank. The hospital is distantly located and is difficult for the diseased person to reach with weak transportation facilities. In addition the treatment is expensive considering



Focus Group Discussions: with the representatives of Ramaram ward (the chart on the table in the first picture is the scale on which the pair-wise comparison for AHP was done)

the high incidence of poverty. Within this component, access and affordability (53.9%) of healthcare facility is considered to be the priority followed by the healthcare quality (39.7%) and status (6.4%).

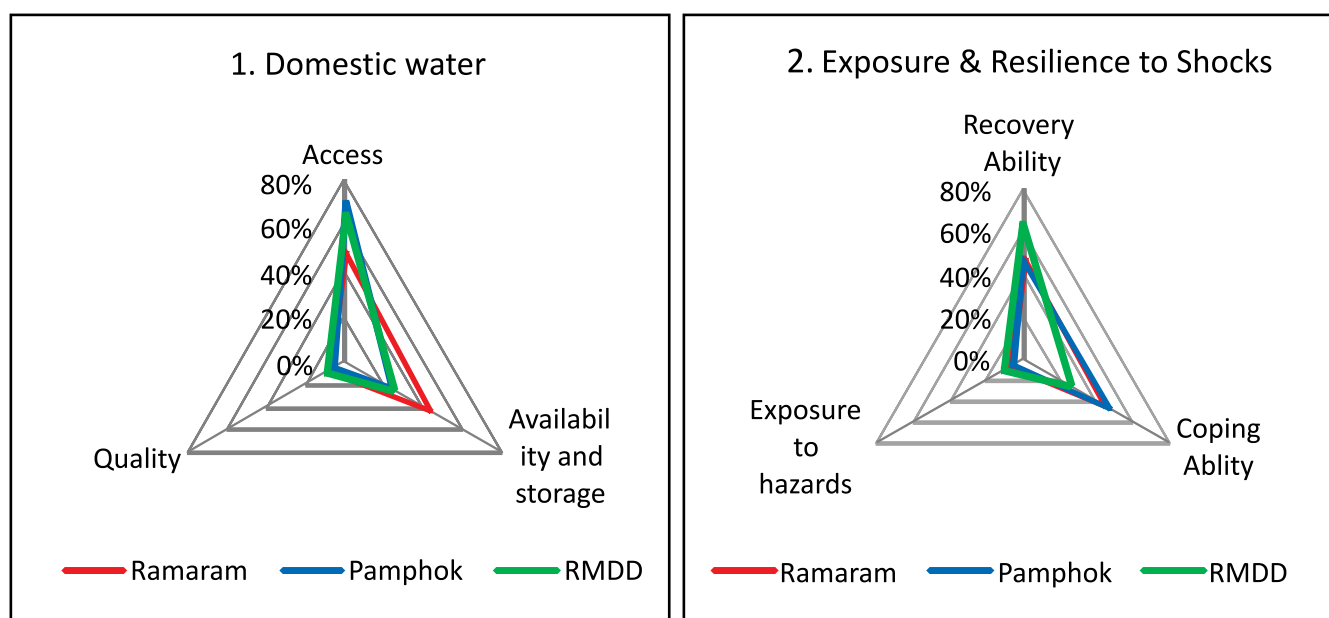
6. **Food and Nutrition security:** As food is indispensable for survival, poverty is also defined in terms of appropriate uptake of calories. Food insecurity is one of the major threats faced during hazards and hence contributes significantly to reduce the resilience of the communities. Therefore, the respondents considered it to be a crucial component to build their resilience. They could also feel that if the intake of quality of food can be increased it will also lead to lower incidence of diseases. They assigned almost equal weightage to quality and consumption.
7. **Housing, Clothing and Energy:** Respondents felt better housing and energy facility is also crucial to improve their standard of living. Also these are basic facilities one should have. They felt housing to be the most crucial component (57.87%), followed by energy (32.38%) and clothing (9.75%).
8. **Sanitation and Hygiene:** RMDD reports states that there is 100% sanitation coverage in the state. Although it did not get a very high ranking compared to the other components, but few respondents felt that there is a scope of improving the toilet facility (50.77%) and the hygiene (41.94%) conditions in the region although each household has sanitation facility. There is hardly any waste management problem in the region as proper waste collection facility is available in the village and so respondents gave it the lowest rank (7.30%)
9. **Gender and Social equality:** This component did not receive much attention from the respondents. Overall the respondent felt that the stress that they face is irrespective of gender or social strata. This could be because except very few, most of the people residing in the study region face similar kind of socio-economic stress which makes the population more or less homogenous.
10. **Farm assets:** RMDD intervention (discussed in the next section) is focused on development of farm assets. The villagers gave farm assets lower rank because they feel that although a lot of focus has been given to farm assets they are still highly vulnerable to changes and the farm assets alone cannot provide them economic stability. And if intervention has to be made on farm assets then more emphasis should be given to crop inputs (48.50%) and livestock (44%). Land holding size is very small (approx 1 acre average size of holding) so land ownership or leasing out land is not a lucrative option to them.

The above analysis shows that the challenge as seen by the stakeholders in the region is not only water scarcity, there are a list of other challenges which needs attention too. Strengthening of these additional components is very important if we want to make the community resilient to change. One of the reasons why such an elaborate framework (MPAT) was taken up for the study was to understand the underlying factors behind vulnerability in the study area, so that appropriate interventions can be planned out to build community's resilience by reducing their vulnerability. As discussed in the conceptual framework section, poverty, if not the only factor but is the major factor contributing to their weak resilience. Hence interventions need to have broader focus so that there could be an overall development of the region. The analysis in the next section therefore discusses the various interventions already taking place in the region with the initiative of RMDD to see to what extent these interventions are able to coincide with what the community demands.

Comparison of stakeholder responses

In section 2 (Fig 1), it was discussed how institution needs to adapt with the changing circumstances brought in by vagaries of nature. RMDD is actively working in the study site to enable the people of the village to adapt to the changing water situation. The most commendable part of their intervention is that they have a decentralized set up, where the block development officer (BDO) has a lot a decision making power. The BDO do not necessarily need to go to the state RMDD department for approval of minor issues. So they have lot of independence to work although they are accountable to the state department. This has resulted in speedy decision making and immediate intervention.

In this section the responses of all the three stakeholders (Ramaram and Pamphok and RMDD officials) are presented separately in figures below, to be able to prioritize intervention accordingly. This analysis will bring to light that although Ramaram and Pamphok are both in the Namthang block but still they have different preferences and therefore interventions has to be planned according.



Domestic water: For Pamphok which faces acute water shortage accessibility of water is most crucial. Women are the worst suffers as they have to travel long distance to collect water.

In Ramaram the crucial component is availability and storage as for them although accessibility is not a problem but during dry period they face water shortage and so good storage facility can solve the problem.

RMDD is already working to enhance water availability, accessibility and storage in both the villages. RMDD has also introduced Rainwater Harvesting (RWH) to collect the rainwater and increase the supply of water for domestic use. As far as quality is concerned RMDD assigns the highest importance to it compared to the other two stakeholders as villagers are unaware of quality issues as they feel accessibility is the biggest concern at the moment. Overall we could see the responses of all the three stakeholders on domestic water supply coincide.

Exposure & Resilience to Shocks:

Capacity to recover from extreme events is considered to be the most crucial sub-component by all the three stakeholders but RMDD attaches maximum importance to it among the three stakeholder groups.

The point worth mentioning here is that the respondents do realize that recovery from a shock is most important because coping with shock does not necessary allows them to recover from the shock completely. At present they are coping with their limited resources they know that this cannot continue forever. So they have ranked recovery higher than coping.

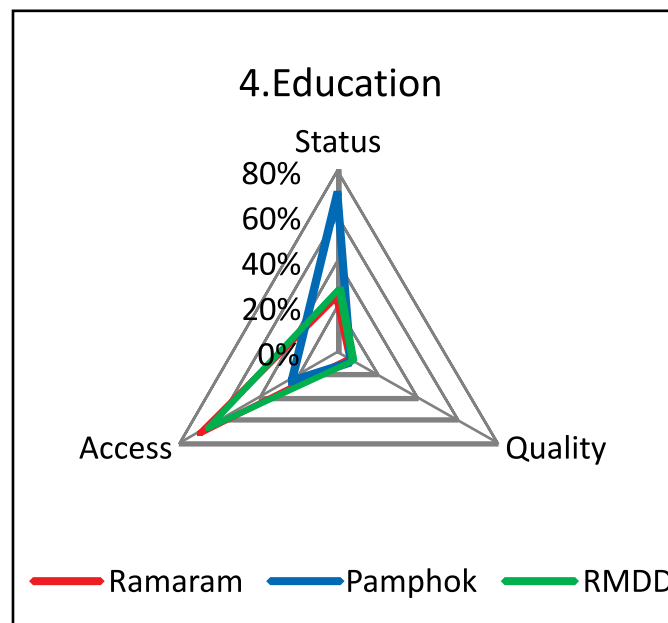
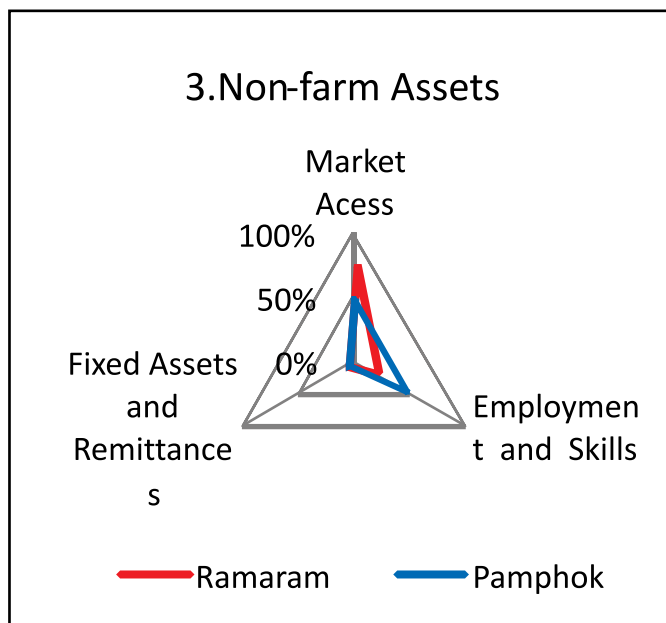
Exposure to hazard is given least priority, however among the three stakeholders groups most important is assigned by RMDD. This is because exposure of an area to climate change is mainly determined by bio – physical characteristic of the region – location, topography, geo hydrology etc. This is beyond the scope of the inhabitants of a region to reduce exposure. But of course steps to mitigate climate change can reduce the exposure of the region and hence RMDD’s response shows that they are aware of the exposure and are also working towards reducing it through climate change mitigation efforts.



Alternative livelihoods: floriculture (feasible on small stretch of land)



Alternative livelihoods: temporary employment under MGNREGA (infrastructure development activity in rural areas; both women and men workers)



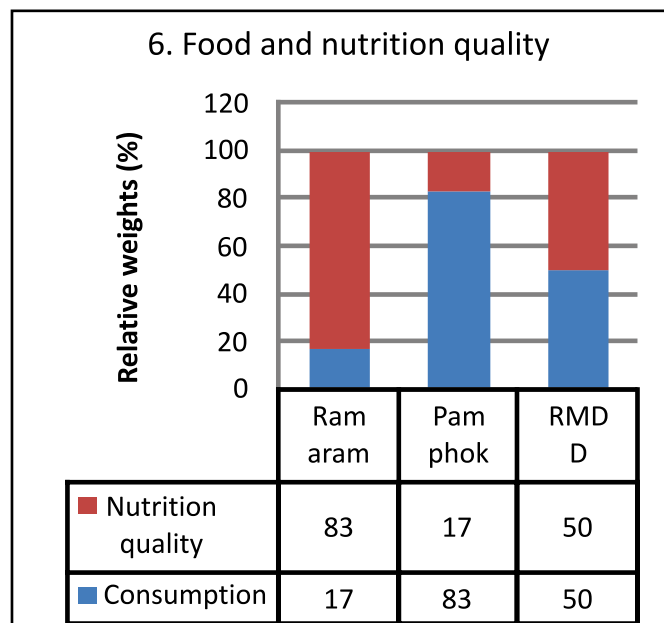
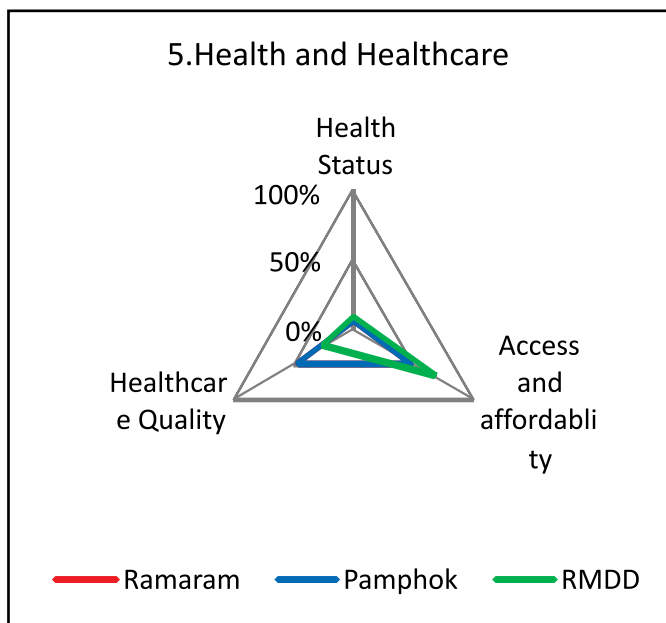
Non Farm assets: The responses on this component were received from Pamphok and Ramaram.

Respondents from Pamphok gave maximum importance to employment and skills. A closer look revealed that agriculture as a livelihood option is not suitable in Pamphok as it has acute water shortage, very small land holdings and the land being hilly and rocky is not fit for agriculture. So Pamphok specifically emphasized on investment in non- farm activities, like setting up small scale industries, market linkages, skill development, training, etc. would be more beneficial.

In Ramaram, stakeholders identified market access to be the most crucial component. This is because, Ramaram is comparatively better off in terms of water availability. They have access to around 32 springs. They are therefore involved in floriculture (orchid and roses) which demands ready market.

This is one area where RMDD needs to give adequate attention because at present the focus has been to improve water availability so that agriculture can flourish. But the villagers mainly in Pamphok are more keen on non-farm activities as they do not see any prospect from farm activity.

Education: Among the three sub-components access to education is the most important as per Ramaram and RMDD's responses whereas status of education is most crucial for Pamphok. But overall the education facility in both the villages is inadequate and needs urgent attention. Students need to cover long distances to schools and assist the family in earning a livelihood; there is a high dropout rate. Further, the nearest high schools and colleges offer less streams, hence the students who desire to pursue higher studies are restricted to the courses which are offered as education elsewhere is not affordable. This leads to disinterest in education at higher level and also makes the students incompetent in securing admission in the colleges functioning at district level.

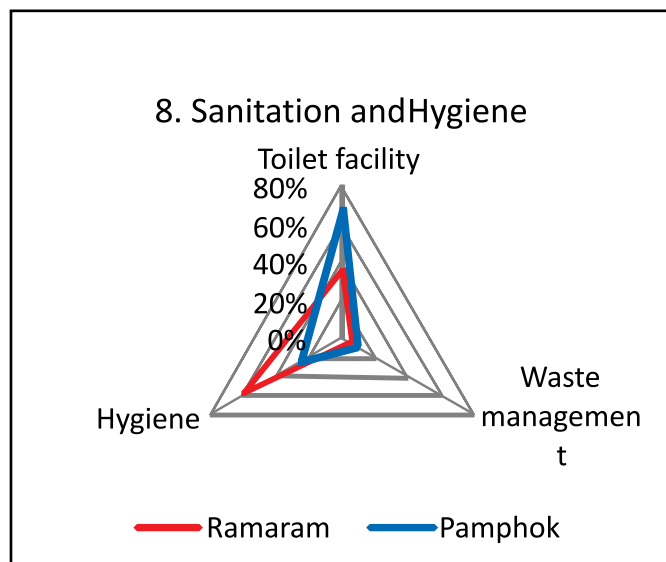
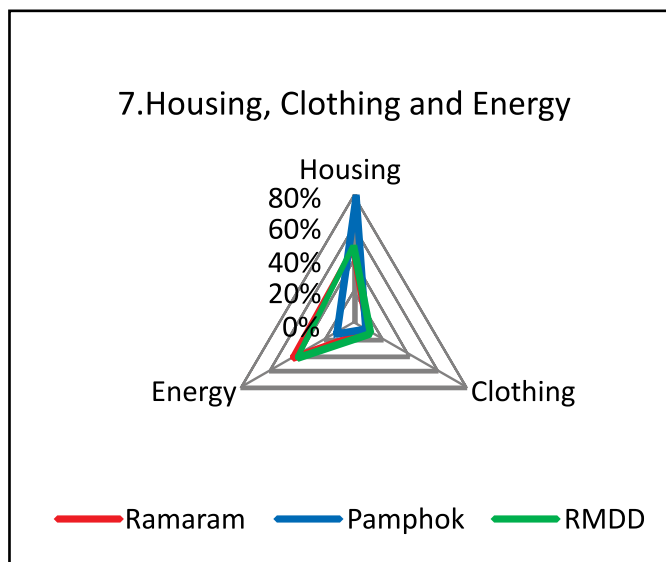


Health & health care: The responses of Ramaram and Pamphok are identical for all the three sub-components. According to RMDD access and affordability is most important followed by health status. As per the view of stakeholders from Pamphok and Ramaram, access and affordability, and healthcare quality are equally important and health status is assigned least important as the disease incidence is low. Access and affordability is most important as the nearest Primary Healthcare Centre (PHC) is located approximately 8-10 km away from Ramaram and Pamphok and medical facilities are not sufficient and doctors are unavailable at the time treatment. So here there is a difference in the weightage assigned to the components by RMDD & the villagers.

Food and nutrition quality: RMDD gave equal importance to both nutrition quality and consumption, although in there is a difference in the response of both Ramaram and Pamphok. As can be seen Ramaram being a comparatively better off village assigns more weightage to quality as the consumption is not a concern for them. But Pamphok, first requirement is consumption and only after their basic consumption status could be improved the quality of what they are consuming will be given importance, so the stakeholders assigned more weightage to consumption than quality.



Education: the new building of the Government Primary School in Pamphok



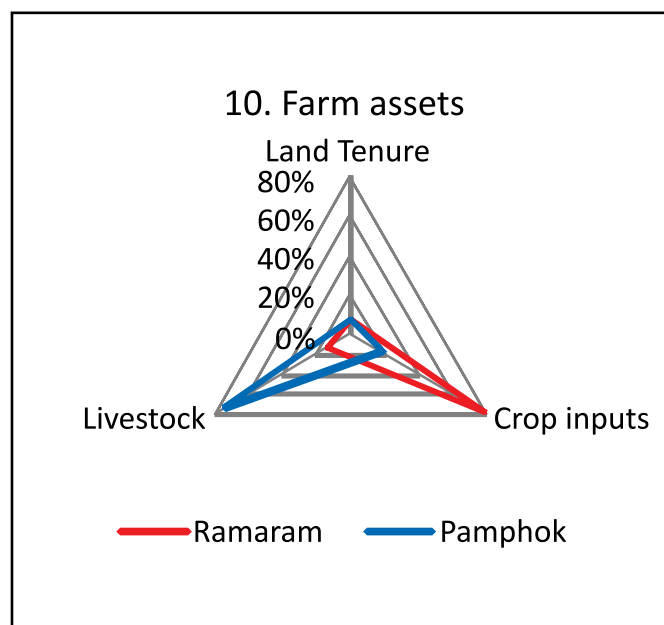
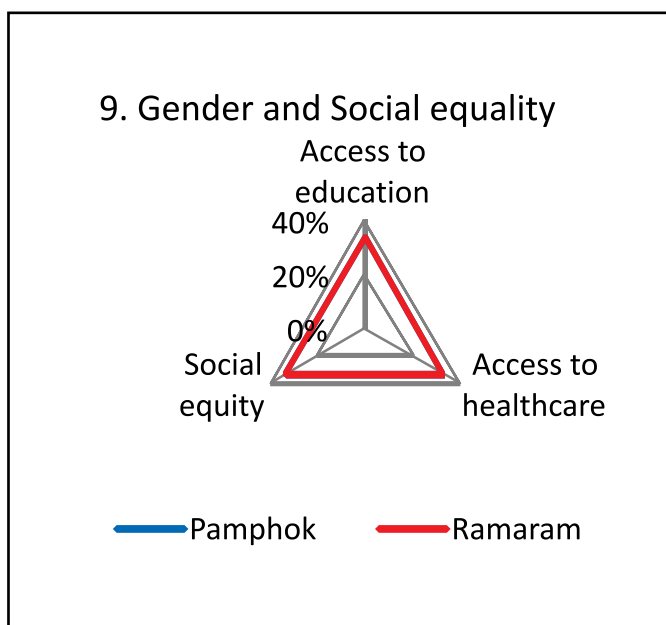
The focus of both RMDD and Ramaram is on energy, but Pamphok has given highest weightage to housing. This is because the houses in Pamphok are mainly kuccha houses while in Ramaram they have semi pucca houses. While Pamphok is still struggling with the basic facility of proper housing, Ramaram where people have a relatively better lifestyle has higher preference for better access to energy (energy source in terms of fuel for cooking in particular). Clothing was not seen as a problem as villagers do have adequate summer and winter clothing.

Sanitation coverage in the region is 100% as claimed by RMDD. But it was found that in terms of hygiene (washing hands) it has a scope of improvement. Also in Pamphok people complained that the toilet installed needs continuous supply of water, when they do not have adequate quantity of water to drink, they cannot use water for sanitation, so during water scarcity they prefer to go for open defecation. Also without water it is very difficult to keep the toilets clean.

So RMDD needs to look for alternative ways to encourage people to use toilets and alternate technology of toilet which requires lesser water. It is very important here to understand that coverage does not necessarily imply usage. It is more of an issue of behavioural change which needs constant interaction with the villagers to raise their awareness on sanitation issues.



The school going children having the mid day meal



All the stakeholders assigned equal weightage to all the three sub-components under this component. As stated by the stakeholders, there is no gender bias/ social stratification in the study region. But this component needs to be dealt separately as during the focus group discussion it was felt that the girl child is the first one in the family to leave school when the family faces any crises. RMDD needs to pay attention to the gender inequity/social inequity which is also a cause of poverty can be identified and adequate measures planned.

Stakeholders from Ramaram felt crop inputs (mainly for floriculture) is the most important sub component, while Pamphok felt within farm assets, livestock can act as a buffer during crises. This is because livestock becomes an important asset which has a ready market. Since most of them are small farmers, so during a bad year they can cope with crises by selling their livestock. But RMDD has to be very careful with that because this is just a coping strategy and this can never lead to full recovery of the household.

The analysis presented above clearly indicates that communities in the study area lack adequate resilience to combat any extreme event and this thus makes them vulnerable to any climate extreme. We hope RMDD will be able to take adequate steps in future to increase their resilience by reducing their vulnerability. This will increase the villager’s capacity to adapt successfully to any unforeseen natural hazard, without any external support. However, the stakeholder analysis also reveals that RMDD is definitely aware of these underlying factors, what is needed are planned interventions which will be more holistic in nature. As the bottom up approach was adopted in the research study this exercise will also help the communities to realize the problems at hand and work together with RMDD.

CONCLUSION

For any climate change research it is very important to identify the factors which reduce resilience of the community and enhance their vulnerability by increasing their exposure. A shift in research focus from climate to society brings in all kinds of non-climate issues. Poverty is one such dynamic issue. As this study highlights that apart from physical exposure, exposure of the people in the study region has been increased due to their poor socio- economic conditions, which are non - climatic. Resilience as discussed in the beginning refers to the capacity (ability) to absorb (withstand) disturbances (for example climate change and its impacts) while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. This is possible only when the indicators of increasing resilience – better access to education, market access, alternative sources of income (non- farm) – are also enhanced since there is a direct link between these indicators and poverty. Once poverty is eradicated it will build resilience of the



Water supply and storage: tanks made by RMDD for Rainwater Harvesting, in the non rainy season being used as storage tanks (the top of the tank is temporarily covered by a CGI sheet)

community to climate change and increased resilience will facilitate adaptation by reducing vulnerability of communities from unforeseen natural disasters.

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Mountain communities in remote, rural pockets are especially vulnerable to climate change impacts due to their dependence on rainfed farming and limited access to technological advancements