COMMUNITY BASED DISASTER MANAGEMENT AND LIVELIHOOD SUSTAINABILITY IN GAULA RIVER CATHMENT: KUMAUN HIMALAYA

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Abstract:

Participatory research approaches are increasingly popular among academic researchers and development organisations working to facilitate change in collaboration with local communities. A case study from the Gaula River Catchment area (Nainital District) in Uttarakhand is used to illustrate some of the methods to assess disaster induced problems in the area. Drawing on research in the area in which participatory techniques are used with indigenous communities to determine strategies for dealing with environmental hazards. The paper illustrates some aspect of the spectrum of disaster preparedness and recovery, beginning with risk perception and vulnerability assessments, and proceedings to the notions of resiliency and livelihood sustainability.

***Keywords*: Community based Disaster Management, Participatory Approach and Livelihood Sustainability.**

Introduction:

Though each and every part of the world is more or less susceptible to natural calamities, the Himalaya due to its complex geological structures, dynamic geomorphology, and seasonality in hydro-meteorological conditions experience, natural disasters very frequently, especially water induced hazards (Rawat et. al., 2011). Over the past two to three decades, the economic losses and the number of people who have been affected by natural disasters have increased more rapidly. The recent disaster of Uttarakhand is the burning example of human, ecology and economic loss. Changing climatic conditions together with land use degradation accelerating climate induced hazards such as river line flood, soil erosion, land slide (due to intense rainfall) and drought in non monsoon period (as drying up of traditional natural water springs). Poorly managed agriculture, forest fire, overgrazing and substandard construction of roads and buildings are some major anthropogenic factors that may contribute to this acceleration. Increasing population and demand of land for agriculture has accelerated pressure on the various watersheds of the Lesser Himalayan region.

The Geo-dynamically active Himalayan terrain is being deforested at the rate of 0.36 km2/year (Rawat and Pant, 2007 and Rawat et.al. 2010). A livelihood comprises the capabilities, assets (both natural and social) and activities required for a means of living. A livelihood is sustainable which can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, both now and in the future, while not undermining the natural resource base (Chambers and Conway, 1992). A livelihoods approach describes how people obtain resources, how they use them, what gets in their way whilst obtaining them and who controls the resources. Importantly, in the case of Uttarakhand, there are some major obstacles which are responsible for it's under development. Firstly the state has uneven phisiography, due to that the generation and utilization of resources is very difficult. Secondly, the state has weak infrastructure and economy that has limited opportunities of generating livelihood for its people. The state lack in industrial development, and the tourism based economy of hill districts has been weakened due to severe hazards especially roadside landsides and river line floods. Thirdly, the state has large forest cover face difficulty in getting infrastructural projects, which hamper its development.

Government Agencies, NGOs, and international organizations implement various programmes both before and after disasters. Most of these are very successful during the project period, but gradually diminish as the years pass. There are many reasons for this kind of phenomena; however, lack of effective participation and capacity building of the local communities to peruse the program remains major factor for lack of sustainability (Pandey and Okazaki, 2010). The most common elements are lack of partnership, participation, empowerment, and ownership of the local communities. Community participation has very important role in disaster management. The base of CBDM is that there is empowerment of and ownership by local stakeholders at community or municipal level that should lead to a sustainable reduction in disaster risks over time (Maskrey, 2011). The emphasis on disaster management efforts should focus on communities and the people who live in them. If we want to reduce the losses and scale of tragedy in a lower extent, we have to involve community on a larger scale. There needs to be an opportunity where people can be drawn in from the preliminary programming stage of disaster management actions. Being at the forefront, communities need to have the capacity to respond to threats on themselves.

The analysis of the impact of past disasters on various communities and social groups will help understand the relationship between the nature of hazard and the kind of impact they can have upon various at-risk-elements. Through this analysis the local authorities can also identify the high impact hazards; e.g. those which kill the most people, or those which affect severely the local economy and infrastructure (Kafle and Murshed, 2006).

Research Methodology:

The study is based on both primary and secondary data. For study 6 village of Gaula river catchment has been selected that are most vulnerable in terms of disaster risks. Twenty five respondents from each village have been selected. Thus total 150 samples have been taken for primary data collection. Subsequently Participatory Rural Appraisal (PRA) tools have been used to know the ground reality. Focused group discussion and interviews have been conducted to know the responses of local communities. Hazard Vulnerability Index has been prepared for measuring hazard, vulnerability and management assessment separately to elucidate the risk assessment by giving them ranking on the basis of local responses. The perceptions of the local community regarding different aspects of sustainability and hazard occurrences and management have been gathered through a pre structured questionnaire excluding general information about the respondents. Population, socio economic and household, land use and disaster related data have been collected from District Census Hand

Book. Secondary data has been used for analysing, explaining, and combining the geographical information of the study area with additional information. Community empowerment for disaster risk management demands their participation in risk assessment, mitigation planning, capacity building, participation in implementation and development of system for monitoring which ensures their stake.

The Study Area:

The Gaula River (500 km. long) originates from the Sattal lakes of Uttarakhand state, and flows south part of Kathgodam, Haldwani,and Shahi, finally joining the Ramganga River about 15 km. northwest of Bareilly in Uttar Pradesh. The catchment of the Gaula River covers 600 km. in the south-central Kumaun Himalaya (Figure 1). The study area falls into two well defined physiographic divisions, each being a distinct geological unit. It lies between Lesser Himalaya and lower Shiwalik, between 29° 16' 10" N to 29° 24' 11" N latitudes and 79° 41' 21" to 79° 48' 13" E longitudes. The zone of ridges and steep slope includes major portion in north of the river. It lies in altitudinal zone of 1400 m. thus subjected to high erosion. It covers 45 per cent area of the total area of the basin. This zone also characterised by fault and a dissected topography, involves maximum anthropogenic interference thus contributes in maximum silt discharge to the principal stream. The zone of minimum elevation varies from 545 mts to 1400 mts thus erosion is low. The soil is enriched with silt and thus it is potentially fertile, this covers roughly 20 per cent area of total river basin.

Climate:

The catchment area lies in the subtropical zone. The average minimum and maximum temperatures are, respectively, 1.3°C (at Nainital) and + 35°C (at Kathgodam). The rainy season extends from mid June to mid September during which period 70-90 per cent of the total annual rainfall occurs. Winter rains from late December to early February are quite common, though much less intense, and snowfall occurs above 1,300 m. Most of the rain fall leaves the area as direct surface runoff; little infiltrates to augment the groundwater. The groundwater commonly moves at the rate of 1-2 cm per day and returns eventually to the surface as springs and seepages through faults, fractures, joints, and permeable layers. The spatial distribution of climate throughout study area suggesting three types of climatic zones i.e. subtropical, temperate and moist temperate which are respectively favorable for mixed forest, pine forest and oak forest in the mountain ecosystem.

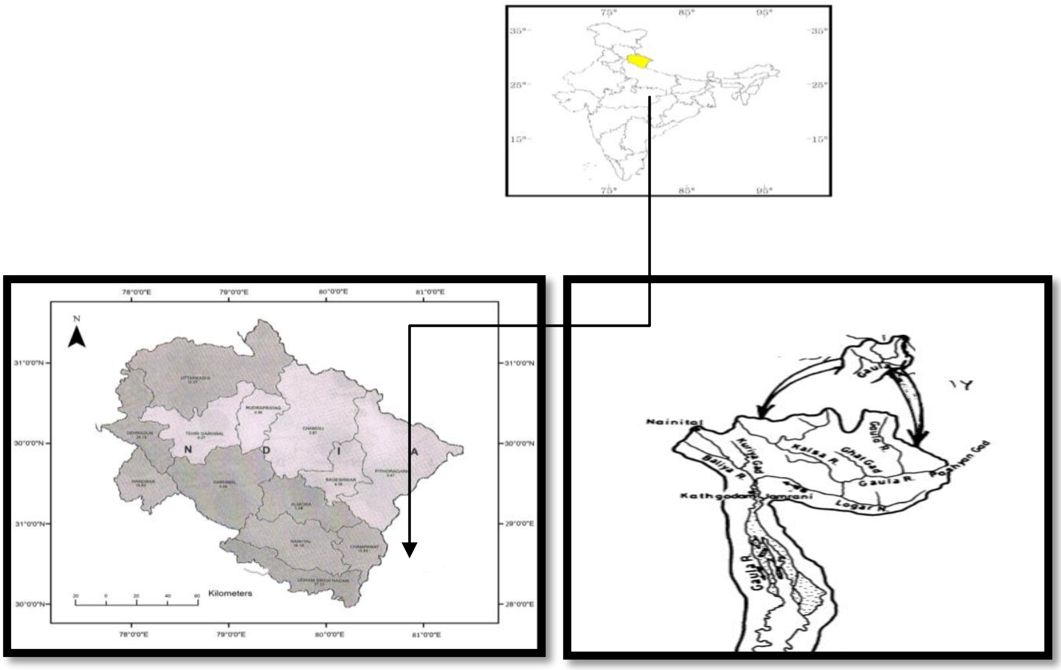

Figure 1: Location Map of the Study Area (Gaula River Catchment Area, Uttarakhand).

Geology:

The study area falls into three well-defined physiographic belts:

1. In the north, the Precambrian Almora Group
2. In the middle reaches, the Ramgarh Group
3. In the lower part, the Bhawali Quartzite

The larger part of the area (98.7 per cent) has steep slopes (25-400) with a slope frequency of 68.8 per cent. A sudden change occurs from the 20-250 slope categories to the 25-300 categories along the Main Boundary Thrust and the transverse faults between Jeolikot and Ranibagh, and between Hairakhan and Sajagaja. The Siwalik in the south, ranging in height from 500 to 1,640 m., is separated from the Lesser Himalayan sub province by a deep tectonic break known as the Main Boundary Thrust (MBT) (Valdiya, 1988).

Village Assessment Profile:

The selected village assessment profile make known that variety of changes have come out in the conventional resource utilization structure mainly in response to changing population dynamics and resultant increased demand of natural resources, inadequate technology transfer, market services, improper land tenure policies, faulty environmental conservation programs and inappropriate developmental schemes. These so called emerging negative trends in the socio economic profile have resulted into rapid over utilization and transformation of local resources and large scale land use changes in the region. A number of new issues began emerging during initial interactions with local communities.

In the last 10 years the Tarai plain area of the region is emerging as a hub of industrial and commercial development, similarly agricultural and residential growth in the region has been largely contributed and achieved as well. One key vulnerability that needs to be considered includes the loss of rural settlement housing and infrastructure due to climate induced hazards and growing number of youth migration from the interior rural villages.

It is also important to note that the hydropower industry is the backbone of Uttarakhand's economy; changes in run off also will have future implications for hydropower energy infrastructure. In the selected villages there is a wide variation in drinking water requirements from season to season. An assessment of human interference in Gaula River Catchment reveals huge dependence on local communities on forest fringes. Previous ecological studies on the Gaula catchment area shows continuous change in forest cover, plants regeneration patterns and slowly falling plant species. The local survey stressed community's participation considering natural and human induced risks a big threat; these risks are reducing the livelihood options in the catchment area. The availability of better livelihood opportunities is a viable option for minimizing pressure and managing biodiversity of the area through active community participation.

The repeated and increasing occurrences of disasters in the catchment area, particularly landslides and floods, underscores that the carrying capacity is often crushed under climate constraints. Among the surveyed villages kuriya Gaon is the largest village in terms of population and Lamjal is the smallest one (Table 1). Though all the villages are vulnerable to landslide but village BhujiaGhat is most susceptible because of its roadside location, here more than 15 landslides occur every year mostly during rainy season.

Table 1: Profile of the Selected Villages of Gaula River Catchment

Name of the Village	Number of Families	Total Population			Population Livestock
		M	F	Total	
Suryajala	140	483	317	800	388
KuriyaGaon	445	1022	1011	2033	1007
BhujiaGhat	35	115	95	210	126
Lamjala	25	68	82	150	70
Rusimalla	45	84	91	175	98
Ranibagh	60	169	151	320	180

Source: Based on Primary Survey 2014.

Community Based Disaster Management Planning:

CBDM's main aim is to prepare disaster management plans at appropriate level (district, block and village), survey of the hazardous areas, assess vulnerability and evaluate community participation, poverty status and disaster risk zoning. CBDMP covers an extensive range of interventions, measures, activities, projects, plans and programs to reduce disaster risks, which are primarily designed by community at risk in specific localities and are based on their urgent requirements and capacities (Figure 2). The most vulnerable figure in disaster is the primary actors (local community) and the focus should be at the household level. As all individuals, houses, organizations and services stand a chance of being affected they should all be involved for successful CBDMP.

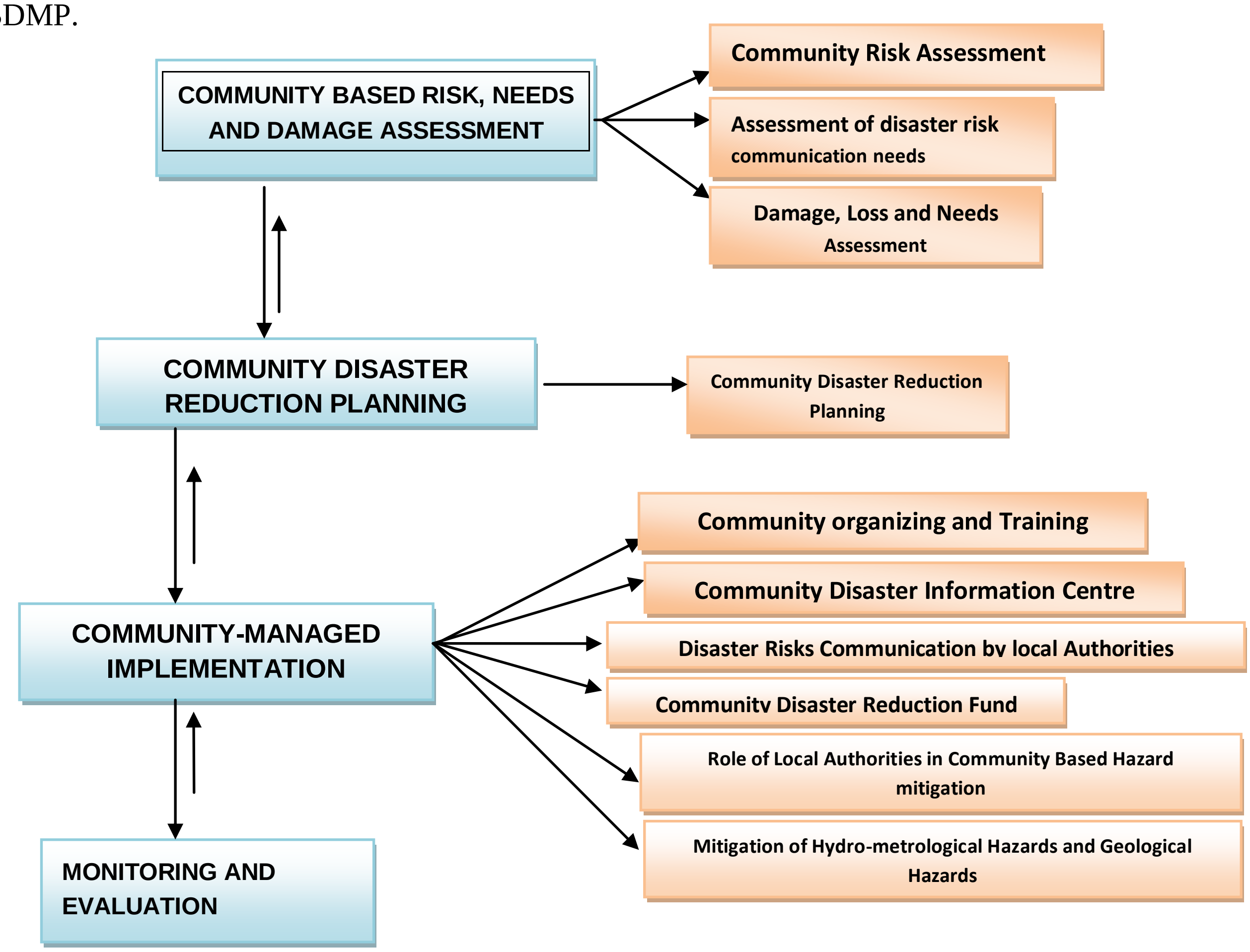

Figure 2: Steps Required in Community Based Disaster Management Planning
Source: A Handbook for Preparation of Multi-Hazard Community Based Disaster Preparedness Plan (CBDP) in Delhi

Disaster Risks in the Gaula River Catchment Area:

Over the years, due to erosion and deforestation the Gaula catchment has become prone to landslides and the springs in it and overall rainfall have declined leading to reduction in its flow. There are several factors that may contribute to this acceleration, including deforestation, poorly managed agriculture, forest fire, overgrazing, and substandard construction of roads and buildings on ill suited sites. The rapid growth of population has brought about extensive land-use changes in the region, mainly through the extension of cultivation and large-scale deforestation. This irrational land transformation process has not only disrupted the ecological balance of the Himalayan watersheds through reduced groundwater recharge, increased run-off and soil erosion, but has also adversely affected the ecology and economy of the adjoining plains by recurrent foods and decreased irrigation potential.

The Gaula riverbed after it hits the plain near Haldwani has also been facing erosion to excessive quarrying. When despite Supreme Court's directive which effectively banned quarrying while only allowing silt deposit removal, has led to public protests in the regions and a 'Bandh' (mass strike) in December 2009 by activists, alleging nexus between stone crushing and mining industry and the administration. The consequences of mining and constructional works in the area are the endemic resulting heavy landslides. Road construction on vulnerable slopes in the geo-dynamically active zones has greatly aggravated slope instability and has promoted mass movements. Even though landslide-zone mapping and identification of erosional features are imperative for land use planning and economic development of the region, investigations of the landslides in Kumaun are not yet adequate.

Gaula River Basin: A Heavy Landslide Affected Area:

The frequency of landslides in the catchment varies from area to area, depending on anthropogenic changes taking place and on the underlying structure.The subtropical climate, characterized by abundant and seasonally intense rainfall, is responsible for the formation of a thick mantle of weathered rocks. Extensive human activities related to agriculture, horticulture, clearing of forests, and excavations for roads have intensified erosion and triggered slope failures on the highly unstable rocks. The landslides in the area are the result of heavy rainfall on a highly faulted terrain made up of cavernous carbonate rocks. Fans and cones of debris derived from slope failures occur widely in the Gaula river basin where channels are choked with debris. Valdiya (1987) records a high landslide frequency of 0.72 landslides/km2 and demonstrates that the average rate of erosion, as determined from the suspended load in the Gaula at Kathgodam, is 1.7 mm/yr. Landslides of all sizes (25 m2 in a real extent) numbering over 550, and both old and active, have been recorded in the catchment area of the Gaula river. About 20.3 per cent of the mass movements occurred along the roads and 79.7 per cent on natural slopes. The landslides are concentrated in fault controlled valleys. The results of climate informatics advocating that the climatic zones of the area are shifting towards higher altitudes due to global climate change and affecting the favorable conditions of the existing land use pattern (Rawat, Tiwari and Pant, 2011).The non forest area has increased dramatically due to lopping and cutting of trees, and growing agricultural activities. On the other hand the river line flood triggering several environmental socio-economic problems in many ways.

Major Landslides Zones in the Catchment:

In the catchment area as many as seven major landslide zones have been identified. These are:

1. The Kalsa valley downstream of Chanphi,
2. The main Gaula valley between the Ghatgad-Gaula confluence and Barajala,
3. The Logar valley downstream from the confluence of the Dhoriyagad and the Jagrugad rivers,

4. The Balia valley downstream from Talli Krishnapur and up to Suriyajala (Plate 1),

5. The Pegrigad and south of Lariakanta Pines to KuriyaTalla along the road,

6. Downstream from the confluence of the Bhimtal-Naukuchiyatal ravines.

Plate 1: Baliya Nala Confluences to Gaula River

The Barajala sub-catchment landslides along roads are very frequent. The Bhankar landslide is the largest in the Gaula catchment. It is located in the Kalsa valley about 2 km east-southeast of Chanphi. The relief zones of 800-1,400 contain the largest number (56.7 per cent) of land- slides, because 800-1,400 mts. relief represents the largest area in the catchment. Most of the landslides occur during or immediately after heavy rains. Three factors seem to be particularly important: the intensity of individual storms, the amount of rainfall, and the duration of the storm period. It was noticed that intense storms, even of very short duration, generated widespread land sliding on roads. It further suggests that the storms coming after prolonged rainfall generate more landslides than storms that occur at the beginning of the rainy season (cf. Caine and Mool, 1982). Thus, landslides are more frequent when the ground is saturated. Reduction in precipitation in the catchment area is one cause of the serious decline in discharge of the Gaula River. The decline in the discharge of springs accounts for the significant reduction in the river discharge. The other reasonable cause of decrease in the Gaula discharge could be greater utilization of upstream water for small-scale irrigation through canals, which now number 38 and irrigate 1,022 hact. of cropland. The rate of sediment transport in the selected villages has been calculated on the basis of suspended load measured (Table 2).

Table 2: Frequency of Active Landslides in the Gaula Basin

Name of the Villages	Number of Landslide on Natural Slopes	Number of Landslide on Roads	Total Number of Landslide	Frequency (Km^2)
Suryajala	2	3	5	1
KuriyaGaon	4	3	7	0.72
BhujiaGhat	9	6	15	1.6
Lamjala	4	2	6	0.87
Rusimalla	3	2	5	1
Ranibagh	3	3	6	1.84

Source: Based on Primary Survey

Community Perception Regarding Different Aspects of Hazards:

A community perception regarding hazards occurrences and its impacts on livelihoods is very important in management and policy level. The in-depth knowledge of local environment related hazard that may pose serious risks to life and property is held by long standing and indigenous inhabitants of mountain people. Their indigenous knowledge has influenced land use and resource management decisions and adaptive strategies for generations. These and the indigenous and local knowledge provide a rich corpus of information which may be of use to scientists, engineers, planners and outsiders involved in development projects in a new area. Hazards are caused due to change in geophysical set up. The scale of severity is based on the state of fragility and vulnerability. So far as the frequency of hazards in the Gaula river basin is concerned (Table 3). The trend (frequencies) has been categorized under 6 heads, namely increasing slowly, constant, reducing rapidly, reducing slowly and don't know. The hazards of, landslide, floods, cloudburst, forest fire, heavy rain storm and soil erosion have been regarded by the respondents as increasing rapidly by 90, 83, 81, 74, 90 and 80 per cent. Heavy rain storm and due to that soil erosion has been increasing slowly as observed by 12 and 18 respondents respectively (Table 3).

Table 3: Peoples' Perceptions Regarding Present Trend of Hazards (frequency)

Hazards												
Present Trend	**Landslides**		**Floods**		**Cloudburst**		**Forest Fire**		**Heavy RainStorm**		**Soil Erosion**	
	Res.*	**per cent**	**Res.***	**per cent**	**Res.***	**per cent**	**Res.***	**per cent**	**Res.***	**per cent**	**Res.***	**per cent**
Increasing rapidly	135	90	125	83	120	81	110	74	135	90	120	80.00
Increasing slowly	15	10	25	17	20	13	15	10	12	8	18	12.00
Constant	0	0	0	0	5	3	5	3	0	0	8	5.33
Reducing rapidly	0	0	0	0	0	0	0	0	0	0	0	0
Reducing slowly	0	0	0	0	0	0	5	3	0	0	2	1.33
Don't know	0	0	0	0	5	3	15	10	3	2	2	1.33
Total	150	100	150	100	150	100	150	100	150	100	150	100.00

Source: Primary Survey, 2014 (* Res. - Number of Respondents, Based on Community Response)

Perceptions Regarding Causes of Hazards:

Intensive household level attitudes were collected for individual hazards: their root cause and other responsible factors were identified through questionnaire. Deforestation, slope cutting, heavy rainfall and overgrazing were identified as the driving factors causing these hazards. The area is severely affected by landslides and soil erosion. Heavy deforestation and mining on slope are found major factors for landslides and soil erosion. Most of the respondents considered heavy rainfall and deforestation as the major factors for cloudburst. Deforestation, overgrazing and changing land use are the major factors responsible for forest fire in the area.

Primarily human activities like deforestation, slope cutting and mining, improper draining on slope and heavy rainfall are responsible for soil erosion by 150, 150,130 and 150 respondents respectively. Heavy rainfall, slope cutting and mining, changing land uses were identified as other responsible factors for landslide hazards by 150, 150 and 100 respondents respectively. For the hazard of forest fire traditionally, deforestation was considered as the foremost factor, others are slope cutting and construction of roads and overgrazing. About 150 respondents recognized the faulty heavy rain fall, deforestation, slope cutting and construction of roads are as a tool for soil erosion in the area (Table 4).

Table 4: Local's Perceptions Regarding Cause of Hazards

Causes	Hazards											
	Landslides		Floods		Cloudburst		Forest Fire		Heavy Rain Storm		Soil Erosion	
	Res*	per cent	Res*	Per cent	Res*	per cent	Res*	per cent	Res*	per cent	Res*	per cent
Deforestation	150.0	100.0	150.0	100.0	120.0	80.00	150.0	100.0	25.00	10.67	150.0	100.00
Slope cutting and Mining	150.0	100.0	130.0	86.67	00.0	00.0	60.0	40.0	00.0	00.0	150.0	100.00
Improper Draining on slopes	120.0	80.0	90.0	60.0	20.0	13.33	00.0	00.0	15.0	10.00	130.0	86.67
Heavy Snowfall	00.0	00.0	2.0	1.33	00.0	00.0	00.0	00.0	10.0	6.67	10.00	6.67
Overgrazing	10.0	6.67	5.0	3.33	00.0	00.0	100.0	66.67	00.0	00.0	123.0	82.00
Steep Slopes	70.0	46.67	80.0	53.33	10.0	6.67	00.0	00.0	20.0	13.33	76.00	50.67
Heavy Rainfall	150.0	100.0	150.0	100.00	150.0	100.0	00.0	00.0	145.0	96.67	150.0	100.00
Changing Land Uses	100.0	66.67	22.0	14.67	00.0	00.0	90.0	60.00	00.0	00.0	58.00	38.67
Faulty Agricultura Practices	40.00	26.67	15.00	10.00	5.00	3.33	10.0	6.67	00.0	00.0	27.00	18.00
Tourism	30.00	20.00	10.00	6.67	00.0	00.0	15.0	10.00	10.0	6.67	20.00	13.33

Source: Primary Survey, 2014 (* Res. - Number of Respondents, Based on Community Response)

Disaster Risk Assessment:

Disaster Risk Assessment is a participatory process to assess the hazards, vulnerabilities and capacities of a community. Through hazard assessment, the likelihood of the occurrence, the severity and duration of various hazards is determined. The vulnerability assessment identifies what elements are at risk and the causes of their vulnerable conditions. The result of the disaster risk assessment is a ranking of the disaster risks of the community as basis of planning for risk reduction. At the local level, the most important factor concerning vulnerability is the level of income. The nature of houses adds to the vulnerability of the local people. Homes made of mud and stone, and roofs made of thatch grass and galvanized tins are more vulnerable than the RCC houses. Poverty status, education, communication and transportation systems, accessibility of public resources such as forest produce, government facilities and drinking water, and presence of agricultural banks/credit banks, NGOs and other service delivery institutions can be used for assessment of vulnerabilities in an area.

The study found that landslide, flood, forest fire, soil erosion and cloudburst are the major hazards impacting the region frequently (Table 5). In the Gaula river basin, there are several weak centres where landslides occur every year in a certain period of time which is the root cause of many other problems evolving in the region.

Table 5: Status of Hazards in Gaula River Catchment

Hazard	Vulnerable Areas/Status	Probability of Occurrences	Speed of Onset	Where
Landslide	Very High	90 percent during rainy season	High	Slope cutting areas (generally roadside areas)
Flood	High	70-80 percent during rainy season	High	Low line areas nearby roads
Forest fire	Moderate	70 percent during winters and 50 percent during Summers	Moderate	Forest (reserve or unreserved) and agri-forests areas
Soil erosion	Very High	80 percent during rainy season	Moderate	Steep slope without vegetation
Heavy rainfall/storm	High	80 percent during rainy season	High	Steep slope beside the roads
Cloudburst	Low	Less than 40 per cent during rainy season	High	-

Source: Based on Primary Survey, 2014

During the rainy season the area comes under intense rainfall and heavy storms, which cause flooding and landslides resulting road blockage and it becomes difficult to supply food and other necessary equipments to the locals of the affected areas. Major hazard of the region are landslides, flood, forest fire, soil erosion, heavy rainfall and cloud burst. The probability of occurrences of landslide and soil erosion becomes 90 per cent and 80 per cent during rainy season. Speed of onset of landslide, flood and rainfall is high.

Vulnerability Assessment:

A vulnerability Assessment is a practice of categorize, evaluate and compile (or ranking) the risks (threat) in a system. Systems for which vulnerability assessments are performed include communication system, energy supply, water supply and availability of health and education facilities etc. The result of vulnerability assessment depicts that among the surveyed villages Suryajala has the highest percentage of population with critical facilities. Vulnerability from the perspective of disaster risk assessment means assessing the threats from potential hazards to the population and to infrastructure. There are several weak zones in the village where landslides occur. Most of the people occupy radio, telephone and television and other means of communication but road accessibility is poor among all the surveyed villages (Table 6). Due to the lack of proper infrastructural facilities the surveyed villages are most vulnerable. During rainy seasons it becomes difficult to access roads, because of linear road blockages in several areas of the whole area.

Table 6: Vulnerability Assessment

Vulnerable Indicators	Percent of Population with Critical Facilities					
	Suryajala	Kuriya Gaon	Bhujia Ghat	Lamjala	Rusimalla	Ranibagh
Telephone	70	50	50	40	40	5
Television	20	10	5	5	5	5
Road Access	60	40	50	30	35	10
Availability of Drinking Water	15	35	30	10	35	15
Radio	5	2	5	2	5	5
Toilet Facilities	5	10	5	7	15	5
RCC Housing	60	65	50	20	45	30
Schooling Facilities	40	30	25	15	25	15
Health Centres	65	65	70	30	60	30

Source: Based on Primary Survey, 2014

Conclusion:

Utilising participatory techniques in such a manner for disaster risk reduction has broadened the capacity for dialogue between impacted communities and relevant stakeholders. Besides anthropogenic process of resource development, specifically construction of road along sensitive slopes, expansion of settlement zone and agriculture on forests and upslope areas, overgrazing etc. have further rendered this entire zone prone to frequent and widespread land sliding and excessive soil erosion. The research has found that the role of community is very insignificant to mitigate and manage disasters in the area; as well the role of government authorities also not satisfactory.

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