

STEPPING TOWARDS RESILIENCE

through People's Participation

Gorakhpur Environmental Action Group (GEAG) is a voluntary organization working in the field of environment and sustainable development since 1975. Ever since its inception, GEAG has been actively engaged in implementing several development projects addressing livelihood issues of small and marginal farmers, particularly women based on ecological principles and gender sensitive participatory approach. Besides, GEAG has accomplished several appraisals, studies, researches at the micro & macro levels as well as successfully conducted a number of capacity building programmes for various stakeholders including women farmers, civil societies groups and government officials etc.

Today, GEAG has established its identity in North India as a leading resource institution on sustainable Agriculture, Participatory approaches, methodologies and Gender. Acknowledging its achievements, efforts and expertise United Nation's Economic and Social Council (ECOSOC) accorded GEAG special consultative status in the year 2000. GEAG has also been recognized recently as North India hub for interSard, South Asia a network to facilitate information sharing on issues of concern.



A Training Manual for Facilitators on
Building Climate Resilience Planning in Rural Areas



Gorakhpur Environmental Action Group

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Acronyms & Abbreviations

ASHA Accredited Social Helth Activist
 ATMA Agriculture Technology Management Authority
 CBA Cast Benefit Analysis
 CC Climate Change
 CRA Climate Resilient Agriculture
 DFID Department for International Development
 GEAG Gorakhpur Environmental Action Group
 GHG Green House Gases
 IARI Indian Agriculture Research Institute
 IAY Indira Awas Yojana
 IFPRI Internatinal Food Policy Research Institute
 IPCC Inter Governmental Panel on Climate Change
 ISET Institute of Social and Environmental Transition
 LAPA Local Adaptation Plan of Action
 MNREGA Mahatma Gandhi National Rural Employment Guarantee Act
 NGO Non Governmental Organisation
 NFSM National Food Security Mission
 PLA Participatory Learning & Action
 RCC Reinforcement Concreute Construction

Acknowledgment

Climate change is proving to be one of the greatest threat to sustainable development. The poorest and marginalized are most vulnerable to climate change impacts as their livelihoods and assets are largely dependent on biodiversity and ecosystems.

Gorakhpur Environmental Action Group (GEAG) has been working on climate change adaptation and livelihood resilience, primarily in the flood affected areas of eastern Uttar Pradesh and drought affected Bundelkhand.

The learnings gained through working with small- marginal-landless-women farmers re- affirmed GEAG's sustainable livelihoods approach focusing on local ecology, integration of science and traditional wisdom, due priorities to communities needs and capacities as the core issues towards resilience in stressed situation, especially in dealing with emerging challenges of climate change impacts.

We felt strong need to develop a simple and easy-to-use toolkit for the extension workers which can help them in understanding vulnerabilities of local communities and planning for community based adaptation in a bottom- up participatory mode.

We are thankful to Christian Aid, particularly Mr. Anand Kumar, Mr. Ram Kishan and Mr. Subrata De for their support and encouragement because of which we are able to bring out this kit.

Mr. Dilip Singh- ISET, Ms. Ekta Bartarya and Mr. K.K. Singh- GEAG worked hard in compiling this document, on the basis of experiences of local communities. Dr. Bijay Singh and Dr. Monojeet Ghoshal in GEAG helped in editing the document.

We are thankful to the local communities who shared their experiences and helped in this documentation.

Dr. Shiraz A. Wajih
President

Executive Summary

Ever since existence of India as land of ancient civilization, it has been caught in imagination of travelers, invaders or traders. People have come here either to understand spirituality, existential cultural philosophy, evolved nature of science and city planning or establish trading relationship, exchange of craftsmanship and even plunder its natural wealth. Such historical processes have left behind a legacy of large socio-economically deprived populace that somehow eke-out their daily needs of life. Compelling realities post-independence in India largely contributed to defining the contours of government policies and programmes.

Dream of making modern India carried obvious biases and baggage from past and were obsessed with socialist ideas of fraternity and equality, assisting in giving birth to a welfare state. Dual challenge of feeding millions and freeing the nation from clutches of social inequalities, welfare state and its successive governments frequently resorted to populist measures of poverty eradication and perhaps forgot to learn from cultural legacy of India, the 'Pancha Tatwa' to live in harmony with five constituents of nature/existence. It is obvious that environment and climate played only a peripheral role in overall policy making. Contemporary global responses on climate change are rediscovering the ways to live in harmony with nature, something which Indian culture had long cherished in past which got maimed in race of envious knowledge.

With billion plus population largely drawing sustenance from agriculture, India stands precariously exposed to risks of climate change to feed millions of hungry and malnourished people. Vagaries of flood and drought perpetuate endemic poverty and

accentuate the need to unlearn and relearn policy challenges, limitations of current researches and interventions made so far. Climate change adaptation in rural areas in India is largely focused on agriculture and there is a clear lack of systemic approach to resolving the impacts of climate change in a holistic manner. In the absence of scientific knowledge and methodologies in rural areas of the country, the resilience building process has become more like an elephant described by the blinds.

Research and high level dialogues for resilience building are going on globally but translation of this knowledge at micro level where it could be used by the actual implementer is an important question. Due to non availability of proper channels and lack of capacities for transfer and application of this knowledge, the resilience building process at the grassroots level has, at best, been partial. Rural communities are facing the changing nature of climate and they themselves are experimenting and learning from their experience to combat the impacts of changing climate. Further, there are also gaps in cross-learning amongst the rural communities across the country or the region to propagate these autonomous adaptation actions. There is a definite need to bridge the gap at various levels between myths and facts, science of climate and wisdom at grassroots, policies of government/s and opinion of people.

GEAG has been working in the rural areas of eastern Uttar Pradesh since past several decades and has gained significant experiences regarding the intricacies of rural development systems. GEAG believes that the 'theory of change' in rural areas is quite different from the urban areas and promoting adaptive livelihood options is the only pathway to sustainable development. Having worked both in rural and urban areas, the GEAG has deduced that resilience building process of urban areas could not be achieved in isolation unless accompanied with rural resilience. This experience was crucial in designing the training manual for overall process of resilience planning which has been adapted from the "Urban Climate Resilience Planning Training Manual" developed by Institute of Social and Environmental Transition (ISET), 2010.

While unpacking the notion of climate change in an easy and understandable format by avoiding pitfalls of theoretical complexities, the purpose of developing this manual is to develop a scientific understanding regarding the climate change and resilience building at the ground level. This manual is intended for use by the grass root level development workers who are facilitating resilience building process in rural areas in the context of climate change.

The users are requested to use this manual as a guiding tool and use their wisdom for the diversified physical and socio-cultural situations.

SECTION : I

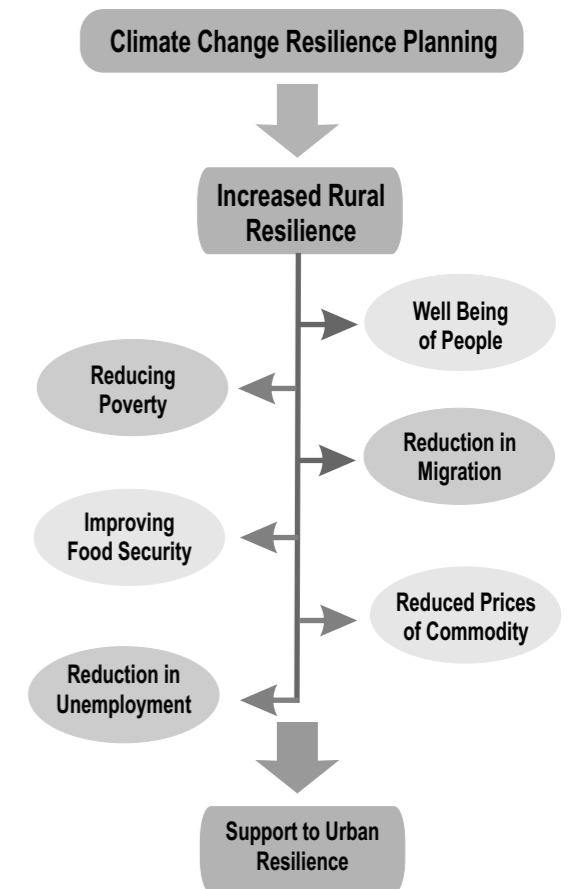
Climate Change and Resilience Building

Climate Change in the Indian Rural Context

Climate change (CC) is no more an issue to be explained its impacts are quite visible and witnessed by all of us. Even though it is not the new phenomenon, the pace at which climate is changing has increased rapidly in the past few decades. Changing climatic conditions become even more crucial because of the increase in the human population on earth and its ever increasing dependency on natural resources. Different spheres of human life depend directly or indirectly upon the tolerance capacity of the nature and any disturbance in it increases the insecurity of the human survival. As we become more and more dependent on modern technologies and automation, the need for natural resources to sustain human population increases manifold. In the earlier times, the primary dependency of human being on nature was only for food & shelter but gradually we have started to exploit the nature and its resources more adversely for our need or greed, in the name of food, fuel, housing, paper, clothing, etc. It is now evident human activities in the later half of the last century has resulted in the increase in pace at which climate is changing.

Though the impact of CC is omnipresent and affecting almost all spheres of human life, its impact is visible more in the rural areas as compared to the urban areas. This is primarily because the rural ecosystem is much more linked to and dependent upon the natural ecosystems which are more fragile. People living in the rural areas are more dependent on the natural ecosystems for their livelihoods, food, shelter, clothing, fuel and any adverse affect to these natural ecosystems directly affects the well being of the rural populace. It may be noted here that the lack of comprehensive climate change resilience plan of rural areas would directly and indirectly affect the

Fig 1 | Climate Change Resilience Planning



development and sustainability of urban areas as well thus reducing its resilience as well. The food to feed the urban people, timber for infrastructure development, other allied industries like jute industry, cloth industry, etc. all depend upon the wellness of rural areas. Apart from this, the non existence of adaptive livelihood options vis-a-vis changing climate continue to provoke rural populace to migrate to urban centres, thus increasing the number of urban poor leading to increase in pressure on urban services and adversely impacting the overall urban development.

People in the developing world, who are already vulnerable, are likely to be the more seriously affected by the impacts of climate change. In 2005, nearly half of the economically active population in developing countries 2.5 billion people relied on agriculture for their livelihood. At present, 75 percent of the world's poor live in rural areas. At the same time it is estimated that projections say by the end of this century the world's population will double to around 15 billion (Nelson et al, 2009). This implies that while the demand for resources will increase multi fold their production may decrease due to the changing climate thus creating a huge imbalance and vulnerability.

According to IFPRI research the adverse affect of climate change on agriculture will negatively affect the well-being of people. The research projects that:

- ▶ *In developing countries, climate change will cause yield declines for the most important crops and South Asia will particularly be hard hit. Similarly, CC will have diverse effects on irrigated yields across regions, but in South Asia the irrigated yields for all crops will experience large declines.*
- ▶ *Climate change will result in additional price increases for the most important agricultural crops rice, wheat, maize, and soybeans. Higher feed prices will result in higher meat prices. As a result, climate change will reduce the growth in meat consumption slightly and cause a more substantial fall in cereals consumption.*
- ▶ *Calorie availability in 2050 will not only be lower than in the noclimate-change scenario it will actually decline relative to 2000 levels throughout the developing world. This reduced calorie availability will increase child malnutrition by 20 percent relative to a world with no climate change. Climate change will eliminate much of the improvement in child malnourishment levels that would occur with no climate change.*
- ▶ *Thus, aggressive agricultural productivity, investments of US\$7.17.3 billion, are needed to raise calorie consumption enough to offset the negative impacts of climate change on the health and well-being of children.*

The impacts of CC do not follow the boundaries. Its adverse impacts are equally visible in India. Farming in India is already fragile- being dependent on the mercurial nature of monsoon. A aberrations in the rate and amount of precipitation and alteration of minimum and maximum temperature scenario (as felt by people) in recent past have confirmed the ominous potent of nature's fury. The available research (Stapleton, 2010) explicitly concluded that climate change have posed direct impact on the aberration of temperature and rainfall patterns. The analysis of different climate

projection models developed on downscaled data (best fitted with past observed data) clearly deduced that due to climate change, particularly in middle Ganga plain, the rainfall amount (July-Sept) in kharif crop season is going to increase which might be a positive impact for kharif crops.

But a rise of one-degree temperature for kharif crops, would have negative impact for its productivity. However, the rise of temperature will have negative impact on the productivity of rabi season crop, particularly the wheat, which is a critical food-grain crop. As per a study by the IARI, every 1°C increase in temperature will reduce wheat production by 4-5 million tons. The surface air temperatures will also increase by 2 to 4°C by 2070-2100 (Agarwal, 2011). Increased climatic extremes like droughts and floods are likely to alter

production variability. However, the report also raises the concern that the productivity of most of the cereals would decrease due to increase in temperature and decrease in water availability, especially in Middle-Ganga plains. The loss in crop production is projected at 10-40% by 2100, depending upon the modelling techniques applied. Extreme weather conditions resulting in disasters will have their own socio-economic impacts, especially on the poor. Further, changes in crop productivity will have implications on farmers' incomes leading to push migration, forced labour,

Table 1 | Gorakhpur City : Climatic Characteristics

Model	Simulated Average Minimum Temperatures : 2046-2065			
	DJF	MAMJ	JAS	JAS
Observed	10.1	19.27	25.48	25.48
CGCM3- Biased	15.1	19.02	24.68	24.68
CGCM3-Corrected	12.8	19.22	25.49	25.49
CNRM Biased	16.6	19.52	25.82	25.82
CNRM- Corrected	12.4	19.56	25.85	25.85
CSIRO- Biased	17.7	19.54	25.61	25.61
CSIRO- Corrected	12.8	19.11	25.17	25.17
MIUB- Biased	14.7	20.29	25.60	25.60
MIUB- Corrected	11.9	19.98	25.65	25.65
MPI- Biased	16.1	19.02	25.19	25.19
MPI-Corrected	12.0	19.63	25.17	25.17

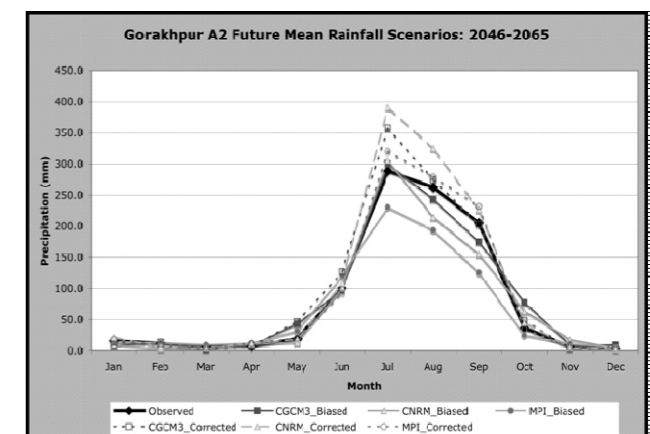
Source: Opitz-Stapleton, S. (2010)

Table 2 | Gorakhpur City : Climatic Characteristics

Model	Simulated Average Maximum Temperatures : 2046-2065			
	DJF	MAMJ	JAS	JAS
Observed	25.1	37.1	31.3	31.3
CGCM3- Biased	28.8	37.8	35.4	31.3
CGCM3-Corrected	27.9	40.0	35.7	33.4
CNRM Biased	30.4	37.9	34.7	33.9
CNRM- Corrected	27.6	39.7	35.0	33.4
CSIRO- Biased	31.0	36.2	36.1	34.0
CSIRO- Corrected	27.9	40.3	35.9	33.8
MIUB- Biased	28.0	37.1	35.6	32.9
MIUB- Corrected	26.0	39.3	34.8	33.3
MPI- Biased	29.9	38.4	35.7	33.5
MPI-Corrected	27.0	39.9	35.8	33.1

Source: Opitz-Stapleton, S. (2010)

Fig 2 | Gorakhpur A2 Future Mean Rainfall Scenarios : 2046-2065



and indifference from agriculture activities. This will lead to an increase in the number of poor people who would be hit the hardest as they neither have resources nor have any capacity to respond to these negative impacts.

Climate Change Resilience Planning

Resilience of any system is the capacity of the system to respond to a change or disturbance by negating or reducing the harmful impacts and recovering to its original state in a short time span. Resilience to climate change implies that the human and natural systems are able (or enabled) to withstand (or recover from) the negative impacts of uncertainties in temperature and precipitation in the foreseeable future.

For any area, without having a prior experience on climate change resilience planning, it is prerequisite to have a lead organization or person having adequate knowledge of climatic aberration and long experience of disaster risk reduction issues to develop synergy of engagement with local people and their inherent adaptive indigenous knowledge. One of the key elements to a successful climate change resilience planning is the 'participation' from a diverse set of stakeholders. Participation is the key to any development process but for the resilience building process it becomes more essential. In real terms participation means the articulation of local contextual wisdom, expertise with external knowledge and examples of best practices. Participation thus ensures that the autonomous adaptive capacities of the people built over a period of time get incorporated into the resilience planning. It has been our experience that people in rural areas are much more cooperative and participatory in nature than their urban counterparts. The first step to resilience planning is formation of a group of such key stakeholders in the village who will participate and lead the resilience building process with support of the facilitating person or organization.

The research and knowledge is available mostly at global and sometimes at the regional level. There is a huge gap between what the communities experience and available global knowledge. Because of this the communities are learning to survive with the changing climatic conditions by themselves but at very slow pace. Though the community learning process is slow but it is something which is actually tried and tested. Hence, for the replication at the broader level it is required to integrate the local knowledge with the scientific methodology.

Here, now it becomes important how to purposefully engage the communities in the resilience building process. For this it is required to develop the capacities of community to think in a direction where they can realize the changing climatic conditions and could understand how they are adapting these changes. This process of adaptation is so spontaneous that the communities are not able to differentiate it with their other experiences.

At this point of place the role of facilitator becomes more crucial to catalyse this situation. First of all she/he has to develop their own understanding with the globally available information and need to translate it at the community level where communities could explain their experiences. The next step is to help the communities to correlate their experiences with the wider knowledge and get engage in resilience building process.

The resilience planning should be based at the local context. Many times it is not possible to replicate the other areas experience as it is without considering the local capacities and social, economical and political context. Hence, the role of the facilitator is to facilitate the resilience building process by stimulating the local wisdom instead of developing it with their own experiences.

For better community involvement in thinking, discussions and resilience building process many methodologies and participatory visual tools are available which could be used by the facilitators. (**Annexure I** : Tools of Participatory Learning Actions) The broader goal is to enhance the thinking process of communities related to climate change and resilience building process based on their own action experience and knowledge cycle and integrate that with the knowledge available at the global level. Participation is also important in the replication of the resilient actions in rural areas where the availability of mass media and other communication media are limited.

The Process for Resilience Planning in Rural Areas

Resilience strategy for a village or a cluster of villages is a document with certain 'guiding principles' that is prepared and owned by the local stakeholders. This document is intended to provide the context, evidence and analysis to justify adaptation actions and sets priorities for actions to build resilience. The key idea here is to prepare the strategy such that it is aligned with the current or existing planning and implementation processes so that it can be readily assimilated and used by the local agencies, private sector and general public. One of the assumptions underlying the development of this guidebook is that the concepts of climate change, vulnerability and adaptation (as understood largely by the external experts) is relatively new to the village areas and rural people and hence there is a need to build this understanding in such a way that this external knowledge is in sync with the local knowledge and practices.

The development of a resilience strategy for any area follows the steps given below in a chronological manner :

Step 1 : Secondary data collection

Step 2 : Visit of village and identification of key informants

- Step 3 : Formation of a core working group
- Step 4 : Build a shared understanding of climate change issues facing the village
- Step 5 : Build understanding of the climate impacts and current vulnerabilities
- Step 6 : Develop a Resilience strategy and resilience actions
- Step 7 : Check feasibility of resilience actions and prioritize them

Steps 4, 5, 6 and 7 have been developed into specific modules intended to help the facilitator in conducting the resilience planning process along with the core working group formed in Step 1. Each of the modules contains examples from the rural landscape to further explain the concepts and issues. Further, some exercises have been suggested (which can be modified as per the experience of the facilitator and the level of the group) that would help in conducting that particular step in the resilience planning process.

Another important point to note regarding the modules is that these are intended to be administered in a phased manner over a period of time. Modules 4 and 5 should be conducted together while Modules 6 and 7 are designed to be conducted together. The facilitator or the facilitating organization should give time to the working group to assimilate the information provided and discuss it with other members of the village community to build a larger consensus. Secondly, some of the exercises and studies suggested in the modules would take long time for data collection and analysis. The results and outcomes of such exercises are needed for the subsequent modules.

The Modules Section of this guidebook follows the respective steps as described in the resilience planning process to develop a community based resilience building in rural areas. It is important to note here that the role of the facilitator is to create a conducive platform for the actual engagement of the communities in the process in such a way that the communities can lead to develop and own the whole resilience planning process and the suggested resilience building measures.

SECTION : II

Getting Started

Step 1 : Secondary Data Collection

Get all the basic information regarding the village or the area where this exercise has to be conducted before the fieldwork and record it in a specific format. Possible secondary information sources are the census records, block office, village land records, and the meteorological department for weather data.

Suggested format, as an example, for secondary data collection:

Table 3 | Format for Secondary data collection

Village	Block	District
Total Population		
Number of Households		
Total geographical area of the village (in ha) :		
Barren and uncultivable land		
Forest area		
Water bodies in and around the village		
Cultivable waste, pastures and groves		
Fallow Land		
Net Sown Area		
Gross Cropped Area		
Net Irrigated Area		
Area under major crops (in ha) :		
	Crop 1 _____	
	Crop 2 _____	
	Crop 3 _____	
	Crop 4 _____	
Number of electrified houses		
Small scale industries in the village		
	Number of units of Industry 1	
	Number of units of Industry 2	
	Number of units of Industry 3	
Climate details	Jan	Feb
	Mar	April
	May	June
	July	Aug
	Sep	Oct
	Nov	Dec
Minimum		
Temperature (°C)		
Maximum		
Average number of rainy days/month		
Average Rainfall amount (mm)		
Name of person collecting information		Date
Name of NGO		

Step 2 : Visit to the Village and Identification of Key Informants

The initial visits to the village are intended to familiarize the team with the village, rapport building, identification of key informants and one-to-one discussion with each of them. The idea behind these initial visits is to take advice regarding the village dynamics, main stakeholder groups and identification of the core working group members. The key informants can also be good resource for cross-checking the secondary information collected, though it is best that this be done at a larger village meeting when village mapping exercise is being done. Some of the typical key informants in a village are the village *pradhan*, or the ex-pradhan, panchayat members, school teachers, *angan-wadi* worker, and ASHA.

Step 3 : Formation of a Core Working Group

Once the main stakeholder people or groups in the village have been identified, take help from the key informants to get these people or their representatives into forming a core working group for the resilience planning exercise. While constituting the core group members, it must be ensured that the proportion of excluded communities member, women, and minorities should also be maintained in the working group. The first things to do with the working group would be to share the objectives of the assignment and its background, assign specific tasks to members (if any) and jointly develop a work plan and a timeline.

SECTION : III

Training Modules

Step 4 : Understanding Climate Change Issues (Module 1)

MODULE DESCRIPTION

Rural life and livelihoods are closely linked with the natural systems that are more climate sensitive. Planning for climate change resilience would indeed require knowledge of the climate that an area would face in the future. However, the projections of climate information are riddled with uncertainties and availability of future Climatic data and its downscaling to the village level is almost impossible at this time. Despite these uncertainties local communities have been taking decisions based on their own wisdom to cope with the climate variability. Hence, it becomes important to develop a common understanding of the changing climate in the local context and define the parameters how communities are observing the climatic aberration. This module discusses to explore the changing climatic trends at the planning unit, develop the indicators for community observations in rural areas and explain how planners could use this information for planning resilience making decisions. Here, in the entire module for the convenience of the participant the planning unit is considered as a single village.

At the end of the module the participant should be able to :

- ◆ Understand Climate Change phenomenon in simplest terms
- ◆ Understand the trends of change in climate in rural areas observed and experienced by the communities.
- ◆ Find out the indicators through which communities observe the change in climate.

Time duration for this module

The suggested time for this module is one complete day of interactive sessions. However, depending upon the availability of the core group members this can be done over two consecutive days.

Preparation required

Though power point presentations can be made (in local language), the facilitators should be prepared with large print-outs (or drawings) of global warming and climate change phenomenon, with which the concepts can be explained in simple term. Further, small cut chart papers for group exercises and colored pens/sketch pens, flip Chart and marker pens would also be needed for noting down participants observations.

SESSION 1 | Explaining Climate Change

The climate of a place is the average of weather conditions prevailing at that location over a period of time. Rainfall, temperature, Air pressure, humidity and, wind speed are the important components that determines the climate. While the weather conditions at any place can change suddenly, the changes in climate are slow and are much less noticeable in short time periods.

Annex point: talk about how there have been specific hot and cold periods throughout our planet's history. But these changes came about in an extremely slow manner and the life forms at those times adapted to the climate of those times.

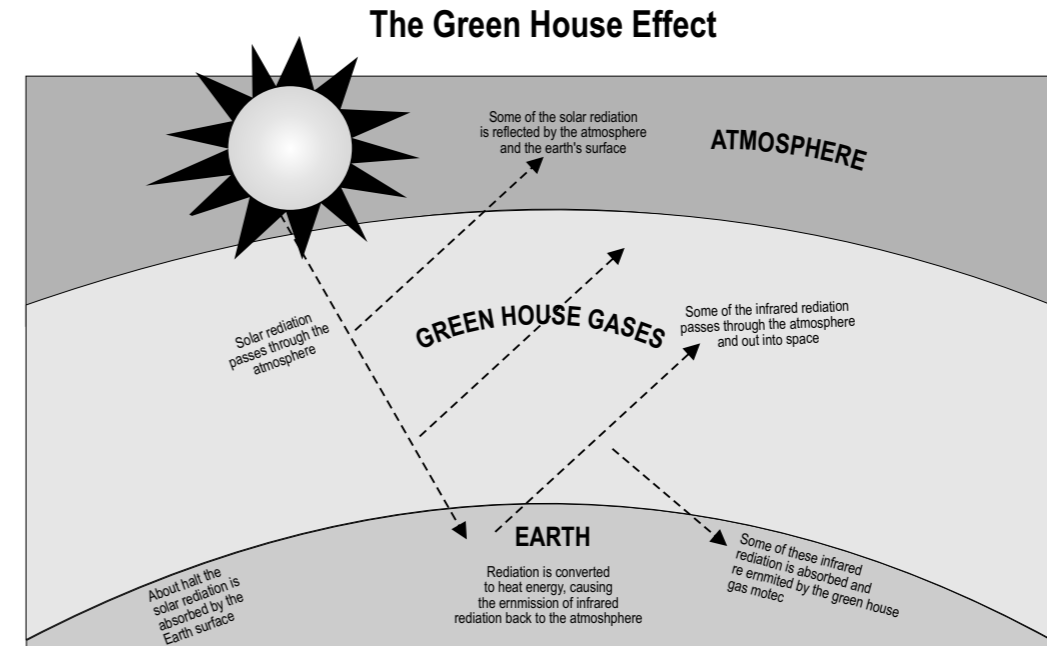
The climate change happening earlier occurred due to natural causes were very slow and that enabled life forms to adapt to those changes. However, the pace at which climate is changing has increased in the last century. It has now been conclusively proven that this increased pace of climate change is much due to the human factor rather than natural factors. Large scale use of fossil fuels like coal and petroleum for industries, energy generation and vehicles generates huge amounts of gases which are known as Green-house Gases or GHGs. Secondly large scale clearing of natural sinks (for CO₂) like forests for the massive population increase (housing and agricultural requirements) also added to the accumulation of GHGs in the atmosphere. It is estimated that the energy sector alone is responsible for about 3/4th of the carbon-dioxide which is the most important GHG in the atmosphere.

The atmosphere surrounding the earth is made up of gases that include greenhouse-gases (GHGs) (**Annexure 2**). These gases are called green-house gases as they help to maintain the earth's temperature to what it is today. In the absence of these gases, the earth would be much cooler. We can say that these GHGs are nature's way of climate control.

Annex point: It is likely that the some farmers may have heard or knows about the green house for growing vegetables and nursery under unfavorable weather conditions. If yes, then encourage them to share this knowledge with others and supplement with your own knowledge.

These gases have been in the earth's atmosphere since the beginning. They were kept in balance because their creation and consumption was controlled by natural ecosystems. However, in the last century, human activities has started to produce and release more GHGs into the atmosphere, that create an imbalance and the envelope/blanket of GHGs is becoming thicker and thicker. This leads to more heat getting trapped and the earth is getting warmer and warmer. This is called global warming.

Fig 3 | The Green House Effect



SESSION 2 | Understanding Climate in Rural Areas

The rural eco-system is closely linked and dependent on the natural systems hence is subject to facing more uncertainties. In most rural areas, agriculture is one of the most prominent means of livelihood which also determines the ecological, social, economical development of the rural areas. Though governance and development policies also impact the rural life, but at core, it is the agricultural and allied sectors which form an important component of rural resilience. For example, areas which are more flood prone are more backward than where there are no floods despite having similar development policies and plans.

The changes in climate in the last 3 to 4 decades have been more prominent and both urban and rural communities have begun to experience the impacts of climate change in their daily lives and livelihoods. While in urban areas people are much more acquainted with the changes in climate as the access to weather related information is easily available and frequent discussions in media on the issue of climate change, the rural communities better observe the changes in climate because the rural systems are closer to the natural ecosystems which is highly sensitive to climate change.

It is important to capture the experience and observations of the rural communities regarding the observed changes in climate of their area, for resilience planning. There

are three climatic variables which are important to understand for the rural resilience planning. These are temperature, precipitation or rainfall and extreme climatic events.

■ **Temperature**

There are various trends of temperature which may affect the resilience of rural system. Variation in temperature or temperature regime may affect the growth of crops, flowering time, the soil quality, and irrigation demands. The changes in temperature may also cause negative impacts on human health. Based on the available climatic scenarios and local experience, for example, the temperature trend may be observed as :

- ◆ Prolonged summer season
- ◆ Increase in day time temperature and cooler nights
- ◆ Shift in the summer season
- ◆ Heat waves in winters or short intense periods of winter

■ **Precipitation**

Precipitation or rainfall is responsible for the crop productivity, soil fertility, economic pressures on rural communities, livestock, etc. For instance the trends of precipitation may be observed as under :

- ◆ More rainfall in less duration
- ◆ Overall decrease in rainfall
- ◆ Dry Spells or fluctuating and irregular rainfall patterns
- ◆ Having floods and droughts like situation in same season
- ◆ Shift in monsoon season

■ **Extreme Climatic Events**

Apart from the fluctuation in temperature and precipitation there are some extreme climate events which could cause severe impact on rural livelihood, health, education, infrastructure, and disturb the routine life. For instance it could be observed in the form of :

- ◆ Floods
- ◆ Droughts
- ◆ Hail Storms
- ◆ Wind Storms
- ◆ Heat waves
- ◆ Frost

SESSION 3 | Identifying Climate Trends in the Village

For identifying the climate change trends there is a need to understand the changes in climate as observed by the local communities. It is possible that the communities may not be able to explain or tell about the changes in temperature from last year to the current year but they would definitely be able to explain the overall shift and/or trends in weather conditions or if they are observing any trends in changing climatic conditions. It will help to get the area specific information and the response capacity of the local communities and further the information could be used to develop the resilience plan.

This can be accomplished in small group exercises. Make small groups of 3 or 4 persons in each group and ask them to discuss amongst themselves the types of changes observed in the three climate variables discussed earlier.

Group Exercise 1

Discuss and note what are the observed changes in the climate over a longer period of time in the 3 climate variables (let each group come up with the changes observed and the time period that they have observed this change this would provide the group with a range observed changes over a range of time period).

| Table 4 | **Climate Variable & Change Observed**

Climate Variables	Change Observed
Temperature	
Rainfall	
Extreme Climate Events	

The answer of this exercise should be not in the form of Yes or No. The facilitator would need to help the participants to think over in what way they are feeling the change. Each group would then present their discussion to the larger gathering and the facilitator should note down in the flip chart. This can be repeated for each small group and any new information can be added to the specific boxes.

***Annex point:** Discuss about any recent climatic extreme event in the village and its impacts on the lives and livelihoods and how people coped during and after the event. Are there any prolonged or lingering impacts? Please note the observations on a flip chart paper as this could be one of the starting points for vulnerability assessments in later session.*

Group exercise 2

The second exercise to be done by the same small groups would be to elaborate on what the types of felt or observed impacts by the community for each of the changes.

In other words, the community needs to provide evidence to validate their earlier observation on climate changes.

This can again be noted by each small group (after discussion amongst themselves) in small cut sheets provided. The facilitator should make a large tabular format on the flip chart (on which later she can also note the points given by groups). This table can be used by the small groups for discussion format as a sample :

| Table 5 | **Format sector wise impact of Climate Change**

Sectors	Impacts/ change Observed
Agriculture	
Trees/ Forests	
Animals	
General Public	
Women	
Small Scale Enterprises	

Once again each of the small groups should present their discussions points to the larger group. Here it is possible (and desirable also) that the other groups would want to intervene or interject with modifications and amendments to the observations. The facilitator should guide this discussions so that a consensus is arrived at, that could be noted on the tabular format prepared on the flip chart. (**Annexure 3**)

Step 5 : Climate Impact & Vulnerability Assessment (Module 2)

MODULE DESCRIPTION

In previous module we have tried to build a basic understanding regarding climate change and what that means at the village level. We have also tried to list some of the evidences in and around our lives in the village that suggest that climate change does have impacts at local level. However, changes in the climate may not necessarily have equal or proportionate effect over each component of village life. These impacts will be differential depending upon the vulnerabilities of the individual component and influences/linkages of other factors. In this module the participants will learn to carry out impact assessment of the changing climatic conditions on different sectors or areas in the village. This will provide the basis for a comprehensive resilience planning for the village as a whole and for its specific constituents like households, and other systems.

This module will help the participants to:

- ◆ Understand the direct and indirect impacts of climate change in the village.
- ◆ Identify the existing vulnerabilities of the village in relation to climate change.

- ◆ Identify who /what are the most vulnerable groups, areas, sectors and systems (ecological, social, economic, and physical) and how they may be affected.
- ◆ Identify the range of factors that individually or together make them vulnerable, including both direct (e.g. exposure to hazards) and indirect (eg. increase in stresses like migration) factors
- ◆ Assess or identify the factors which enhance the vulnerabilities and the factors that are or could add to the capacities to face the climate change impacts.

Basic Concepts, Principles, Application

Vulnerability : The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as: “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes” and frames vulnerability as “a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity” (IPCC, 2007).

The above definition identifies the exposure to climate induced hazards by humans or systems as the key variable that would make them vulnerable. Though this is largely true in rural areas, in several instances climate induced stresses are not always direct and can be a consequence of distant changes that are translated to rural areas through interlinked systems and dependency on remote ecosystems or wider infrastructure networks (such as irrigation canals or electrical grid).As noted by the IPCC, we also need to study the role of sensitivity or fragility of the household or system, their capacities and other institutional factors while assessing vulnerability. Vulnerability to climate change occurs when fragile systems and/or marginalized or low capacity households are exposed to climate change and their ability to shift strategies is limited by institutions that fail to react timely and adequately.

The climate impact and vulnerability assessment provides basis for a better understanding of how different individuals, communities & systems may be affected by climate impacts (both directly and indirectly), what their existing capacities are (or that can be built) that can enhance their ability to adapt and be more resilient to climate change. Vulnerability assessment helps us understand *who or what* is vulnerable to *What and Why*. The vulnerability assessment is intended to support resilience planning, helping to ensure that the planned approaches and interventions are targeted to those that are most vulnerable.

Who or What refers to the households or systems in a village that are exposed to hazardse.g. poor and landless households, households in low lying areas, health system in the village, irrigation systems, etc. Understanding vulnerability '*to what*' does not only direct or extreme events that get noticed, but also the slow and

incremental changes that take place over years if not decades. Similarly, *why* a household or a system is vulnerable also needs to be investigated deeply. For example a household may be vulnerable to floods but the reason could be that the river has changed its course over time thus making it vulnerable while originally it was not! The *capacity* of a household or a system can be explained in terms of its qualities which enables the system to prepare for, respond and recover from, and adapt to the changing climatic conditions. Needless to say that capacity of a system or household is in verse to its vulnerability.

A sample of direct and indirect climate change impacts in a rural area is given in the table below:

| Table 6 | Direct and Indirect Impacts of Climate Change

Direct Impacts of Climate Change	Indirect Impacts of Climate Change
<ul style="list-style-type: none"> - Loss in Crop Production - Shift in Cropping Season - Changes in Cropping pattern - Soil Erosion - Change in bio diversity - Change in Ecosystems - Increased dry spells 	<ul style="list-style-type: none"> - Reduced Food Security - Increased Migration - Increase in Number of Rural Poor - Increased Poverty - Livelihood Crisis - Increased Food Prices

Exercise 1 : Developing a Village map

The first step towards identifying current and future vulnerabilities in any community is to prepare a social-cum-natural resource map of the village. Maps are useful as they provide a visual representation of where all the people/households, infrastructure, and resources in a village are located. *In case possible, the facilitator should try and organize a Satellite map (google earth images) of the concerned village and its surroundings, as this would provide an actual snapshot of the location to the villagers.*

Maps can also be used at a later stage to pictorially depict the interventions measures for climate change adaptation. Since the purpose of the map is to obtain information on the location of various natural and physical resources in the village. The map should depict at least the following :

- ♦ Key buildings (such as temples, school, hospital, *panchayat* building etc.), roads, main localities and households
- ♦ Approximate distances from a central point to 4-5 points on the outskirts of the village
- ♦ General location of agricultural lands
- ♦ Location of natural resources such as reserved forests, farm forests, social forestry, other vegetation, River and water bodies

- ♦ Location of amenities in the village like hand pumps, wells/tube-wells, etc.

A sample map is given here for your reference. This map should be drawn on a large sheet (the general practice is to first draw the map on a smaller or draft sheet and then transferred to a larger size chart paper). The map should be preserved carefully as it would be used later during the resilience planning as well.

| Photo 1 | Social Mapping Exercise



Exercise 2 : Problem Ranking

Before understanding the community's vulnerability to climate change factors, we need to identify the current risks or problems that they are facing. This would give us an idea of the areas that we definitely need to consider for climate impacts and whether these get aggravated. For this we need to carry out small group exercise and come to a consensus by ranking exercise.

Group exercise: Form small groups of 3-4 persons each and ask them to identify current problems that the villagers face as a community. These could be as diverse as water for irrigation to lack of health facilities in the village. Ask the groups to write one problem area in one card and they need to be as specific as possible. When all the groups have finished this exercise, the facilitator should collect the cards and sort them as per the sector or issue. This would also mean weeding out repetitions.

Once sorted, the facilitator can then list them on a flip chart and make a table as given photo 2:

| Photo 2 | Problem Ranking Matrix

समस्या/संकेत	संख्या	संक्रमण/वैयर्थ्य	उत्पत्ति	कठिनाई/प्रकार	समाधान	अवधि/समय
सिंचनी	5	5	5	4	2	5
संचालनी	7	4	0	0	1	0
कृषि मजदूरी	5	2	0	0	0	0
वाटर मजदूरी	0	3	0	0	0	0
पिताला दुकान	2	2	0	0	3	0
समुदाय/संस्था	7	5	1	2	2	0
सुखी-मैकी	0	0	0	0	0	0
उपला-व्यवस्था	0	2	1	0	3	0
डाइवरी	0	3	1	0	0	0
ग्राम	30	26	8	6	11	5

संकेतक: सर्वाधिक उत्तर-10, न्यूनतम उत्तर-1, अक्षर विरहित-0.

Once done, the next columns should be completed in consultation with the core group members. This table would provide a clear picture of the current problems and the next step would be to see what areas or issues are likely to be impacted by changes in climate. Since in rural areas, almost all walks of life and livelihood are connected (either directly or indirectly) with natural ecosystems, it is likely that almost all areas would classify as being impacted by changing climate. Still it is a

Table 7 | Format of Problem Ranking Matrix

Problem Area/ issue (for example)	Village fully or partly affected	Ranking
Irrigation		
Drinking Water		
Health Facility		
.....		
.....		
.....		

good practice to have this discussion with the group members so that all are clear on the reasoning and linkages.

Exercise 3: Identification of village and communities vulnerabilities

In the previous step, we learnt about the current problems facing the village and its people. The working group members also now understand the climate change factors affecting the village and their manifestations. Based on these two we shall now try and identify households that are most vulnerable and also the 'systems' in the village that are vulnerable. This would form the part where we understand 'what or who' in the village is vulnerable and 'from what'. In the process we would also try and understand what makes these components vulnerable ('why').

As stated earlier, the vulnerabilities in a village could be divided on two levels, these are:

- ◆ Household Level Vulnerability: related to individual household which may or may not differ from the community vulnerability
- ◆ Community Level Vulnerability: this reflects the overall vulnerability of the area and impacts the community as a whole. This can also be identified as the 'systems' vulnerability

There are several factors which define the vulnerability of any area or individual and climate change is only one of the factors that may aggravate the vulnerabilities. Proper understanding of these factors and their combinations is important to understand the vulnerabilities and their context.

In the following table, some of the factors which may exacerbate the vulnerabilities and capacities of the households or the village community are listed. They have been segregated according to the five (5) sustainable livelihood capitals as defined by DFID. While some of these indicators can be quantified, the others are only qualitative indicators.

Table 8 | Factors exacerbating vulnerabilities and capacities related to climate change

	Exacerbating Vulnerabilities	Enhancing Capacities
Social	<ul style="list-style-type: none"> ◆ Poverty ◆ Castism ◆ Occupation of unsafe areas for settlement and agriculture purpose ◆ Gender inequity in decision making access to services ◆ Women headed households ◆ Illiteracy, lack of education ◆ Poor health & Migration ◆ Resistance to change ◆ Exposure to disease ◆ Feeling of helplessness 	<ul style="list-style-type: none"> ◆ Social relations, networks kinshipties ◆ Local leadership ◆ Community Institutions/ Groups, Strong Social Capital ◆ Knowledge about climate impacts and adaptation strategies ◆ Education and training on alternative livelihood options
Political/ Institutional	<ul style="list-style-type: none"> ◆ Access to market ◆ Non- transparent Governance, exclusion from governance and decision-making ◆ Lack of people's participation in development planning ◆ Corruption ◆ Poor access to updated/scientific information ◆ Poor access to agricultural institutions 	<ul style="list-style-type: none"> ◆ Inclusive and representative governance processes ◆ Early warning systems ◆ Disaster preparedness ◆ Participation in planning ◆ Effective linkage with development schemes- livelihood health, education ◆ Functional and upgraded extension system ◆ Easy access to agricultural institutions
Physical	<ul style="list-style-type: none"> ◆ Location of settlement in hazard prone location ◆ Exposure to physical hazards (Floods, droughts, etc) ◆ Infrastructure in risk (housing, roads, electricity) ◆ Unsafe critical facilities- PHC, CHC, Schools, Community Centre 	<ul style="list-style-type: none"> ◆ Resilient life line building and infrastructure that cope with and resist extreme events ◆ Diversified and improved energy systems to meet increasing demand ◆ Effective natural resource management
Environmental/ Natural	<ul style="list-style-type: none"> ◆ Soil quality ◆ Obstruction of drainage systems ◆ Availability of irrigation water ◆ Poor drainage facilities 	<ul style="list-style-type: none"> ◆ Effective management of drainage channels ◆ Capacities for sustainable agriculture ◆ Rainwater harvesting ◆ Water recycling
Economic/ Financial	<ul style="list-style-type: none"> ◆ Climate sensitive livelihood options ◆ Lack of access to credit ◆ Middleman in financial access ◆ Lack of agriculture insurance facilities ◆ Informal economics with limited social protection ◆ Indebtedness ◆ Relief/ welfare dependency 	<ul style="list-style-type: none"> ◆ Access to credit, insurance ◆ Diversified livelihoods, economics

Exercise 4: Group exercise for developing vulnerability indicators

The first step to decide upon household and community vulnerability is to decide upon indicators that would best describe their vulnerability. This needs a discussion amongst the group. For the discussion, we need to have the village map, and all the three tables developed (in earlier exercise) for ready reference. Facilitate the community to discuss amongst themselves as to which households they think are most vulnerable and why. For example, houses close to the river or in low lying areas of the village are more vulnerable. But if they have relatives in other villages which are not affected by flooding or if they have a pucca double storey house, then they are not as vulnerable as those who have a kuchha single storey house.

Record the observations and reasoning and facilitate development of indicators for vulnerability for the household or the community. For each type we need to develop separate set of indicators and for each indicator develop marks in consultation with the household/community.

For example, for individual households, a set of indicators could be: (**Annexure 4, Reference:** 'From Risk to Resilience' Working paper 2)

- ◆ Income Source
- ◆ Educational Attainment
- ◆ Assets
- ◆ Exposure to Risk
- ◆ Social Network
- ◆ Infrastructure
- ◆ Proportion of Dependents in household
- ◆ Membership of disadvantaged lower caste, religious or ethnic minority
- ◆ Sense of Empowerment

Similarly for community as a whole, the set of indicators could be:

- ◆ Income Source
- ◆ Educational Attainment
- ◆ Assets
- ◆ Exposure to Risk
- ◆ Social Network
- ◆ Infrastructure
- ◆ Proportion of Dependents in household
- ◆ Membership of disadvantaged lower caste, religious or ethnic minority
- ◆ Sense of Empowerment

The above should be discussed thoroughly in the group and a final listing of indicators should be developed that can be displayed on a chart paper.

The next activity is to have the group mark the indicators on to the households in the social map developed earlier. This will provide the quantitative data of vulnerability of the village. The households having maximum number of indicators assigned to

them will be the most vulnerable households and require special attention. In addition to identifying household vulnerabilities, we also need to identify major or key vulnerabilities of the village community as a whole and of the village systems and institutions as these would add on or exacerbate the vulnerabilities of the already vulnerable households. Count the signs which come under maximum number of household. These are the areas which require attention at the community level. One can prioritize the action on the basis of which area affect majority of the community.

After the discussions, the following table can be developed that gives details of the vulnerable sectors and their vulnerabilities and idea about the capacities that can be used for building resilience.

Table 9 | Vulnerable Sectors and their Vulnerabilities and Capacities

Vulnerable Group/ Sector	Current Vulnerabilities	Links to other systems	Capacities
Landless households			
Households near river bank/ low lying areas	<ul style="list-style-type: none"> ◆ Exposure to floods, inability to swim ◆ Loss of assets, shelter, risk of loss of life 	All	Social networks
Households having single source of income			
Women-headed households	<ul style="list-style-type: none"> ◆ Limited mobility/ access to roads ◆ Limited access to information, early warning ◆ Limited education ◆ Limited credit, reliance on high-interest money lenders 		<ul style="list-style-type: none"> ◆ Social networks and community orgs for social/ economic assistance, information sharing ◆ Interest in learning new opportunities
Sector : Drinking Water	<ul style="list-style-type: none"> ◆ Salinization of ground water resources ◆ Declining availability in dry season ◆ High reliance on ground water ◆ Large amounts of waste ◆ Problems with pollution 	<ul style="list-style-type: none"> ◆ Decreasing water supply will have impacts on health (longer distance to fetch water) ◆ Poor Health diseases 	<ul style="list-style-type: none"> ◆ Local NGOs promoting water management initiatives ◆ Healthy ecosystems help protect water quality
Sector : Agriculture	<ul style="list-style-type: none"> ◆ Loss of crops due to intermittent or less monsoon ◆ Delay in cropping leading to less production ◆ Less rain in catchment areas leads to less water for irrigation canals 		<ul style="list-style-type: none"> ◆ Agriculture extension systems provides better services ◆ Early warning systems give information on monsoon

Exercise 5: Conducting Sector studies

Once the core group members have identified and listed the current vulnerabilities of various households, group of households and systems in the village, we may need to carry out additional in-depth study to understand the specific vulnerabilities, what are the conditions that make them vulnerable and what kinds of capabilities (that can be developed), or the kind of action needs to be undertaken for reducing these current and future vulnerabilities.

For example, if the water sector is identified as a vulnerable sector in itself and which consequently also increases the vulnerabilities of the people/community and the agricultural system, we may need to carry out a detailed study to understand the complete water system in the village that may also have linkages to external systems. In this study we would first map out the water systems in the area that includes rivers, springs, wells, irrigation canals, and village water distribution systems. The functioning of these systems is studied for different seasons and climate scenarios. We further probe into the reasons why a system does or does not function in a particular scenario and answer questions like whether it is a physical or technical challenge, whether the majority of irrigation water is through canal systems on which the villagers may have little control, social/political issues of exclusion to a certain community or group of households, distance from the source that makes the access difficult, or institutional issues such as lack of maintenance. This provides a much clearer picture of current strengths and weaknesses of the water system. The next step in this study would be to consider the future climate scenarios and see how these systems would respond/ behave in future. For example we could consider a scenario that after 10 years, the rainfall is more erratic, the water table has gone down further and it is about 2°C warmer, then how would the irrigation systems or the drinking water systems would function. Similar probing queries and considering multiple future scenarios provide a better understanding and clarity on the functioning and challenges of water systems in the village to provide services like irrigation and drinking water.

Similarly, sector studies could be conducted for the vulnerable households or community groups where in we try and understand in greater detail, their current vulnerabilities and fragility and seek answers to how these can be made more resilient.

These sector studies can be conducted by external facilitators but always in conjunction with the local people.

The next part of the training modules should be taken up only after the group has completed such sector studies (if identified).

Step 6 : Resilience Planning (Module 3)

In the previous modules, we learned about the probable climate change impacts and the sectors, households that would be impacted based upon their vulnerability. The next step in the Rural Resilience Planning process is the identification of adaptation options for the vulnerable sectors/households identified so that they become resilient to climate change impacts.

Module Description

Planning for adaptation in rural areas to make them climate resilient is not as complex as doing the same for urban areas. Rural systems in general are much less complex and interlinked than the urban areas, and almost all walks of life are more directly in touch with the natural ecosystems. Hence the linkages between climate change and rural systems are more easily understood and analyzed. This module will help the village planning teams to identify adaptation options for the vulnerable sectors and households and organize the proposed activities/options using a predefined set of criteria. These criteria will help the participants to identify and organize potential adaptation actions, and to recognize any gaps in the actions already proposed.

After completion of the module the participants will be able to :

- Understand/develop future climate scenarios and their impact on rural people
- Identify adaptation options that would help systems and people resilient to climate change impacts
- Analysis of proposed adaptation measures according to the parameters and identify the strengths and gaps in the range of proposed village resilience actions.

Basic Concepts and Principles

Resilience in simple terms and in the context of climate change implies the ability of a system to withstand and maintain their core functions through the stresses and climate shocks and recover quickly. As we develop our understanding on resilience for the rural systems, it is to be noted that the resilience of any system also stems from and is connected to the resilience of other systems. For example, a resilient irrigation system may lead to a resilient agriculture system that impacts the resilience of households in rural areas. Other characteristics of resilient systems are that these should be dynamic, adjusting over time in response to new information and external pressures, including climate factors. In conclusion, a system would be considered resilient to climate change if it does not fail when faced with climate stresses and shocks that may affect each system directly, or through its linkages to other systems.

So if we were to define a resilient system, some of the characteristics that the systems should exhibit are listed below. In any resilient system, not all of these characteristics

may be present but all resilient systems in any rural/urban setting or as part of natural ecosystem exhibit most of these characteristics.

Redundancy : Redundancy is basically multiple ways to achieve that essential task required from a system. Thus a resilient system can function and achieve results through alternate pathways when one fails. In contrast, a 'single best solution' is not resilient because if this single option fails, the system is not able to deliver the required services. Back-up systems, or decentralized arrangements for service delivery in a linked network, are always preferable and are resilient.

Examples of Redundancy:

- ♦ Multiple livelihood options like agriculture combined with dairy or sheep. Even if the agriculture fails for some reason, the other will help sustain the household economy.
- ♦ Multiple facilities for irrigation like canal irrigation supported by tube wells.

Flexibility or Robustness : A resilient system is able to function under different conditions than for which it was primarily designed and deliver the required services. The systems which are designed only to handle unique and specific situation or conditions are not resilient and fail if there are any changes in the optimal functioning conditions. However, since almost any system will fail once it surpasses a certain threshold; another quality of resilient system is its capability to fail under stress in a safe and predictable way, rather than suddenly and catastrophically. Further, a resilient system would also recover to its prior condition quickly without having undergone any irreversible changes.

Example of flexibility

- ♦ Flood resilient agricultural practices (such as machan farming , early varieties seeds) .
- ♦ Livestock which could either provide milk and/or meat.
- ♦ Existence of community owned centers (VRC ASC , farmer union)

Reorganization and Responsiveness : Resilient systems are flexible in the way that they can respond to unexpected shocks or changes. This requires that a system uses variety of resources like information, skills, experience, etc. to mould itself according to the changed working conditions and continue delivering services as per the changed requirements.

Example of Responsiveness

- ♦ Community institution may work in multiple modes. Women Self-help groups usually provide small credit support, but they can be quickly used as well for new skill building groups to support households in case of droughts or floods when agriculture systems fail.
- ♦ In flood prone areas, increasing RCC roof and raising plinth of houses.

Capacity for Learning : Resilient systems learn from and build on experience, so that mistakes are not repeated and lessons from similar activities undertaken in other rural areas are integrated into current planning and implementation. Communication and sharing amongst various organizations and networks is key to develop this characteristic of resilient system.

Examples of capacity for learning :

- ♦ Dissemination of flood adaptation practices, through a network of NGOs and Govt. departments
- ♦ Dissemination of knowledge regarding failed variety of paddy in floods.
- ♦ Sharing of successful intervention of MNERGA to Government, Policy makers and rural planners.

Exercise 1 : Visioning Future Climate Scenario

Visioning exercise or a collective agreement upon the most probable future scenario is important to generate before we start planning for the adaptation options. For visioning exercise, the first step is to build consensus over the possible future climate scenarios. This would be followed by future development scenarios and how climate change will impact the already vulnerable sectors and households. For this we proceed as given below:

Deciding time periods

The group needs to define the time period over which they would like to build the possible scenarios. One of the quick ways is to generate three types of scenarios - short-term (up to 5 years), intermediate-term (up to 10 years) and long-term (up to 20 years).

Exploring future climate scenarios

Considering the historic aberration in climatic behavior and external knowledge on the possible changes in the future climate of the region, the group should be instigated to discuss and generates the possible climate scenarios over specific time periods. This can be put on a chart paper in a tabular format for instance, suggested below. The climate parameters that are better predicted are listed first like the temperature and subsequently the rainfall, floods, drought, etc. are listed later. A possible scenario, for example, is given below:

Note: For this exercise, it is important that the facilitator has access to the regional climate models and knowledge of the most probable climate projections

Table 10 | Format for Future Climate Scenarios

Climate Parameters	Current Scenario	Short-term (5 years)	Medium terms (10 years)	Long term (20 yrs and more)
Temperature		No. of days above 40°C increase	Increase of about 2-3 degree C	Increase of about 4 degree C
Summer months duration		Increased		
Winter months duration		Reduced	Highly reduced	Highly reduced
Rainfall		Increase/decrease in quantity	Increase/decrease in dry or wet spell	Erratic rainfall
Monsoon Months		Reduction in number of rainy days	Highly erratic	Highly erratic rainfall
Floods		Uncertain	More annual floods and higher inundation	More annual floods and higher inundation

One of the alternate methods is to divide the above table into two parts each for a particular season like Rabi and Kharif (or summer and winter). This will give more specific information and people will be able to relate to the climate change impacts in a better way.

Exercise 2: Listing impacts on communities, systems and Resilience options

The core group members should now discuss the possible impacts of each of these scenarios on the vulnerable community (households) and the sectors (such as agriculture or infrastructure). One of the ways to facilitate this process is to make separate tables for each of the climate scenarios like rainfall or temperature and list the possible impacts on the vulnerable people/households, and systems using the question 'what if'.

These discussions should also identify areas of inter-dependence or linkages between one system and the other. This gives a much clear idea of the kinds of problems or issues that need to be addressed to make a specific system or household resilient to climate change. A sample table (adapted from LAPA Tools, ISET Nepal, 2012) is given below:

Table 11 | Format for Resilience Actions and Criteria

Climate Parameters	Possible Scenario	Effects	Impacts on Agriculture	Impacts on local People
Rainfall	Low volume	<ul style="list-style-type: none"> ◆ Reduced soil moisture ◆ Long dry spells ◆ Low stream/ river flow 	Crop failure	<ul style="list-style-type: none"> ◆ Increased distress migration ◆ Increase input cost in agriculture ◆ Prevalent of food insecurity ◆ Dearth of fodder for cattle
	More rainfall in shorter period	<ul style="list-style-type: none"> ◆ Frequent dry spells ◆ Flash run-off ◆ Reduced infiltration ◆ Depletion of ground water ◆ Water logging in low lying area 	<ul style="list-style-type: none"> ◆ Crops under stress at risk of drying out and vulnerable to pests and disease ◆ Top soil erosion ◆ Soil salinity in water logged area 	<ul style="list-style-type: none"> ◆ Low crop production ◆ Increase input cost in agriculture ◆ Loss of life assets ◆ Damages of infrastructure
	High volume	<ul style="list-style-type: none"> ◆ Flooding, river scouring, land cutting, increased soil moisture 	<ul style="list-style-type: none"> ◆ Damages of standing crops ◆ Water logging in agricultural field ◆ Crops rotting and disease 	<ul style="list-style-type: none"> ◆ Flooding results in loss of land and other assets ◆ Loss of life ◆ Damaged infrastructure ◆ Impacts on health ◆ Food insecurity ◆ Distress migration

The issues identified above will also provide a list of areas where adaptation planning is needed at the community or village level. It may be noted that in the above table while we have provided four scenarios of future rainfall, this is not absolutely necessary. Based upon the earlier exercise on exploring future climate scenarios, the group should work with the most plausible scenarios for each climate variable.

Note: This exercise may take a little more time than the earlier exercises. So if time is short, an option is to conduct one example with the whole group and then divide the group into 3 smaller groups of at least 4 persons each. Each group should be allowed to choose on their own a combination of future climate scenario and the vulnerable group/system to list out the possible impacts.

Identifying Resilience Options

The discussion above would result in a comprehensive list of impacts on various households/ community groups or village systems on these would then result in the

kinds of resilience options or adaptation activities to be undertaken at the village/ community/household level for resilience building. The facilitator needs to be aware of the knowledge and capacities of the core group members. Though in several cases, the core group members may be able to identify the resilience building options, in some cases, external knowledge and experience from other areas could also be incorporated. The facilitator should initiate discussions of such kinds and bring in the external knowledge.

Note: it may be possible that a successful resilience option may include multiple actions that complement each other.

Exercise 3: Developing a Resilience Matrix

This listing of adaptation actions so generated can now be tabulated and checked if they contribute to building resilience by discussing how each one meets the four characteristics that define a resilient system. The idea behind developing such a matrix is that if the group feels that any of the actions chosen are either missing or weak in one or more of the criteria, then what can be done to improve or complementary action that can be initiated that would meet the criteria. A sample table format is given below to help facilitate the discussions. For each of the actions identified, a short description is to be provided to show how it meets the said characteristic. This needs to be based upon discussions amongst multiple stakeholders to develop shared understanding of planned actions.

A sample format, as an Example is as follows:

| Table 12 | **Format for Resilience Actions and Criteria**

Proposed Actions	Redundancy	Flexibility/ Robustness	Reorganization/ Responsiveness	Capacity for Learning
Climate Resilient Agriculture (CRA)	CRA is not focused on any single option it includes livestock, agriculture, horticulture, etc. with diversity of species and variety hence there is no possibility of failure of all the options. Hence, it is a redundant option.	CRA is follows various theories like time management, space management, diversity of species, diversity of crops, diversity of livestock Being a complex system it is flexible and robust.	There is a space of taking catch crops when the main crop destroyed completely. This helps to remove the rigidity in the system and help to reorganize.	It is learning system as it builds on new experience and not only based on the existing knowledge.
Water harvesting structures like check Dams				

Exercise 4: Resource Mapping/Stakeholder Analysis

One of the important steps in developing a long list of adaptation options that would enhance resilience of vulnerable populations or systems in a village is identification of the resources and/or stakeholders that would be available and needed for any resilience building action. This discussion also involves identification of resources and manpower that would be needed for actual implementation of the selected activities.

Note: Use of local capacities in any adaptation action will keep the implementation costs down and may act as a deciding factor in prioritizing the action plan.

| Photo 3 | **Resource Mapping Exercise**



It helps the group identify the technical capabilities of various organizations and people both within and outside the village that would be needed for implementation of the activities. Similarly, some of the Government programmes like MNREGA, IAY, Agriculture Extension schemes, etc. may be identified that could be tapped for resources concerning specific actions that align with these programmes.

The following table is provided as an Example to facilitate the discussions:

| Table 13 | **Format for identifying technical capacities of different organization/ departments**

Organization / Departments	Skill set/ Capacities	Links to other systems	Capacities
Panchayat			MNREGA
Block Development Office			MNREGA
District/Tehsil Office	Relief work, construction work		Indira Awas Yojana
District Disaster Management Authority	Preparedness, Rescue, Rehabilitation		Disaster Preparedness Programme
Agriculture Department/ Extension	Improved quality of seeds, pesticides provided	Loans for seeds/ fertilizers	
Local NGOs	Provided Training, Technical knowhow		

Step 7 : Feasibility Assessment (Module 4)

Module Description

In the previous module, we first looked at how the currently vulnerable populations and sectors would be impacted based upon the future climate scenarios. Based upon the impacts, we identified several 'action' items that would improve their resilience to the probable climate shocks. In this module, each of those adaptation options would be 'tested' against certain criteria to assess their feasibility for implementation. The major criteria against which the implement-ability is assessed are the technical feasibility, available resources (both human and financial), and their cost to benefit ratio.

After completing this module the participant should be able to:

- 1) Analyze the practical feasibility of the identified resilient options.
- 2) Analyze the options with different parameters and angles of development.
- 3) Include these parameters while developing resilience plan.

Basic Concepts, Principles and Application

Feasibility assessment for any project is necessary to answer the specific question on whether a project 'can be done'. During planning, we could plan for an intervention that may seem to be a strong resilience building option but without detailed discussions and participation from all groups of the village, some actions may exclude a group or segment of people.

Before we undertake the Feasibility exercise, we should carry out a Cost Benefit Analysis (CBA). Though we could have conducted the Cost Benefit Analysis in the earlier module as well, this has been included in this module as CBA is also somewhat related to determining the feasibility of the interventions. Although CBA actually clarifies another aspect of the feasibility namely, whether a project 'should be done or not'. This would be more conspicuous with the detailed economic and financial CBA analyses. In this instance however, we are conducting CBA to clarify two important aspects.

- ◆ To determine the better option if there are two competing adaptation options to overcome the same impact.
- ◆ Prioritizing actions if the resources are limited and we have to decide which activity to undertake first.

Instead of a detailed financial cost-benefit analysis, a participatory and qualitative cost-benefit analysis can be done to meet with both the above objectives. This method of conducting the cost-benefit analysis enables the participation of vulnerable groups during stakeholder consultations and group discussions, especially when most village people are not comfortable with numbers and calculations for large projects.

Exercise 1: Community based qualitative Cost Benefit analysis (CBA)

Given below are the steps to conduct a qualitative CBA :

Step 1: Create a table in a large chart-paper so that all members of the group can easily see it. The table should look as given below.

| Table 14 | Format of CBA

Proposed Adaptation Action	Cost					Benefits					Benefit Cost Ratio
	Economic	Social	Environmental	Others	Total Costs	Economic	Social	Environmental	Others	Total Benefits	

Step 2: Fill in the various boxes for each of the cost elements such as economic, social and environmental. As given in the table above discusses within the group and fills in the costs for each intervention. These need to be descriptive rather than specific numbers. The idea is that we need a description of the cost elements such that the people are able to compare the elements across various intervention options.

Step 3: In the same fashion, identify the benefits derived from the interventions. Since we are proposing these interventions to avert shocks and damages averted, these should be recorded as benefits, including the social and environmental benefits.

Step 4: Once all costs and benefits for each of the adaptation options have been filled, the group needs to then rank them for each of the costs or benefits. This should be carefully facilitated and the facilitator should keep asking questions and prodding for more discussions. The ranking could be in a scale of 1 to 5 where 1 is low cost or benefit and 5 is highest cost or benefit. These

numbers should be noted in the small squares given in each of the cells of costs and benefits. The process is to discuss all the interventions against a single variable like economic costs and the numbers/ranking noted, before moving on to discuss the next variable like Social Costs.

Step 5 : The next step is to add up the costs for each intervention and note in the total costs cell. Similarly, the benefits for that intervention may be added and noted in the Total Benefits Cell. These two numbers can be now compared to derive the cost versus benefits for that intervention. To get a single number or ratio, the Total Benefits by the Total Costs. This ratio can be noted in the Benefit Cost Ratio cell.

The CBA exercise is complete and now we have specific numbers for each intervention that tells us which intervention is more beneficial. The higher the ratio, the better will be the intervention.

Exercise 2 : Overall Feasibility Analysis and prioritizing Resilient Action Plan

The criteria for conducting a feasibility analysis are discussed below. These need to be discussed within the community before making the final decision on implementation priorities. The community has the best experience to resolve these issues and only needs good facilitation for focused discussions.

Technical feasibility : If the intervention entails technical knowhow for implementation, then we need to discuss what the technology is and/or technique is needed and whether it is available locally within the village or has to be sourced externally. The Stakeholder Mapping exercise conducted in the earlier module would be useful for this discussion and needs to be displayed prominently during this discussion. Another question to be answered is that whether this technology is new and if this has been already used / tested in similar conditions elsewhere or in a nearby village.

Human capacity/local knowledge: Similarly for 'soft' interventions that need human capital, we need to assess whether we have this capital within the village or have to be dependent on external resources. For example, capacity building of households for alternate vocations may be an interventions but the training is to be provided by an agency which is situated in the State Capital. Even for 'hard' technology oriented interventions, we need to assess whether the village has adequate knowledge and capacity to support the implementation and later on undertake operation and maintenance. If not, then this gap needs to be addressed.

Financial feasibility : For most of the interventions, financial resources are crucial for its sustainability. It may be large or small. The village group needs to

assess how much and from where are these resources to be arranged. At this stage a simple financial assessment to prioritize and/or select the options is adequate. In some cases, we may identify programmes like Indira Awas Yojana (IAY) and integrated development programme that would provide financial resources for low cost housing that can be utilized to make flood resistant houses. However, once the implementation options have been finalized, the group and the village need to conduct a fairly detailed financial analysis for each of the selected interventions.

Cost Benefit Analysis : Cost-benefit analysis is one of the basic tools used to measure the costs of intervention against the benefits they provide in monetary terms to compare the competing investment strategies. Though this criterion is used in most public or private sector investment decision making, in most of the cases, the CBA exercise is relegated merely to the hard economic and financial calculations. In activities such as resilience building, the social and environmental factors also need to be factored in and this makes the social CBA somewhat more challenging. As discussed earlier, the qualitative CBA exercise has been conducted mainly for prioritization and selection purposes.

Inclusiveness : Another important criterion in the resilience building process is the impact of interventions on the marginalized groups including women. Since the impacts of climate change is different for different groups of people (mainly due to their capacities to respond), we need to actively think about identifying and including their concerns into the implementation plans and activities. For each potential resilience building action, the group needs to check the ideas with the above mention criteria. This will provide clarity over choosing the best actions among various actions and developing resilience plan.

Requirements for Feasibility Analysis Exercise : To conduct this exercise, we would need the following documents already developed in the last module.

1. Problem identification matrix (Impact on Community)
2. Resilience Plan Matrix complete list of the adaptation options
3. Stakeholder mapping or analysis
4. CBA analysis chart

Step 1 : Prepare a chart similar to the one developed for CBA analysis with all the adaptation options noted in the left hand column of the table. The other columns need to be titled as per the Feasibility Analysis criteria namely, technical feasibility, human resource availability, financial resource availability, Cost benefit ratio, and gender inclusion.

Step 2 : The group then needs to discuss the practical issues of implementation from the technical feasibility point of view and rank the interventions. Similar discussions and exercise needs to be carried out for all the criteria.

Step 3 : The sum of all rankings across the row would give the final ranking of the intervention and can be used to prioritize the intervention actions. One example has been illustrated through below mentioned table.

Please rank each option for the various criteria from 1-5, where 5 is very good or high.

Table 15 | **Format for feasibility matrix of resilient actions**

Resilience Options	Technical feasibility	Human Resouce/ Capacity	Financial feasibility	Cost benefit ratio	Gender and marginal group inclusion	Final Ranking
Check Dam	5	3	3	3	3	17
Climate Resilient Agriculture	5	4	3	2	2	16
Rain water harvesting	4	2	2	3	4	15

Step 4 : These findings need to be presented to the larger group of villagers for their comments and discussions. Here we need to make sure that the marginalized groups and women are present and they voice their concerns. This is to ensure that the resilience action plan developed by the core group members gets accepted by the village members and the implementation is easier.

Table 16 | **Format for feasibility matrix of resilient actions**

A sample Format for developing Resilience Action Plan

Resilience action	
Rationale	
Problem Description	
Aim & Specific Objective	
Outcome : Who will benefit and how	
What is Methodology for doing it - How would it be done (what is the process?) - Who would do it (individuals, institutions)	
Stakeholders	
How it is helping in building Rural Resilience?	
How it is addressing the most vulnerable population of the village?	

An advantage of carrying out this exercise and discussions with the core group members for ranking exercise is the realization on various facets of the specific activity. The facilitator and the group would be able to identify the challenges and recognize and identify specific areas for further studies, additional resources or expertise, and/or new approaches.

Monitoring Evaluation and Corrective Actions

The final process in the resilience planning and implementation activity in the village should be of monitoring the implementation activity, evaluate the impacts and continuously review the outcomes with what was envisaged during the concept stage.

Once the proposal has been developed, the facilitating agency and the core group members can monitor the challenges or additional requirements that emerge during the planning and/or implementation phase, that need to be resolved. Thus monitoring and evaluation is a continuous activity once the project is selected for detailed planning and implementation.

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Annexure

Annexure : I

Tools of Participatory Learning Actions

Before going to field exercise in the villages, it is essential to have a brief discussion with all team members regarding the use of tools. Finally team members collectively decide the tools according to the need of project outcomes. Some common PLA tools are listed below:

- ◆ **Transect Walk** for better understanding of the location of village, the observing its landscape, land uses, becoming familiar with the community and their daily practices.
- ◆ **Social Mapping:** for knowing the existence of natural resources, service availability, institutions, inhabitation according to the castes etc.
- ◆ **Livelihood seasonal calendar:** To collect data on seasonality of food gap months and employment options available to the community.
- ◆ **Seasonal calendar** for knowing different kinds of hazards ((flood, drought, fire, changing rain pattern, dry spells, water logging etc.), its intensity, severity and community's ranking on it.
- ◆ **Service opportunity (chapatti, wealth ranking)** for knowing accessibility of different kinds of Govt schemes to the community, assets of the community in the village and its surrounding area and dependence of the community on it.
- ◆ **Vulnerability matrix** to indicate the type of hazards having serious impact on important livelihood resources and understanding which livelihood resources are most vulnerable
- ◆ **Causal Loop diagram (CLD)** for collecting information on causes of poverty, identification of issues for vulnerability reduction and planning strategy for actions.
- ◆ **Focus Group Discussion (FGD)** for understanding the community's perceptions about climatic changes, events, and phenomena indicated in the seasonal calendar, discussing the impact of these changes on their livelihoods and identifying their strategies to cope with and adapt to any perceived changes.

Annexure : II

Green House Gases

Carbon dioxide	:	CO ₂
Carbon monoxide	:	CO
Methane	:	CH ₄
Nitrous Oxide	:	N ₂ O
Tetra fluoromethene	:	CF ₄
Hexa fluoromethene	:	C ₂ F ₆
Sulfur Hexafluoride	:	SF ₆

Annexure : III

Example for the Climate Assessment, Village Budheli, Block Jungle Kaudia, District Gorakhpur

Group Exercise 1 : Identify if community is observing any change in the climate over a period of time?

Climate Parameter	Changes
Temperature	Overall summer increased; Temperature is increased from the past; much warmer days; Heat waves;
Rainfall	Overall rainfall reduced; Intensity increased; Dry spells; Shorter monsoon
Extreme Climate Events	Frequency and intensity of disaster has increased mostly due to manmade factors

Group Exercise 2: If yes, then elaborate on their experiences and observations and how they are feeling these changes.

The community observed and explains these changes in their own ways. Segment wise changes they have observed are as follows :

Sectors	Observation
Agriculture	Overall shift (delay) of one month in agriculture season; Irrigation demand increased; Variety of weeds increased; Variety of Pests increased; low production in wheat and lighter grains; Earlier sowing was done in Rohin Nakshtra; When deck was not there more production of Kakri & Kheera, vegetables; Now people only grow wheat and paddy; Shift from Leguminous crops and cash crops to cereal crops; Delayed sowing of paddy,
Trees	Late flowering; Reduced production of fruits;
Animals	Reduced production of fodder; Due to reduce quantity of Jalkumbhi, Behaya the quantity and diversity of fish is reduced
Human Being	Incidences of Diarrhea, Encephalitis, Malaria have increased

Group Exercise 3: If yes, then find out from how many years they are feeling these changes.

People of Budheli village observe the climate of the village is change in last about 30 years. There after the climate is fluctuating and it is difficult to identify any resemblance with the climate of previous years.

Annexure : IV

A Composite Vulnerabilities and Capacities Index for the household level in rural areas (RHH- VCI)

Types of Vulnerability and Indicators

S.No.	Types of Vulnerability and Indicators	Vul.	Cap.
1.	Material Vulnerability <u>Income Source</u> : If 100 per cent dependent on a local level productive asset, e.g. fishing, land, shop, etc upon local * Lower vulnerability score by 1 for every 10 percent of non local income reported * Subtract 2 if the income sources is stable and insensitive to local hazard * Add 2 to the score if the income sources is unstable, eg. day labour	35 10/12	
2.	<u>Educational Attainment</u> : If no member of the house hold literate * Lower vulnerability score by 1 for every 5 years of schooling of the most educated male member of the house hold * Lower the score by 2 for every female member's 5 years schooling	5	
3.	<u>Assets</u> : If non of the assets are immediately fungible, for eg. farm implements, household items * Lower the score by 1 for every Rs. 20,000 of fungible assets, e.g. tractor, animals, savings, jewellery (to be calibrated empirically).	8	
4.	<u>Exposure</u> : Distance from the source of prime hazard, e.g. river, coastline, landslide zone. If within the equivalent of 10 yrs. flood plain * Lower the score by 1 for the equivalent of every 10- yrs, flood plain residence and or assets. * Lower the score by 1 for every piece of evidence of hazard proofing , e.g. building of a house on higher plinth for floods, light construction, low cost construction which could be rebuilt with local resources.	10	
5.	Institutional Vulnerability <u>Social Networks</u> : Members of ethnic, caste, professional or religious organization or grouping. If none then * Lower vulnerability score by 2 for every instance of past assistance by a group/ organization in adversity. * Lower multiple times if multiple organizations. * Lower score by proportion of respondent reporting the organization to be efficacious.	50 10	
6.	<u>Extra local kinship ties</u> : If no extra local kinship or other ties, which could be source of shelter and assistance during adversity * Lower the score by 2 for every immediate family member living extra- locally. * Lower the score by 1 for every non-immediate family member living out side.	5	
7.	<u>Infrastructure</u> Lack of an all weather road If seasonal road then Lack of electricity Lack of clean drinking water Lack of robust telecommunications (Mobile coverage) Lack of local medical facility	4 -4 2 -2 2 -2 4 -4 4 -4	
8.	<u>Proportion of dependents in a household</u> If the proportion is greater than 50 percent * Lower the number by 1 for every additional earning member If a single parent headed household.	5 or 10	
9.	<u>Warning Systems</u> Lack of a warning system Warning system exists but people are not aware of it or don't trust it	4 or 4	-4 or -4
10.	<u>Membership of disadvantaged lower caste, religious or ethnic minority</u>	5	
11.	Attitudinal Vulnerability <u>Sense of Empowerment</u> : Self declared community leadership or Proximity to community leadership Proximity to regional leadership structure or Access to national leadership structure Lack of access to community or regional leadership Lack of knowledge about potential hazards (lower score by 1 for every type of hazard and its intensity accurately listed by respondents	15 10 5	-10 or -10 -15 or -15
	Total Possible Vulnerability Score	100	

