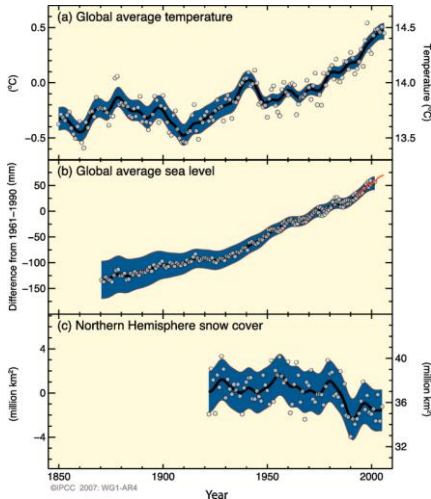


Contents

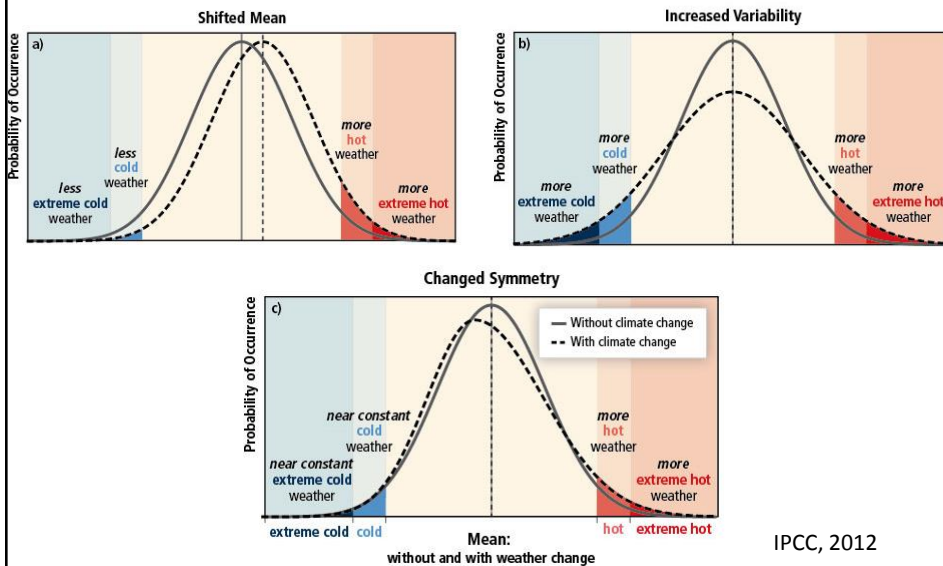
- What is vulnerability?
 - Why conduct vulnerability assessments?
 - Defining vulnerability
 - What determines vulnerabilities?
- VCAI tool
 - VCAI computation methodology
 - Organization of the tool

Why Vulnerability Assessments?



- “Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level” (IPCC 2007)

Change in Extremes



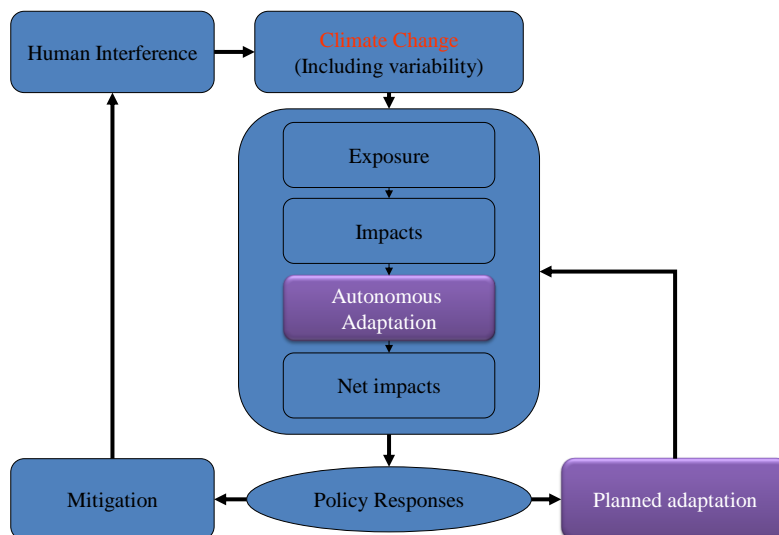
Current and Future Impacts

Phenomenon and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	<i>Very likely</i>	<i>Likely</i>	<i>Virtually certain</i>
Warmer and more frequent hot days and nights over most land areas	<i>Very likely</i>	<i>Likely (nights)</i>	<i>Virtually certain</i>
Warm spells/heat waves. Frequency increases over most land areas	<i>Likely</i>	<i>More likely than not</i>	<i>Very likely</i>
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	<i>Likely</i>	<i>More likely than not</i>	<i>Very likely</i>
Area affected by droughts increases	<i>Likely in many regions since 1970s</i>	<i>More likely than not</i>	<i>Likely</i>
Intense tropical cyclone activity increases	<i>Likely in some regions since 1970</i>	<i>More likely than not</i>	<i>Likely</i>
Increased incidence of extreme high sea level (excludes tsunamis)	<i>Likely</i>	<i>More likely than not</i>	<i>Likely</i>

5

(IPCC 2007)

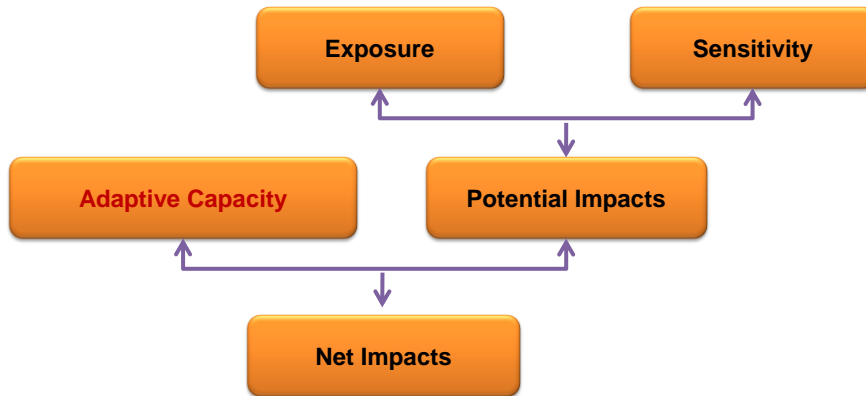
Climate Change Adaptation



6

(IPCC 2007)

What Determines Impacts?



7

Vulnerability

“The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.”

Source: IPCC

8

$$\mathbf{V} = \mathbf{f}(\mathbf{E}_{xt}, \mathbf{S}_{xt}, \mathbf{A}_{xt})$$

(Smit and Pilifosova, 2003)

- V= current vulnerability (damage a system will incur if it experiences climatic hazard in its present state)
- E= Exposure of system x at time t
- A = Adaptive capacity of system x at time t

Understanding Exposure

- Exposure is the intensity of hazard that is experienced by the elements within the path of the hazard
- Exposure is related to external pressures i.e. hazards
- All elements that are within the path of the hazard are equally exposed to the hazard
- Exposure is often not altered within most of the interventions

Understanding Sensitivity

- **Sensitivity** is the degree to which a system is affected by the hazard
- Sensitivity is determined by the condition of the elements within the path of the hazard
 - Social conditions
 - Economic conditions
 - Environmental conditions

What Conditions?

Social

- Inequality
- Gender
- Age
- Health
- Access to services
- Fairness
- Social exclusion
- Governance
- Policies
- Networks

Economic

- Poverty
- Livelihoods/occupation
- Markets
- Assets

Environmental

- Land
- Water
- Forests
- Biodiversity and ecosystem services

Understanding Capacity

- A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster.
- Capacity has indirect relationship with the vulnerability
- Eg. Skills, financial services, institutions, relief, response and rehabilitation plans.

VCA Methodologies: Tools

Frameworks and Tools	Vulnerability as function of S, E, & C	Exposure				Sensitivity				Capacity			
		Current climate trends	Climate-induced events	Climate projections	Community based and scientific data	Current hazard trends	Biophysical impacts	Livelihood impacts	Hazard prioritization	Coping strategies	Livelihood assets	Awareness/knowledge	Capacity to plan and effect change
A framework for social adaptation to climate change, IUCN	✓	✓	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Climate vulnerability and capacity analysis, Care	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	✓	✓
CVAAA, SPREP & CIDA	✓	✓	✓	✓	✓	✓					✓		
Vulnerability to resilience, Practical Action	✓	✓	✓	✓	0	✓	✓	✓	✓	✓	✓	✓	0
Participatory tools for assessing climate change impacts and exploring adaptation options, LFP & UKAID	Not clear	0	✓	0	✓	✓	✓	✓	✓	✓	0	0	0
Adaptation toolkit, Christian Aid	Not clear	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	✓	✓
CRISTAL, IISD			✓			✓		✓		✓	✓		
CEDRA, Tearfund		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
CBA, IIED	Broad	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Refer to the Table 3 on methodologies employed in Indian context in the VCAI documentation

CONCEPTS INVOLVED IN VULNERABILITY ASSESSMENTS

Impact vs Capacity
based decision
making

Or

Top down vs bottom
up

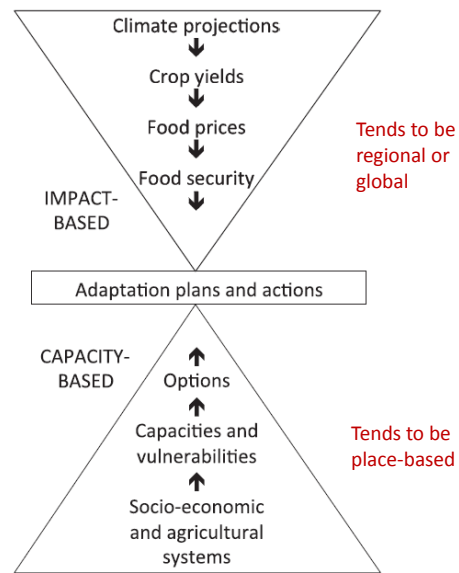
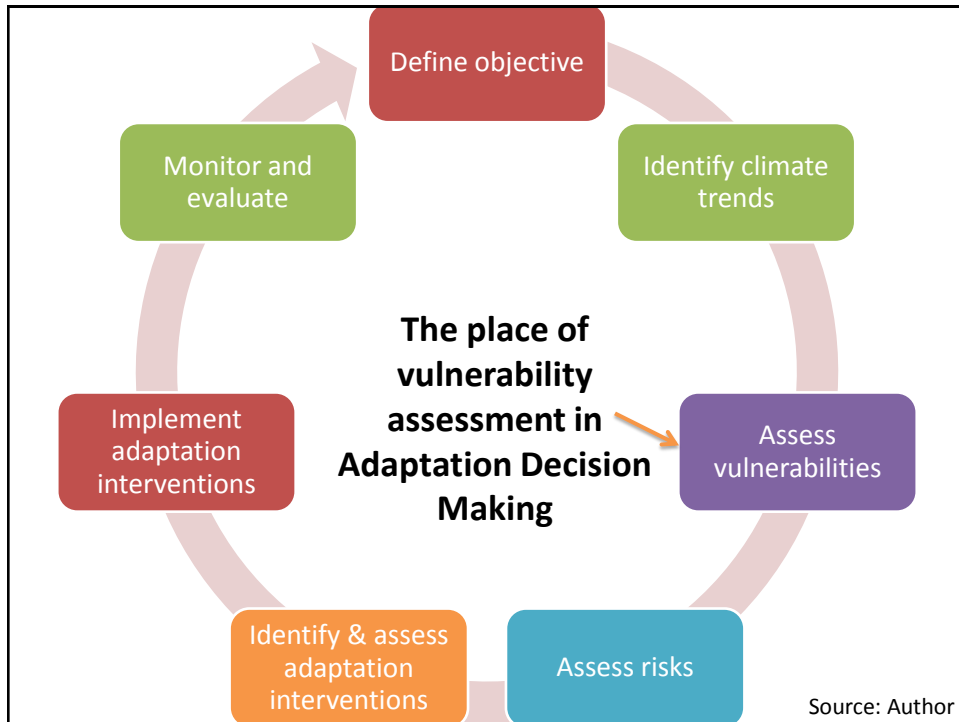


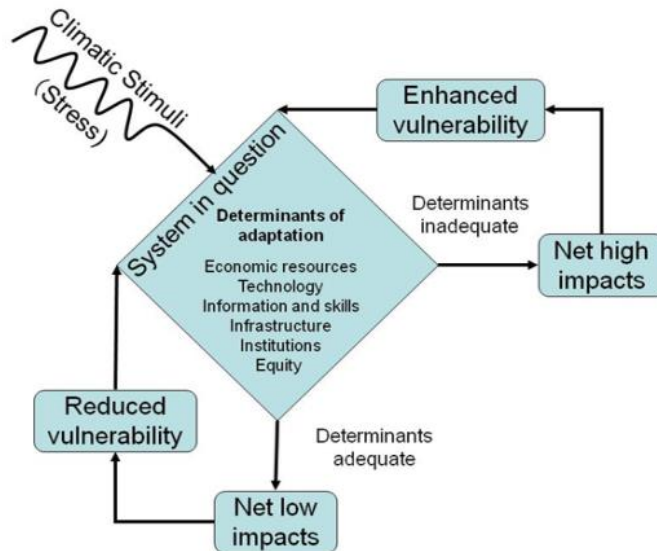
Fig. 1. Impact and capacity approaches to adaptation planning.



Salient Findings from the Review

- Largely follows the vulnerability as a function of exposure, sensitivity and capacity
- Largely qualitative approaches but qualitative listing of vulnerabilities are also common particularly in small scale projects
- Advocates for participatory approaches and often employs participatory rural appraisal methodologies for identifying vulnerabilities
- Employs indicators for quantifying the exposure, sensitivity and capacity factors
- The concept of critical thresholds have been proposed but not been employed due to lack of clear boundary line and means of identifying thresholds
- Some have converted indicators into an index for better comprehension (mostly quantitative)
- Often, indicator were obtained through stakeholder consultations

Critical Thresholds



Source: Prabhakar and Srinivasan, 2010

Developing Vulnerability Capacity Assessment Index (VCAI) for NABARD

Steps for Development of VCAI for NABARD

Consultation with NABARD on VCA requirements

Review of research and implementation literature for VCA methodologies

Consultations with communities, executing entities and NABARD

Development of methodological framework and set of VCA indicators

Review and finalization of methodology

VCAI Methodology: Expectations from Adaptation Fund

- Adaptation Fund (AF) defines a project as a set of activities that are aimed at reducing the climate change vulnerabilities and increase the capacity of communities
- The AF gives specific stress for projects to address the vulnerabilities of the specific groups such as women, children, marginalized groups, displaced, indigenous etc.
- Apart from these broad underpinnings, there are no specific guidelines from AF on how to develop VCA methodologies leaving the approach to individual implementing entities

Nature of Adaptation Projects by NABARD

- Mostly focus on natural resource management
- Address the vulnerabilities found typically in rural and semi-urban contexts
- Specific focus of projects has thus far has been on
 - Agriculture,
 - Agroforestry and mangroves,
 - Animal husbandry and fisheries
 - Other broad rural development approaches

How the Project Proposals Addressed the Vulnerabilities

- Largely qualitative discussion on vulnerabilities with focus on exposure related aspects than the sensitivities
- Not so clear identification of vulnerability assessment indicators, indices and methodologies
- Gaps in terms of lack of clear linkage between interventions identified and vulnerabilities discussed
- Vulnerability assessments were proposed to be conducted as a part of the project implementation
- Possible gap in the capacity of executing entities to conduct vulnerability assessments

VCAI Design Considerations

- **Simple:** The tool has to be simple keeping in view the capacity considerations of the stakeholders engaged in designing and implementing adaptation projects
- **Measurable:** The vulnerabilities have to be measured, desirably quantitatively, so as to provide a means of assessing the progress on the project time scale and beyond
- **Applicable to various scales:** The scope of projects may vary in scales, from local to sub-national level and hence the tool should be applicable at these levels
- **Comparable:** For the purpose of the NABARD as an executing agency, it is important that the vulnerability assessments from different projects be comparable. Hence, providing a basic minimum set of indicators that could be applicable in wide range of geographical and socio-economic conditions is essential for such comparisons at both generic and sectoral level.

Vulnerability and Capacity Assessment Index (VCAI)

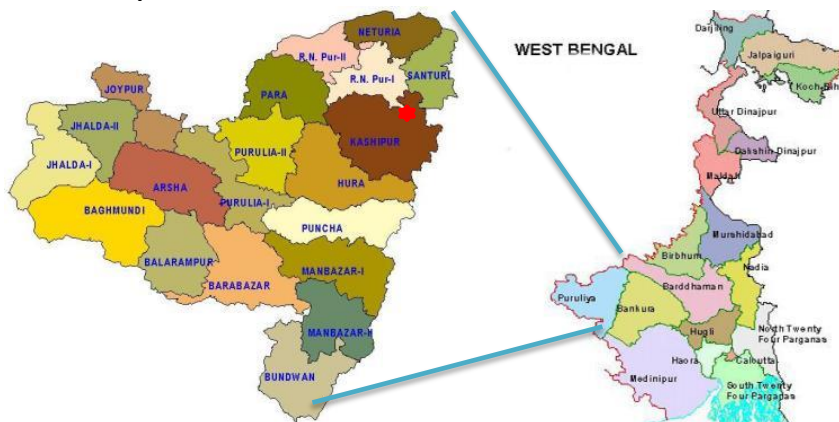
- **VCAI:** is a vulnerability and capacity assessment tool developed based on the general underlying concepts of vulnerability assessments discussed earlier.
- **The scope:** The scope of the Index is to measure the vulnerability at the project level. However, efforts have also been made to include some policy and institutional indicators to contextualize the project at the project location that is not in isolation with the larger policy and institutional enabling environment.
- **Interpretation of the output:** The index outputs a normalized maximum value of 1 and a minimum of 0 where 1 is maximum vulnerability and 0 is no vulnerability. The index outputs can be obtained for overall project location, sub-locations such as villages or a section of communities and sub-sector level such as food and agriculture, biodiversity and ecosystem services etc.

VCAI cont...

- It employs a quantitative methodology coupled with participatory consultative approaches for prioritizing vulnerability indicators and their weightages
- Adapts thresholds concept for normalizing the data, advocates a broad range of threshold values rather than a single value within which the value of indicators may fall in the real world.
- Provides ability to assess VCA at specific and aggregate geographical and sectoral levels
- Provides ability to compare projects in terms of their performance for M&E purposes as it accommodates a generic set of indicators that are common to all the sectors included in the tool
- The tool provides the opportunity to chose indicators from an exhaustive list of indicators drawn from stakeholder consultations and literature review.

Identification of VCA Indicators

- Case study in Purulia District of West Bengal in cooperation with DRCSC



Steps Involved in Indicator Identification

- **Step I: Discussion on demographic background**
- **Step II: Hazard identification and prioritization**
- **Step III: Identification of vulnerability indicators**
 - **Exposure**
 - What is the severity of past disasters
 - **Sensitivity**
 - What makes you to predispose to the hazards, what makes you impacted by them?
 - **Capacity**
 - What resources do you have?
 - What skills do you have?
 - What preparedness measures have you taken?

Computation of VCAI

Vulnerability and Capacity Assessment Index (VCAI) = (E+S)-C

Where

E is exposure value obtained by average of the exposure indicators

S is the sensitivity value obtained by average of sensitivity indicators

C is the capacity value obtained by average of capacity indicators

Indicators Framework

- The VCAI tool comprises of several exposure, sensitivity and capacity indicators categorized into generic and specific sectors.
- All indicator values are normalized before they are combined in the form of an index

Sector/Category	Current No of Indicators in VCAI
Generic	64 (38)
Food and Agriculture	21
Water	24 (21)
Land	15 (13)
Fisheries and Animal Husbandry	15 (13)
Biodiversity and Ecosystem Services	26

[Show the Excel Sheet](#)

Organization of the Tool

- The VCAI tool is organized into multiple sheets consisting of Intro, Places, Computations, & Output
- Places sheet
 - Allows users to input actual data on prioritized indicators
 - Prioritized indicators can be selected using the drop-down menu
 - Each category can accommodate a maximum of 6 indicators
 - Provides graphical and numerical output of VCAI by area, places and overall.

Organization of the Tool

- Computations sheet
 - The only user input required is for the thresholds (min and max within which a particular indicator falls)
 - Thresholds are fixed for the entire duration of the project at the beginning of the project
 - Thresholds can be saturated (i.e. 0 as min)
- Output sheet
 - Helps comparing the VCAI across locations and identify critical area for intervention
 - No user input is required
 - Both numerical and radar charts

Normalization of Indicator Values for VCAI

- The indicator values are to be normalized as indicators differ in units to bring them to a unit-less value
- The methodology used for normalization is linear normalization using thresholds within which values of an indicator falls in the real world

Normalized indicator value

Where

x_i is value of the index

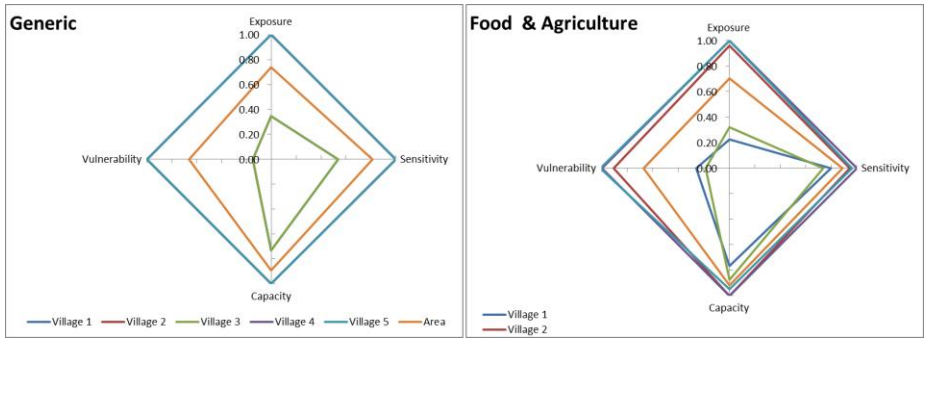
T_{\min} is minimum threshold value of index x_i

T_{\max} is maximum threshold value of index x_i

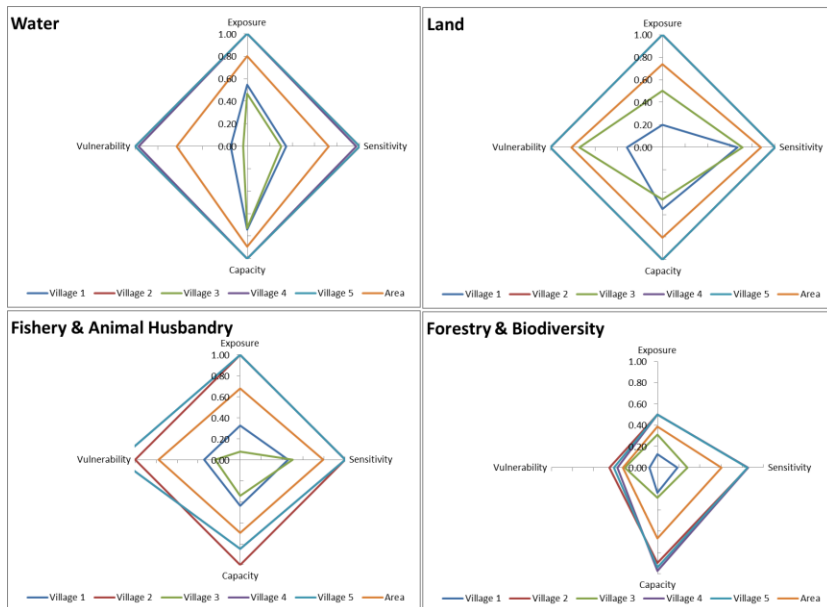
$$z_i = \frac{|x_i - T_{\min}(x)|}{T_{\max}(x) - T_{\min}(x)}$$

VCAI Output

- The tool provides a graphical output to help the user compare different geographic locations on sectoral and aggregate levels



VCAI Output



Go to the Excel sheet

Steps Involved in Implementing VA

- Conduct FGDs with communities, NGOs and other stakeholders in the project location
 - Discuss the objective of the project
 - Familiarize with the concepts of vulnerability and indicators
 - Discuss and prioritize sectors and indicators
 - Agree on the baseline with which the progress of project to be assessed
 - Obtain data for the indicators

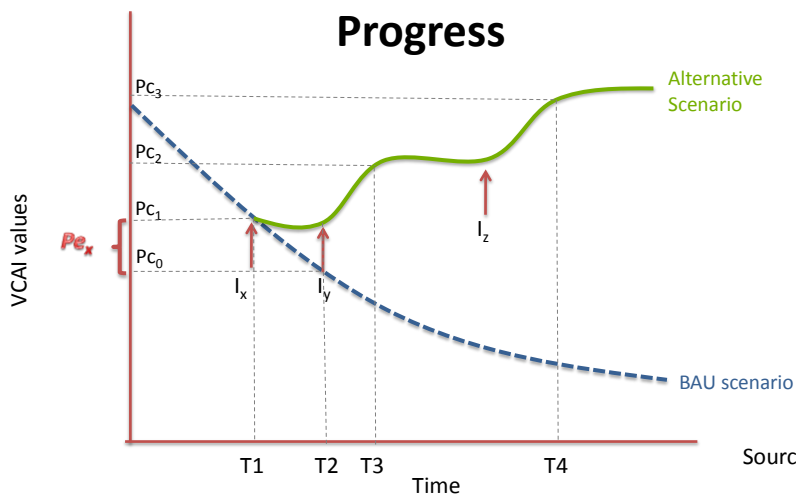
- Collection of data for indicators
 - Consult literature/published data for those indicators
 - Rely upon participatory rural appraisal sessions for remaining indicators and to validate the data from the secondary sources
- Input the data into the excel sheet
- Submit the excel data on regular intervals (annual) for monitoring and evaluation purposes

PRA Techniques that you can Choose

- Data can be collected by selecting among 21 PRA techniques described in the report

• Communication maps	• Problem/Preference ranking
• Cross impacts analysis	• Rain calendars
• Focus group discussions	• Ranking
• Gender audit	• Resource maps
• Gender analysis	• Seasonal calendar
• Hazard impact on livelihood matrix	• Social maps
• Hazard mapping	• Transect walks
• Hazard trend analysis	• Venn diagrams
• Mental models	• Vulnerability and capacity matrix
• Participatory scenario development	• Wealth ranking
• Power mapping	

Using VCAI for Assessing the Project Progress



$$Pe_x = Pc_1 - Pc_0$$

Where:

Pe_x : Effectiveness of project x;

Pc_0, Pc_1 : VCAI values at times T1 and T2

I_x, I_y, I_z : Project interventions at time T1, T2 and T3 respectively

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Thank You!

For more information, please contact: sivapuram.prabhakar@gmail.com