Review of Community Based Vulnerability Assessment Methods and Tools

Executive Summary

The review on existing participatory and community based vulnerability assessment framework, methodology and tools that deal with vulnerability and adaptation to climate change was carried out looking at how different organizations has approached to assess the vulnerability. The strength and areas of gaps in existing framework, tools and methods was analyzed on the basis of how all these address vulnerability as a function of exposure, sensitivity and adaptive capacity to the impacts (in consistent with IPCC definition of vulnerability to the impacts). There are differnt appraoches that has been proposed, identifed and developed to assess climate vulnerablity based on building on earlier work on disaster risk reduction communities, food security, poverty analyst, sustainable livelihoods and related fields. The numbers of other evolving assessment methods framed vulnerability in consistent with definition of IPCC and attempting to quantify the community vulnerability based on indicators. Some organizations provide practical guidance on use of tools to assess vulnerability. However, there has been very less attempt found in existing approaches to downscale the assessment where primary data are collected from community and be thoroughly consistent with IPCC definition to assess vulnerability to the climate impact.

1. Introduction: approaching vulnerability to climate change

The relationship between human actions and the effects of natural disasters looking at socio-economic dimensions have been well documented, argued and several defensible conceptual models were developed over past several decades to give disasters managers a framework for understanding vulnerability to disasters and reducing it (Anderson and Woodrow 1989/1998; Blaikie et al, 1994; Twigg, 2001). The experiences from these frameworks suggest that vulnerability is still a complex subject and has many dimensions: economic, social, demographic, political, psychological etc that can have overlapping effect induced from one factor and it can be difficult to tease out precisely the cause - effect relationship. These framework prioritized livelihood security and communities capacity to deal with vulnerability that can emerge from observed and predicted disasters, but it is generally agreed that, vulnerability does not make people poor, but the poor tend to be most vulnerable.

With this backdrop, vulnerability dealing with climate changes to address need for adaptation is relatively emerging field and some of existing conceptual models and framework developed by different organizations have build on with what earlier work on disaster risk reduction communities, food security, poverty analyst, sustainable livelihoods and related fields have attempted to address. The number of other have attempted to conceptualize climate change and vulnerability to its impacts in consistent with IPCC[1] definition (defined as function of character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity). But, the IPCC does not present vulnerability in terms of an equation, and most participatory or community based vulnerability assessment frameworks avoid the mathematical model and quantitative generalizations of community vulnerability.

For example, the ***CARE International*** focuses on the qualitative aspects of addressing the underlying causes of vulnerability at a variety of scales (from national to household/individual) (Dazé, Ambrose, & Ehrhart, 2009); ***Practical Action's Vulnerability to Resilience (V2R)*** framework stresses the dynamic and cyclical nature of building resilience to climate change (Pasteur, 2010), which makes numerical measurement difficult. Perhaps the most

[1] IPCC (2001). Third Assessment Report. Annex B. Glossaries

comprehensive framework for assessing vulnerability to climate change, provided by ***IUCN***, also focuses on obtaining qualitative data from communities and triangulating it with scientific data (although some matrix ranking of vulnerability versus adaptive capacity is included) (Marshall, et al., 2009). ***Tearfund*** included the quantification of risks posed by various climate-related hazards, which allows for the prioritisation and selection of adaptation options (the greater the risk, the greater the need for adaptation options) (Wiggins, 2009). However, Tearfund framework stops there, and does not develop a quantification of overall vulnerability taking adaptation into account. The ***International Institute for Sustainable Development (IISD)*** developed ***CRiSTAL*** (Community-based Risk Screening Tool – Adaptation and Livelihoods) as an interactive, step-by-step tool for quantifying livelihood components in relation to hazards. However, focus is laid heavily on hazards (with no account of seasonal or projected changes), coping strategies rather than adaptation, and the impact on existing projects, rather than communities. Moreover, like the Tearfund framework, quantification is not carried forward to make an assessment of vulnerability. The Community based tool kit for practitioners developed by ***LFP and UKAid*** is based on sustainable livelihood framework and some tools are adopted from CRiSTAL, LOCATE[2] and SAS[3] tools with existing PRA techniques. Like ***CRiSTAL*** the tools also focuses on hazards (referred also as current risks and future risks) and subsequent vulnerability and livelihood analysis will be scored and rated based on prioritized hazards (using hazard ranking, matrix ranking, hazard assessment, livelihood resource vulnerability assessment, vulnerability matrix ranking etc) (Regmi et al, 2010). ***The World Bank***, meanwhile, has published a quantitative vulnerability assessment in the book "Evaluating Climate Change and Development" (Van den Berg & Feinstein, 2009). In the chapter "***Vulnerability Assessment as a Tool to Build Resilience*** among the Coastal Community of Mauritius" the authors quantify vulnerability in terms of existing conditions and assets (physical, biological, social, economic, and cultural), and the impacts of changes and hazards on those conditions/assets (Panray, Noyensing, & Reddi, 2009). The first set of measurement indicators address the individual/household scale, and the second set explores the bio-geophysical and socio-economic impacts on the community as a whole. While the case-study focuses on a coastal fishing community, the methods can be applied elsewhere. The ***WWF*** India has developed assessment method based on Livelihood Vulnerability Index[4] and presented quantitative treatment to IPCC definition to assess vulnerability by setting out indicators that qualifies exposure, sensitivity and adaptive capacity and normalized values for each indicators to come up with five outputs profiles (climate, demographic, agriculture, ecosystem and socio-economic). However this is macro-level analysis based on secondary data, use of GIS application and involves several steps moving from indicators to profiles and ultimately to the final vulnerability index (Mohan & Sinha, 2010). The **UNDP Adaptation Policy framework** (APF) provides guidance on designing the implementing projects that reduce vulnerability to climate change by both reducing potential negatives impacts and enhancing any beneficial consequences of a changing climate (Bo & Siegfried, 2004). APF on its conceptual framework to define vulnerability have consider IPCC definition as V= R-A where R is Risk i.e predicted adverse climate impacts and A is Adaptation. In defining risk, taking note from hazard literature R= H x V where R is risk (probability of hazard occurrence), H is climatic hazard (potential threat to humans and welfare) and V is vulnerability (exposure and susceptibility to losses). However, in the proposed definition, vulnerability is seen as the residual impacts of climate change after adaptation measures have been implemented.

All these examples suggest that differnt appraoches has been proposed and developed to assess climate vulnerablity based on building on earlier work on hazards literatures, food security, poverty analyst, sustainable livelihoods and related fields and some other approaches stick on definition of IPCC and attempting to quantify the community

[2] LOCATE- Local Options for communities to adapt and technologies to enhance capacity based on South South North Adaptation Projects Protocol.
[3] Social Analysis System (www.sas2.net)
[4] based on work of Hahn et al, (2009)

vulnerability. However, there has been very less attempt found in existing approaches to downscale the assessment where primary data are collected from community and be thoroughly consistent with IPCC definition on vulnerability to the impact. Regardless of framing adopted, it is also important to ensure that formal methods have not been proposed, there is still consensus that needs to develop with in community of practices to have tractable analytical definition on vulnerability.

2. Review of existing tools for addressing vulnerability to climate change consistent with IPCC definition

This section explains on review of two aspects of vulnerability assessment methods and tools developed by different organizations. They are i) determinants of vulnerability considered in the methods to assess community vulnerability and ii) practical guidance provided on using of tools to assess community vulnerability. The overall analysis and comparison is carried out based on how existing methods and tools have considered the vulnerability components in consistence with IPCC definition i.e. exposure, sensitivity and adaptive capacity.

2.1. Determinants of Vulnerability on existing vulnerability assessment tools

The methodology aspects have been compared with set of different parameters considered by different organizations to assess community's vulnerability. The determinants that qualifies vulnerability components is tabulated in Table 1 and compared with existing methodological framework developed by different organizations and these are rated as i) specific and strategic components of the framework ii) unspecific, implied or potential component of the framework and iii) not included and addressed in the framework (tabulated in Table 3). There are only few methodology frameworks that considered vulnerability as function of exposure, sensitivity and adaptive capacity elements as specific and strategic components of the framework to assess vulnerability. The further sections specifically discuss on which organizations have considered the determinant indicators of vulnerablity in their assessment components.

Table 1 Components considered for review by existing vulnerability assessment tools

VA Component	Determinants Indicators considered in the existing VA tools
Vulnerability	Compare weather or not the developed methods basis is to assess vulnerability as function of how system is exposure to change, its sensitivity to impact and ability to adapt
Exposure	Current climate trends (seasonal), climate induced events, climate projections, community based and scientific data
Sensitivity	Current hazards trends, biophysical impacts, livelihood impacts, hazard prioritization
Adaptive capacity	Coping strategies, livelihood assets, community awareness, knowledge and information on climate change, capacity to plan and affect changes

2.1.1 Exposure

IPCC defines exposure as the extent of climate change to which a system is exposed. However, not all organizations or their methodological frameworks adopt similar language. The ***World Bank***, ***Christian Aid*** refer to climate risk (not climate change risk), while organizations such as ***Tearfund, LFP & UKaid,*** and tools such as ***CRiSTAL,*** simply focus on hazards and potential future exposure (defined as future risk), which may not be confined to those directly attributable to climate change. There is also divergence when the term

'exposure' is explicitly used; ***IUCN,*** for example, defines exposure as the experience of climate change, but in practice the framework includes the *impacts* of climate change as a measure of exposure. Looking at the determinants of exposure i.e. current climate trends (seasonal), climate induced events, climate projections and community based and scientific data, most of the methodological framework developed by different organizations have made it specific and strategic components.

2.1.2 Sensitivity

IPCC defines sensitivity as the impact of climate change – the impact of long-term seasonal change, short-term/severe climate change events, and climate change related hazards/stresses. The majority of frameworks address the extent of impacts of climate change, usually through hazards derived from climate change or directly from climate change. In their framework, ***IUCN*** defines sensitivity as impact, but in explaining how to assess sensitivity describe the concept in terms of dependency on resources that are susceptible to impact by climate change (Marshall, et al., 2009). In presenting sensitivity as the number of people who directly rely on natural resources, the IUCN framework oversimplifies the livelihood system (a household can be dependent on a resource, but if they have developed ways of managing the resource in the face of climate change, then the household is not sensitive to climate change). ***Christian Aid*** (Christian Aid, Undated), meanwhile, develops a complex framework for accounting for direct and indirect impacts of climate change, where direct impacts have both a primary and secondary effect. **LFP & UKaid** tools emphasize to measure on physical hazards associated with climate variability and attempt to examine livelihood resources vulnerability assessment associated with physical hazards.

2.1.3 Adaptive Capacity

Adaptive capacity is the least understood component of frameworks that tackle climate change. Many frameworks do not even address adaptive capacity of a community; rather take a DRR perspective to coping with hazards (e.g. CRiSTAL). In many methodological frameworks, adaptive capacity is attempted to assess through possession notion of assets by a community with indicators that will measure adaptive capacity. This is consistent approaches, such as ***CARE International***'s and ***LFP and UKaid*** approach and attempted to examine underlying socio-economic, livelihood and institutional factors that enable communities to respond and cope with climate change hazards.

However, *a static analysis of livelihood assets is not sufficient; attention must turn to the dynamic nature of livelihood assets – to the ways in which communities substitute between assets both now and in the future*. Simply documenting the existing assets in a community and making the assumption that a certain quantity and quality of assets equates to a certain amount of adaptive capacity oversimplifies adaptation. Adaptation is about the ways in which communities respond to and affect change, both now and in the future. Thus, a series of indicators are required that take into account the capacity to plan, make decisions, and implement decisions for effective adaptation. The majority of frameworks jump from an assessment of risk to climate related hazards to the stage of planning with the community; few seek to undertake a full adaptive capacity assessment. A notable exception is the ***IUCN*** framework for adaptation (Marshall, et al., 2009), which sets out specific indicators for adaptive capacity at the individual and community level.

2.2. Practical Guidance suggested in existing toolkits

The practical guidance on existing toolkits considered have been compared in existing methodological framework developed by different organizations that facilitate use to gather information on community vulnerability (tabulated in Table 2). Most of the community

assessment is based on participatory rural appraisal techniques such as focus group discussion, key informants interview, sharing and learning dialogues and triangulation with secondary data etc. As a matter of fact, only some organizations have suggested specific practical guidance on tools for research process to gather information from community. The table 4 compares relevant participatory tools (suggested by some organizations) useful for community vulnerability assessment are presented.

Table 2: Practical guidance tools for research process to assess vulnerability

VA Components	**Practical Guidance on toolkits suggested for community VA[5]**
Exposure	Seasonal calendar, Historical timelines, rain calendars, climate diaries
Sensitivity (impacts)	Hazard mapping, hazard trend analysis, Hazard ranking, Hazard impact ranking, mental models, transect walk for risk identification, climate hazard impacts on livelihood matrix, participatory scenario development for potential risks
Adaptive Capacity	Community resource mapping, Livelihood resource vulnerability assessment, Livelihood asset assessment, Vulnerability and capacity matrix, Venn diagram, coping and adaptation strategies assessment matrix, effectiveness of coping adaptation strategies assessment, communication maps, preference ranking, wealth ranking

The following section discuss on existing tools developed by different organizations that explicitly suggests on practical guidance for research process by using participatory tools for assessing vulnerability. For example, ***CARE*** suggested practical guidance with facilitation tips and guiding questions to assess vulnerability at household, community/local government and national level. The tools suggested for research process are hazard mapping, seasonal calendars, historical timelines, vulnerability matrix and Venn diagram. **IUCN** provides comprehensive list of indicators to consider for assessing adaptive capacity at individual (16 different indicators), community or industry scale (8 different indicators). **LFP and UKaid** have suggested 13 field toolkits useful for assessing community perception on climate and hazards, community vulnerability and planning for adaptation. The tools incept with analysis of past hazards and on that basis it compare and priortise the most critical local climate hazards and risks. The subsequent analysis on livelihood impacts, vulnerability assessment, existing coping and adaptation mechanism, and adaptation planning will be followed on the basis of priortised hazards. Unless, some qualitative analysis is done, there is chance that masking of secondary or tertiary impacts led by seasonal changes will be omitted in response to observed exposure and sensitivity in the system leading analysis only to hazard-led basis and not on overall sensitivity produced by exposure in the system. ***IIED*** with series of case studies explored community based adaptation (CBA) framework. They attempted to address the incorporation of climate change information both scientific and local, drawing on participatory DRR approaches, linkages between livelihoods, DRR and climate change, identification and planning of adaptation activities, monitoring and evaluation and polices and institutions for CBA. The emphasis is placed on participation and many participatory tools are explores such as rain calendars: a tool for understanding changing rainfall patterns and effect on livelihood, mental models: understanding cause and consequences of climate change, child friendly participatory research tools, and participatory scenario development for climate change adaptation. **DFID** Sustainable livelihood guidance sheets provide practical guidance to range of participatory tools for livelihood analysis and vulnerability context of the communities. The guidance sheets have produced several tools including environmental

[5] Some of the tools mentioned are from DFID Sustainable livelihood guidance sheet section 4

checklist, gender analysis, governance assessment, institutional appraisal, macro-economic analysis, participatory poverty assessment, stakeholder analysis, strategic conflict assessment etc. The further guidance is also noted on rapid and participatory methods such as secondary data, key informants, individual and household case studies, sample surveys. **SPREP & CIDA** tools also highlights on community assessment on hazard ranking and capacity assessment.

The APF provides several practical guidance's on assessing vulnerability for climate adaptation. In order to assess, present vulnerability toolkits suggests are brainstorming, checklist/multiple attributes, expert judgment, focus groups, indicators/mapping, influence diagrams/mapping tools, ranking/dominance analysis / pair wise comparison, stakeholders consultation and vulnerability profiles. Apart from this, in assessing the current climate risk, the cross-impact analysis have been suggested where key climate variables and climate related variables compared with selected activities or exposure units (weighted sensitivity matrix).

The ***Christian Aid*** Adaptation tools clearly emanated from DRR perspectives, and seek to integrate them with a livelihoods approach that is targeted towards building resilience to climate change. However, there is little in the way of practical guidance; the framework calls for community-driven adaptation plans and the selection of appropriate indicators. But, how the community should drive such a process is not clear, and there is no suggested list of indicators. **CRiSTAL** tools developed step by step information gathering using defined format. This tool need technical facilitator and all the information needs to decoded in the computer format. On the other hand, **CEDRA** is planning tools by identifying the project risk assessment to integrate adaptation options to reduce future risks. Despite of strength in framework other tools reviewed do not explicitly provide practical guidance on tools to be used for research process.

Table 3: Comparison of climate change vulnerability assessment parameters considered by different organizations

S/N	Framework	Implementing organization(s)	Vulnerability	Exposure				Sensitivity				Adaptive Capacity			
			Vulnerability as function of exposure to change, sensitivity to impacts, and ability to adapt	Current climate trends (seasonal)	Climate-induced events	Climate projections	Community-based and scientific data	Current hazard trends	Biophysical impacts	Livelihood impacts	Hazards prioritisation	Coping strategies	Livelihood assets	Building community awareness, knowledge, and information on CC	Capacity to plan and affect change
	<u>Methodologies and Framework for assessment</u>: √ = Specific and strategic component of the framework O = Unspecific, implied, or potential component of the framework Empty = Not included or addressed in the framework														
1	**A Framework for Social Adaptation to Climate Change**	IUCN	✓	O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	**Climate Vulnerability and Capacity Analysis**	Care International	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	O	✓
3	**CV &A- A Guide to Community Vulnerability and Adaptation Assessment and Action**	SPREP & CIDA	✓	✓	✓	✓	✓	✓						✓	
4	**Vulnerability to Resilience**	Practical Action	✓	✓	✓	✓	O	✓	✓	✓	✓	✓	✓	✓	O
5	**Participatory Tools and Techniques for Assessing Climate Change Impacts and Exploring Adaptation Options**	LFP and Ukaid		O	✓	O	✓	✓	✓	✓	✓	✓	✓	O	O

6	**Vulnerability Assessment as a Tool to Build Resilience**	World Bank			✓		✓		✓	✓	✓	✓			
7	**Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects**	World Bank		✓	✓		o		✓	✓				✓	
8	**Development and Climate Change: A Strategic Framework for the World Bank Group**	World Bank												✓	
9	**Adaptation Toolkit: Integrating Adaptation to Climate Change into Secure livelihoods**	Christian Aid		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	o	
10	**Community-based adaptation to Climate Change**	IIED		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	**CEDRA (Climate change and Environmental Degradation Risk and Adaptation assessment)**	Tearfund		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
12	**CRiSTAL (Community-based Risk Screening Tool - Adaptation and Livelihoods)**	IISD, with IUCN, SEI, and IC			✓			✓		✓		✓	✓		

Table 4: Comparison of practical guidance on tools for vulnerability assessment by different organizations

Vulnerability Component	S/N	Practical Guidance on use of participatory tools	Identified organizations[6]					
			Care	LFP and Ukaid	SPREP & CIDA	IIED	DFID-SLF	UNDP APF
Exposure	1	Seasonal Calendar	√				√	
	2	Historical Timelines	√					
	3	Rain calendars				√		
Sensitivity/impacts	4	Mental Models				√		
	5	Hazard mapping	√	√				
	6	Hazard Trend analysis		√				
	7	Hazard ranking		√				
	8	Hazard impact ranking		√	√			
	9	Transect walk						
	10	climate hazard impacts on livelihood matrix		√				
	11	participatory scenario development				√		
	12	Cross-impacts analysis						√
Adaptive Capacity	13	Social Map					√	
	14	Resource Map		√			√	
	15	Livelihood resource Vulnerability assessment		√				
	16	Livelihood assets assessment		√				
	17	Vulnerability and capacity matrix	√	√	√			
	18	Venn Diagram	√				√	
	19	Coping and adaptation strategies assessment		√				
	20	Effectiveness of coping and adaptation strategies		√				
	21	communication maps				√		
	22	preference ranking					√	
	23	Wealth ranking					√	
Present Vulnerability	24	Brainstorming						√
	25	Checklists/multiple attributes						√
	26	Expert judgment						√
	27	Focus groups						√
	28	Indicators/mapping						√
	29	Influence diagrams/mapping tools						√
	30	Stakeholder consultation						√
	31	Vulnerability profiles						√
	32	Ranking/dominance analysis/ pair wise comparison						√

6 CARE International**: Climate Vulnerability and Capacity Assessment (CVCA):** LPF & UKAid**: Participatory tools and techniques for assessing climate change impacts and exploring adaptation options;** SPREP & CIDA**: Guideline for community vulnerability and adaptation assessment and action (CV&A).** IIED**: Community based adaptation to climate change.** DFID : **Sustainable Livelihood Guidance sheets: UNDP APF- Adaptation Policy Framework**

3. Recommendations: Learning from other frameworks

- IUCN: provides a comprehensive list of indicators for household and community adaptive capacity.
- CARE International: Lessons can be learned from the CARE framework in relation to the scale of adaptation.
- World Bank: The guidelines on "Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects" provide a starting point for developing components on engaging institutions, building an enabling policy environment, economic analysis, and M&E.
- Christian Aid: the framework provide some inspiration for conceptualising work flows in carrying out the vulnerability assessment and subsequent planning.
- IIED: the framework includes many useful examples of participatory tools, some of which are tailored particularly to climate change.
- LFP & UKAid: the toolkits are useful participatory tools for identifying climate hazards and subsequently analysis of vulnerability and adaptive capacity based on livelihood assets.
- DFID sustainable livelihood guidance sheets are useful for approaching vulnerability context using different participatory tools.

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End Note:

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For more information contact: info@practicalaction.org.np or apar.paudyal@practicalaction.org.np