VAST-Agro: Community-based Vulnerability and Adaptive Capacity Assessment for Agriculture

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Outline

- Introduction
- Definition of Terms
- Framework for Vulnerability and Adaptive Capacity Assessment
- Procedure in Assessing Vulnerability and Adaptive Capacity Assessment
- Computation of Vulnerability Index
- Conclusion

Introduction

Introduction

- Food production areas are considered to be the most vulnerable sector to climate change
- Climate change may cause changes in the growing seasons, heat stress in plants and animals, outbreaks of pests or diseases and increase in soil erosion
- May bring significant losses and damages to the agricultural sector
- Since the agricultural sector is the largest contributor to the Philippine economy, it is therefore important to assess its vulnerability to climate change.

Introduction...

- Vulnerability assessment will facilitate the decision-making process of stakeholders of the agricultural sector about their options for adaptations
- Several methods have been developed for the past decades but none focuses on the agricultural sector
- Developed a community-based vulnerability assessment tool to be used at the local level

Definition of Terms

Vulnerability to Climate Change

The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC 2001)

"a function of the character, magnitude, and rate of climate variation to which a system is **exposed**, its **sensitivity**, and its **adaptive capacity**" (IPCC 2001)

Climate-related Hazard

- A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR, 2009)
- To effectively analyze vulnerability, we must understand the dynamic nature and interactions of hazards
- Important to distinguish between hazard and the effects of hazard

Sensitivity to Climate Change

Sensitivity is the degree to which the community is affected by climatic stresses.

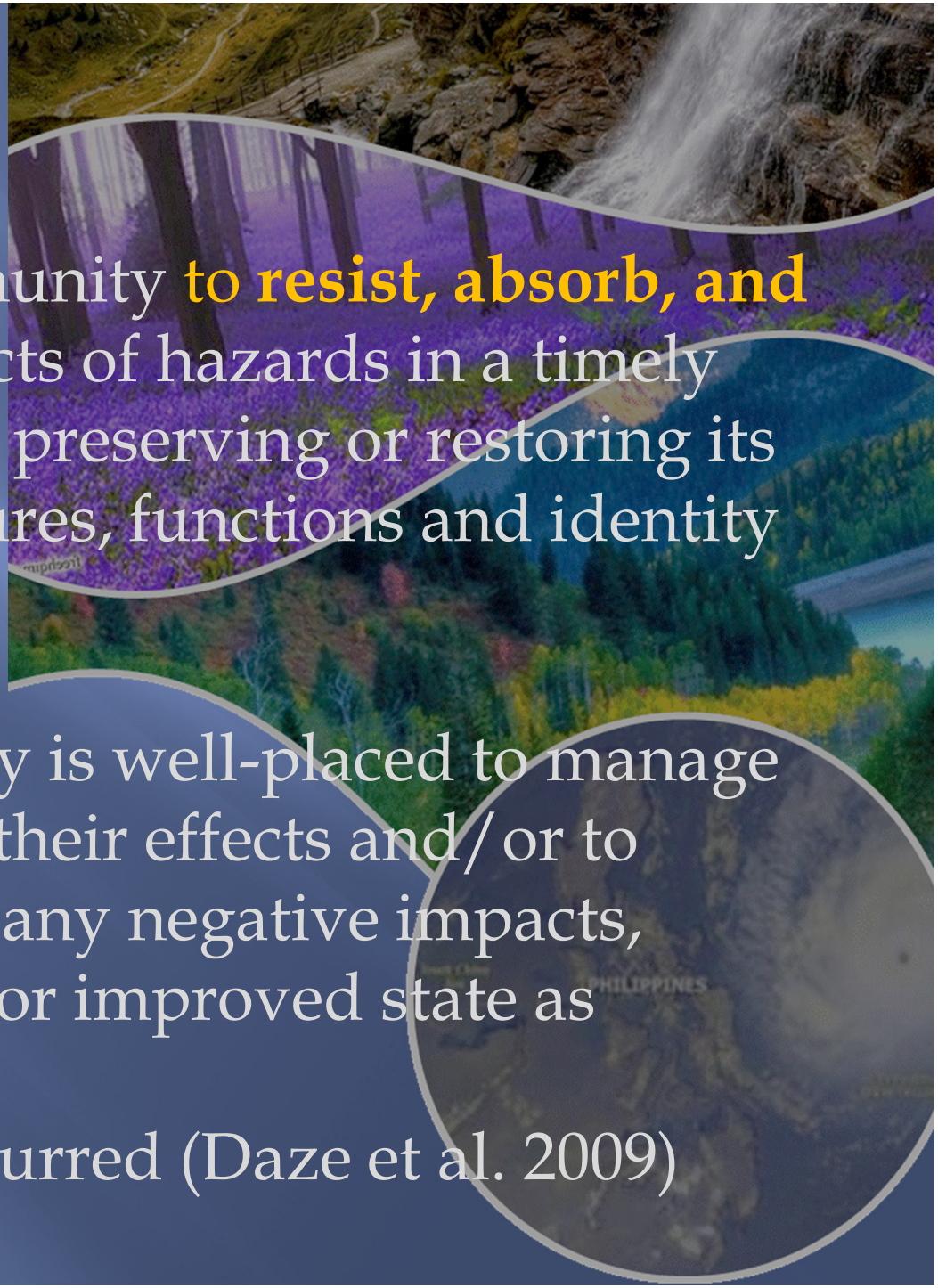
E.g. A community dependent on rainfed agriculture is much more sensitive than one where the main livelihood strategy is labor in a factory, for instance.

Adaptive Capacity

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2001).

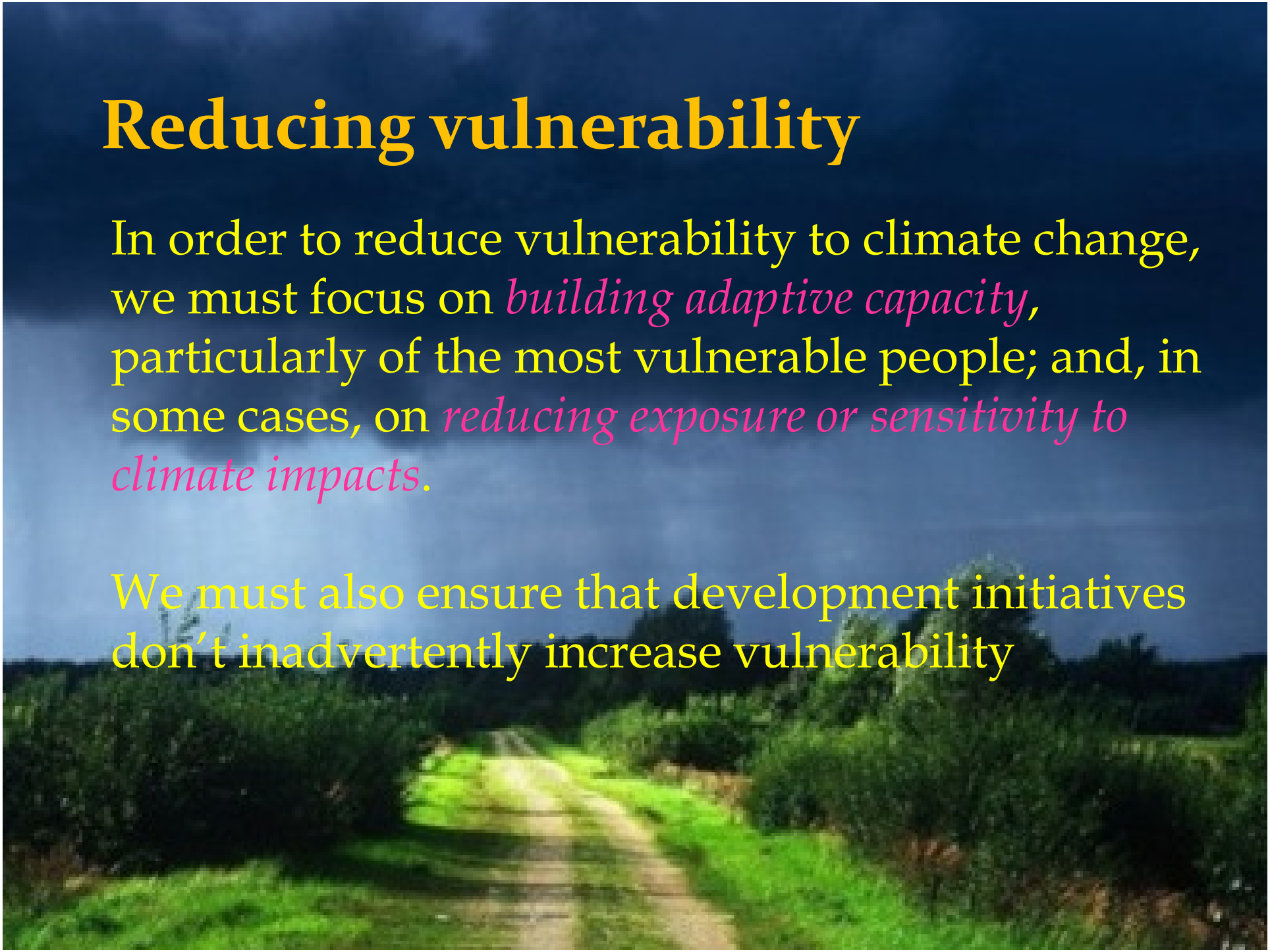
Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities

Resilience



The ability of a community to **resist, absorb, and recover** from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity (UNISDR, 2009)

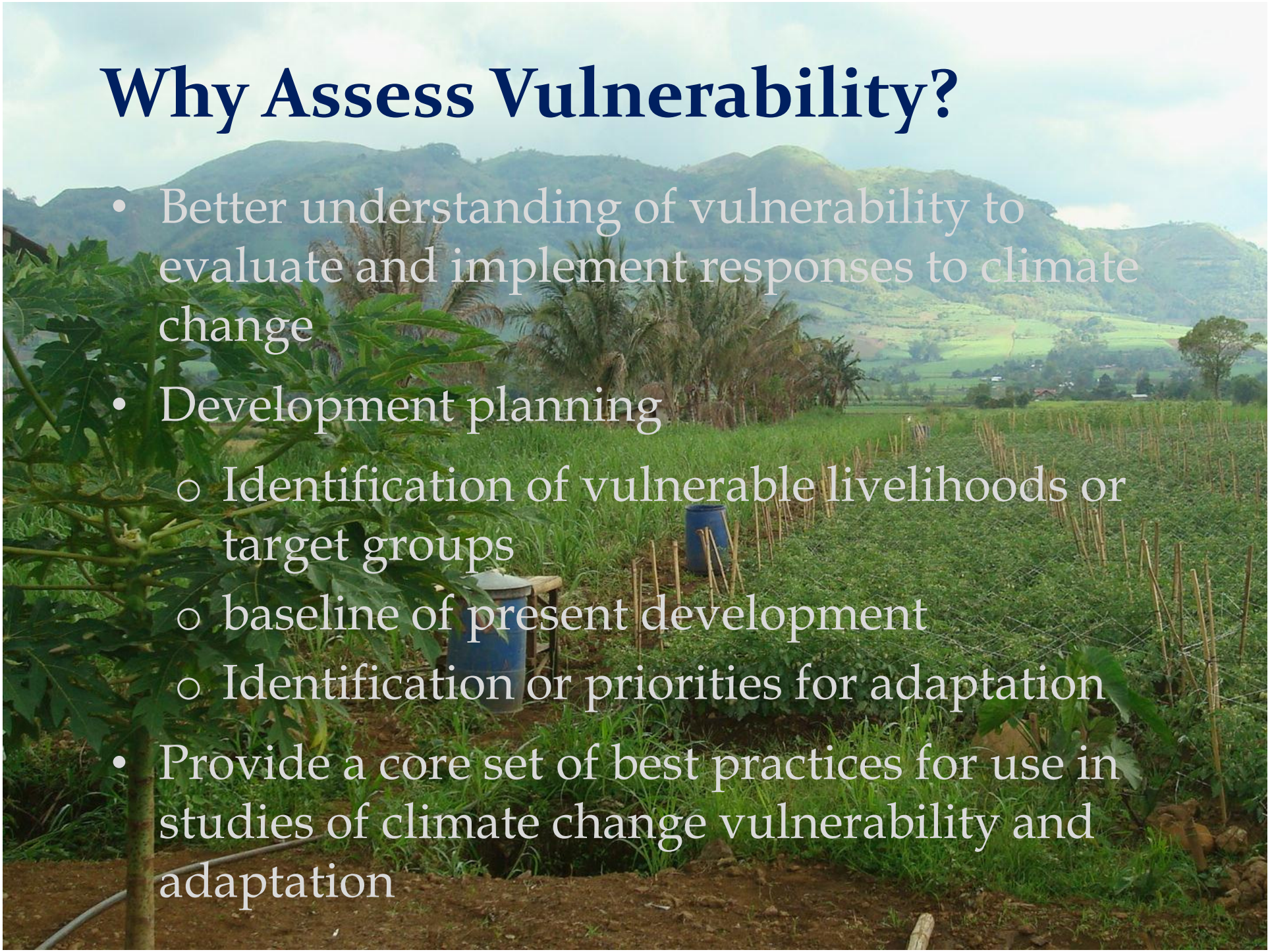
A resilient community is well-placed to manage hazards to minimize their effects and/or to recover quickly from any negative impacts, resulting in a similar or improved state as compared to
before the hazard occurred (Daze et al. 2009)



Reducing vulnerability

In order to reduce vulnerability to climate change, we must focus on *building adaptive capacity*, particularly of the most vulnerable people; and, in some cases, on *reducing exposure or sensitivity to climate impacts*.

We must also ensure that development initiatives don't inadvertently increase vulnerability



Why Assess Vulnerability?

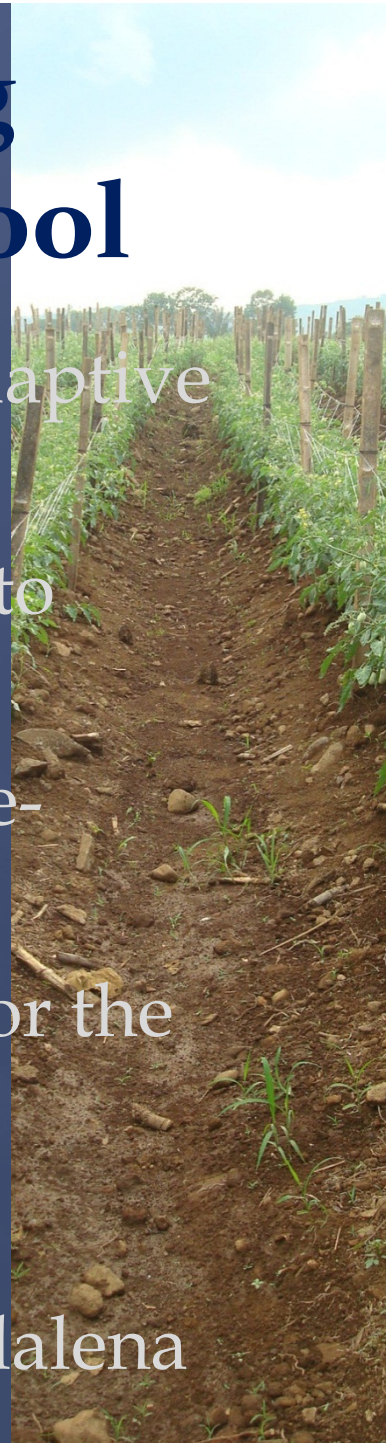
- Better understanding of vulnerability to evaluate and implement responses to climate change
- Development planning
  - Identification of vulnerable livelihoods or target groups
  - baseline of present development
  - Identification or priorities for adaptation
- Provide a core set of best practices for use in studies of climate change vulnerability and adaptation

Why Community Level?

- Agricultural communities are central in the management of climate change and should be capable of initiating their own development
- The community is the key actor and beneficiaries of vulnerability assessment process
- Vulnerability assessment should lead to the general improvement of the community's quality of life through the identification and implementation of appropriate adaptations

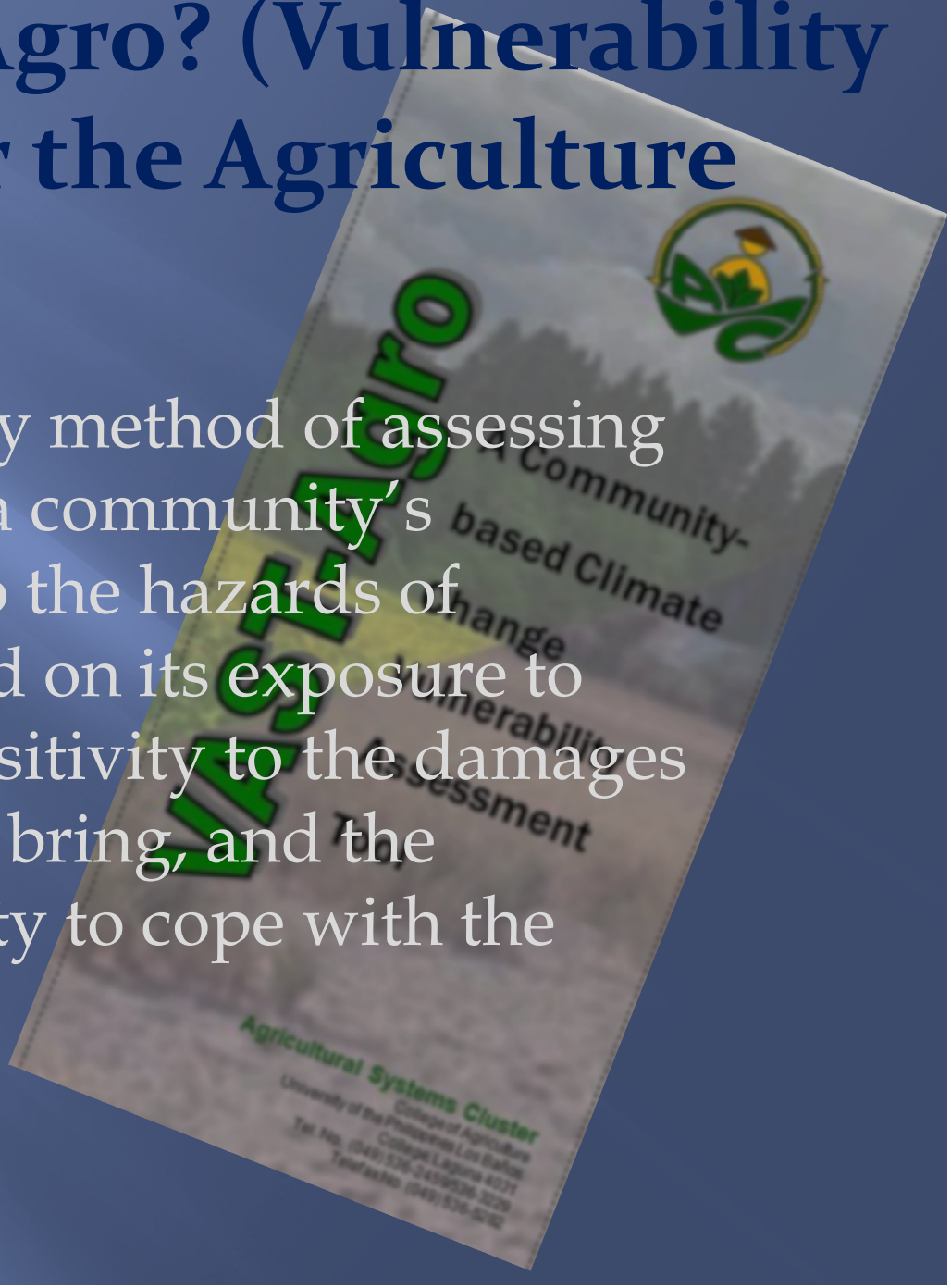
Methodology of Developing Vulnerability Assessment Tool

- Review of existing vulnerability and adaptive capacity assessment tools
- Framework for assessing vulnerability to climate change
- Identification of climate and agriculture-relevant variables
- Development of qualitative measures for the variables identified
- Formulation of vulnerability index
- Pretested the tool in Benguet and Magdalena



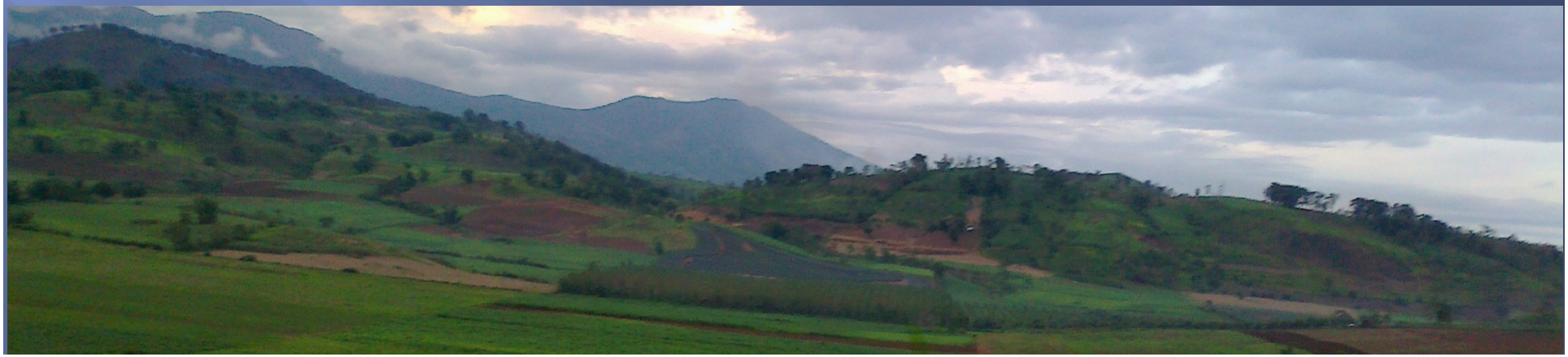
What is VAST-Agro? (Vulnerability Assessment for the Agriculture Sector)

- A quick participatory method of assessing the vulnerability of a community's agricultural sector to the hazards of climate change based on its exposure to climate hazards, sensitivity to the damages that the hazard may bring, and the community's capacity to cope with the adversities.

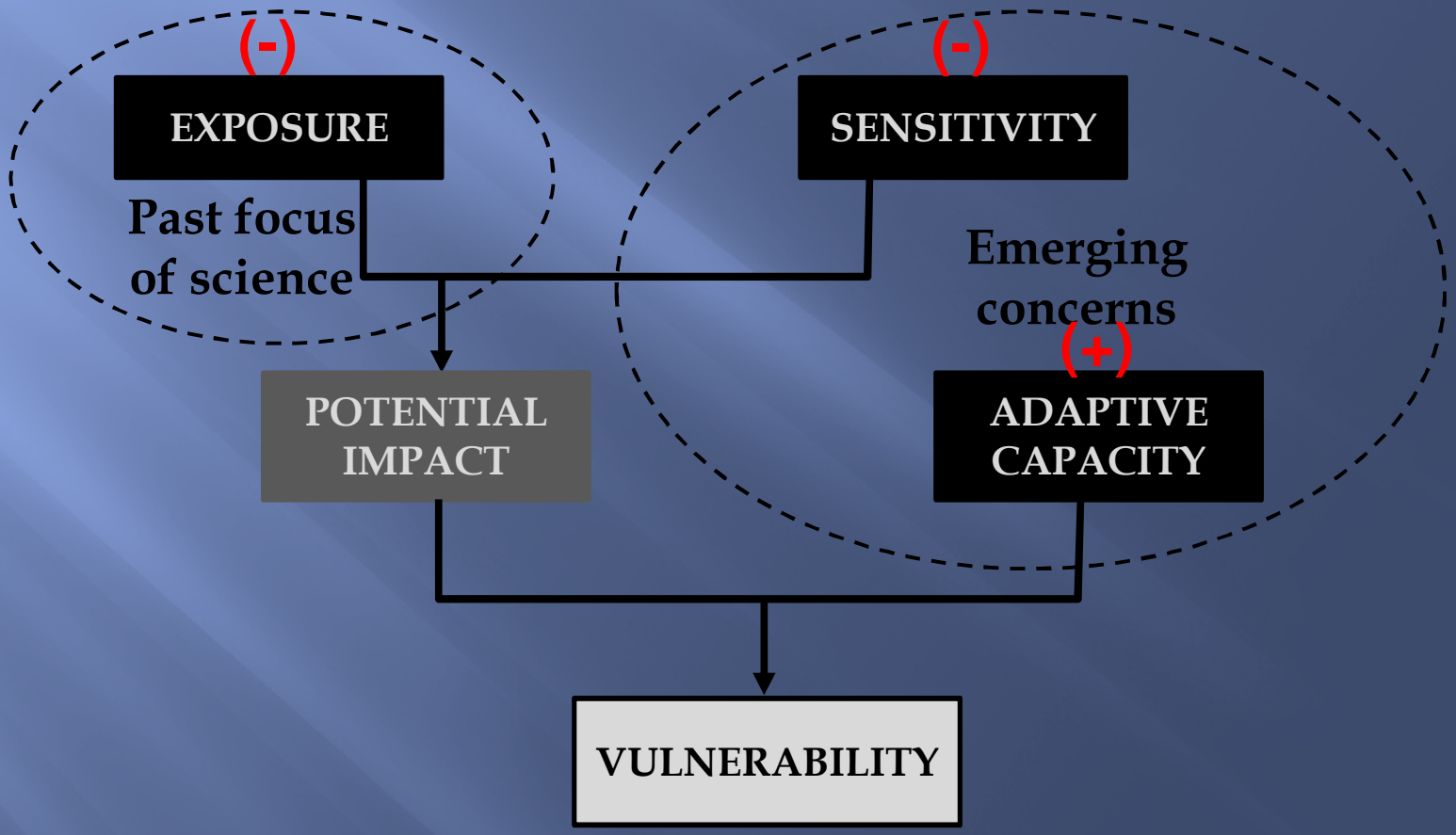


Features of VAST-Agro:

- Focus on the agricultural sector
- Community-based
- Holistic approach
- Uses participatory methods
- Uses scoring method to measure variables
- Come up with a vulnerability index



Framework for Assessing Vulnerability



Variables Identification

Exposure

- Identification of climate hazards experienced in the community in the past 10 years
- Frequency of occurrence in the past 10 years
- More frequency climate hazards are considered more important hazards

Sensitivity

- **Biophysical sensitivity** (by hazards)
  - Sensitive areas
  - Sensitive crops/animals
- **Socio-economic sensitivity** (by hazards)
  - Dependency rate (old and young members of population)
  - Income from climate sensitive sources

Some examples of sensitive area/crops to specific hazard:

Hazard	Sensitive Areas/Crops
Erratic Rainfall	• Annual crops • Fruit crops • Drying of grains (rice, corn, legumes)
Heavier and Continuous Rains	• Crops in flood prone areas • Crops in waterlogged areas • Root crops • Grains
Landslide	• Steep areas
Stronger/More Typhoons	• Grain crops/ cereals/staple • Fruit trees (lanzones, banana, others) • Vegetables (in trellis)
Erosion/Landslide	- Crops in steep areas
Drought	- All crops are sensitive

Adaptive capacity

Type of Capacity	Description
Physical capacity	– the quality of being physically capable
Cognitive ability and linguistic capacity	– the ability to quickly and efficiently process information while linguistic capacity is the ability to comprehend key messages
Resource availability	– Resources that can be used in reducing negative effects of climate change
Communication system	– The system by which information on climatic change is channeled and imparted from the source to the community.

Adaptive capacity...

Type of Capacity	Description
Degree of isolation	– Isolation from physical, political or cultural areas
Strength or availability of support systems	– Support services from different sources
Economic capacity	– Income
	– Diversity of income sources
Technological ability	– Knowledge of technology that can reduce negative impacts of climate change

Steps in Using the VAST-Agro

1 ORGANIZE THE TEAM

2 STUDY THE AREA FROM SECONDARY DATA

3 PLAN AND PREPARE FOR FIELD WORK

4

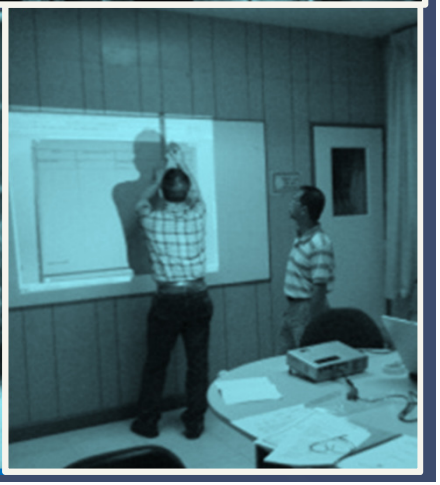
CONDUCT SITE RECONNAISSANCE

5

PREPARE COMMUNITY MAP & TOOL TEMPLATES

6

ASSESS EXPOSURE TO CLIMATE HAZARDS



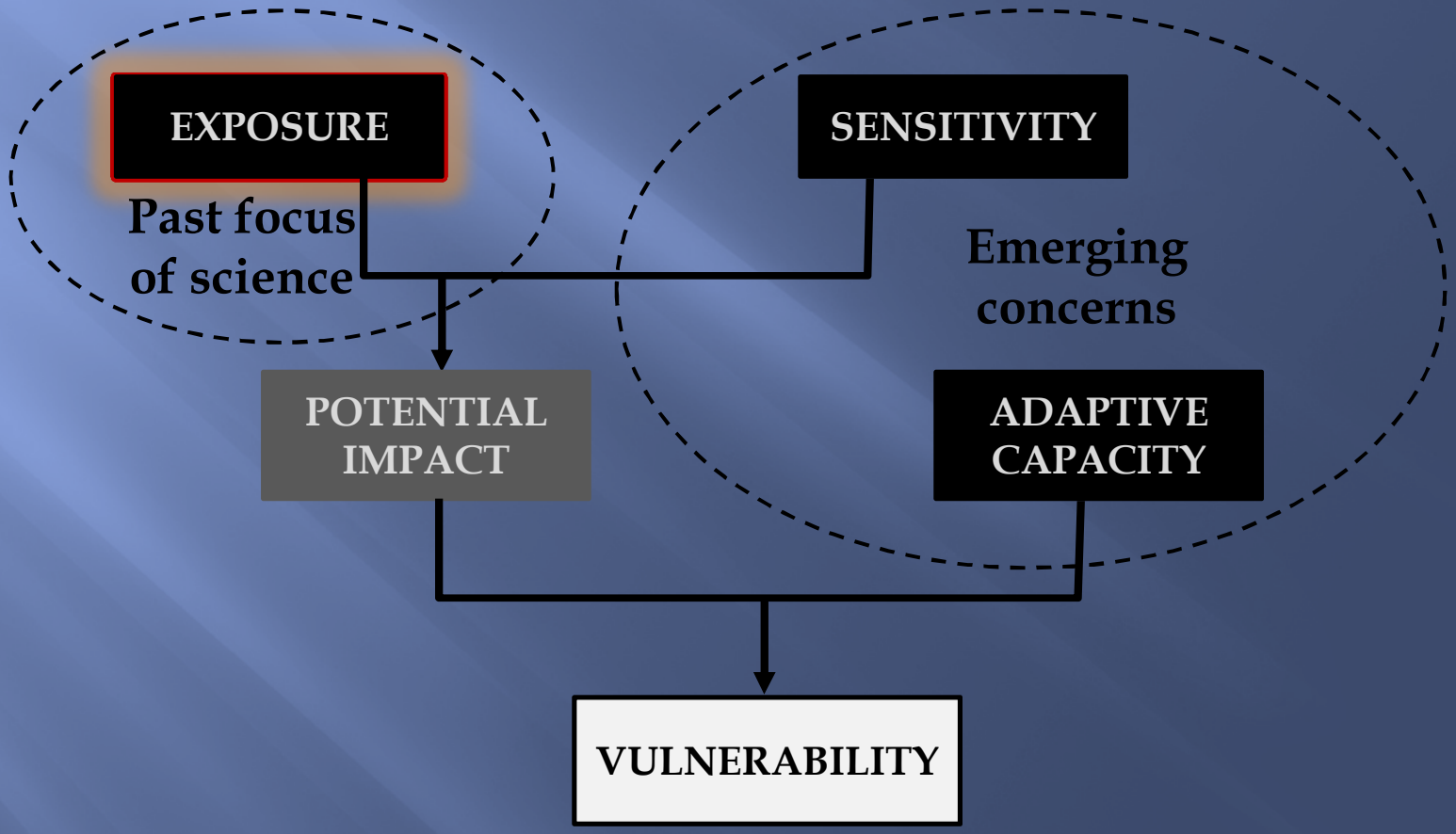
7 ASSESS SENSITIVITY TO CLIMATE HAZARDS

8 ASSESS ADAPTIVE CAPACITY

COMPUTE VULNERABILITY INDEX 9

10 INTERPRET RESULTS

Exposure



(Smith et al. 2001)

Measuring Exposure

Step	Data	Method
a. Identify climate-related hazards in the community.	• Type of hazards • Seasonality	• Timeline • Seasonal calendar
b. For each of the hazards, determine frequency of exposure	• Frequency of exposure to the hazards	• Key Informant Interview

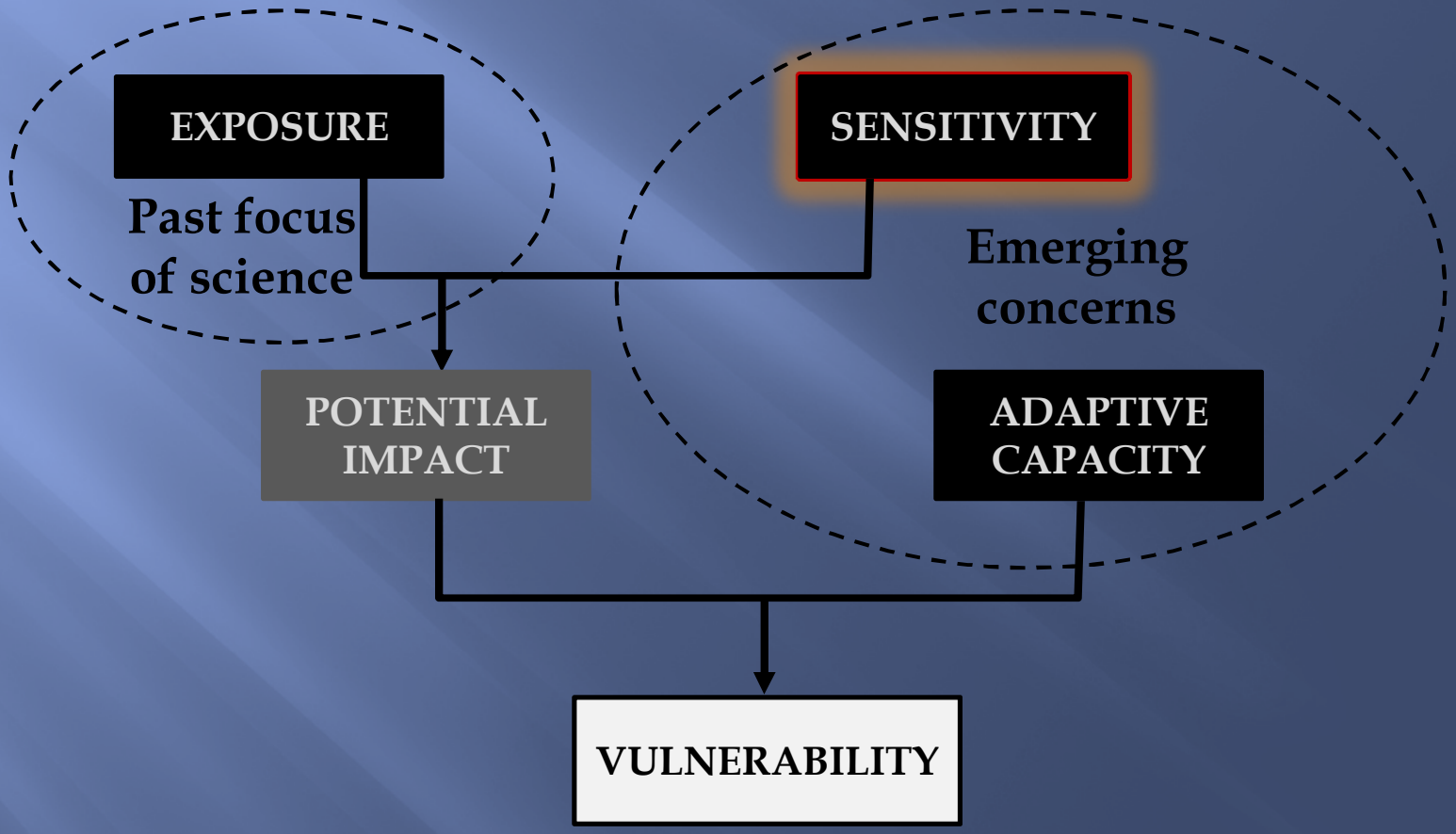
Frequency occurrence of identified hazards

Hazard	Frequency (Number of times/10 years)		Score*
Typhoon	no. of times/year		
Heavier rain	no. of times/year		
Flood	no. of times/10 years		
Drought	no. of times/10 years		
Landslide	no. of times/10 years		
Frost	no. of times/10 years		

* Use the following scoring:

Frequency/10 years	Description	Score
0	None	0
1-2x	Very rare	1
3-4x	Rare	2
5-6x	Moderate	3
7-8x	Frequent	4
9-10x	Very frequent	5

Sensitivity



(Smith et al. 2001)

Measuring Sensitivity

A. Biophysical sensitivity (area/crops)

Step	Data	Method
a. For each of the hazard, ask what area or crops are sensitive to the hazard.	• Sensitive area/crops	• Key informant interview • Community mapping • Transect walk
b. Estimate the percentage of each of the affected area/crop from the total agricultural area	• % of area/crops that are sensitive	• Key Informant Interview

Biophysical sensitivity (area/crops)

Hazard	Sensitive Area or Crops	% of total Agricultural Area Affected (A)	Describe the effects of the hazards to the area/crops	% Magnitude of damage (B)	Biophysical sensitivity potential (A x B)/100
Typhoon					
Total					
Heavier rain					
Total					
Flood					
Total					

Measuring Sensitivity...

B. Socioeconomic sensitivity

Step	Data	Method
a. Determine the dependency rate i.e. the proportion of the barangay population with ages of >70 and <=8 years old.	• Dependency rate	• Secondary data

* Use the following scoring:

Dependency rate	Description	Score
0	None	0
1-20%	Very low	1
21-40%	Low	2
41-60%	Moderate	3
61-80%	High	4
81-100%	Very high	5

Measuring Sensitivity...

B. Socioeconomic sensitivity

Step	Data	Method
b. Identify sources of income of the community population and determine the proportion of the sources from agriculture and other climate-sensitive sources.	• Sources of income • % of income from sensitive sources	• Key Informant Interview

Income sources and their sensitivity to climate hazards

Source of Income/ Food	Percent of Households Engaging	Sensitive to Climate Hazard? (Yes/No)						
		Typhoon	Heavier rain	Flood	Drought	Landslide	Frost	Others
Agriculture								
Quarry								
Driving								
Masonry								
OFW								
Others (specify)								

Percent of income from to climate hazards sensitive sources.

Sources of Income/Food	% of Households Engaging	Hazards					
		Typhoon	Heavier rain	Flood	Drought	Landslide	Frost
Agriculture only (A)							
Agriculture + climate sensitive sources (B)							
Agriculture + non-climate sensitive sources (C)							
% of income from sensitive sources (D)							
% of income from non-sensitive sources (E)							
Non-climate sensitive sources only							
Total	100%						

Score: Socio-economic sensitivity

Hazard	Prevalence (P) [a] (A + B + C)/100	Magnitude (M) [b] (A + B + (C*D)/100)	Socio-economic Sensitivity Potential (P x M)/100
Typhoon			
Heavier rain			
Flood			
Drought			
Landslide			
Frost			

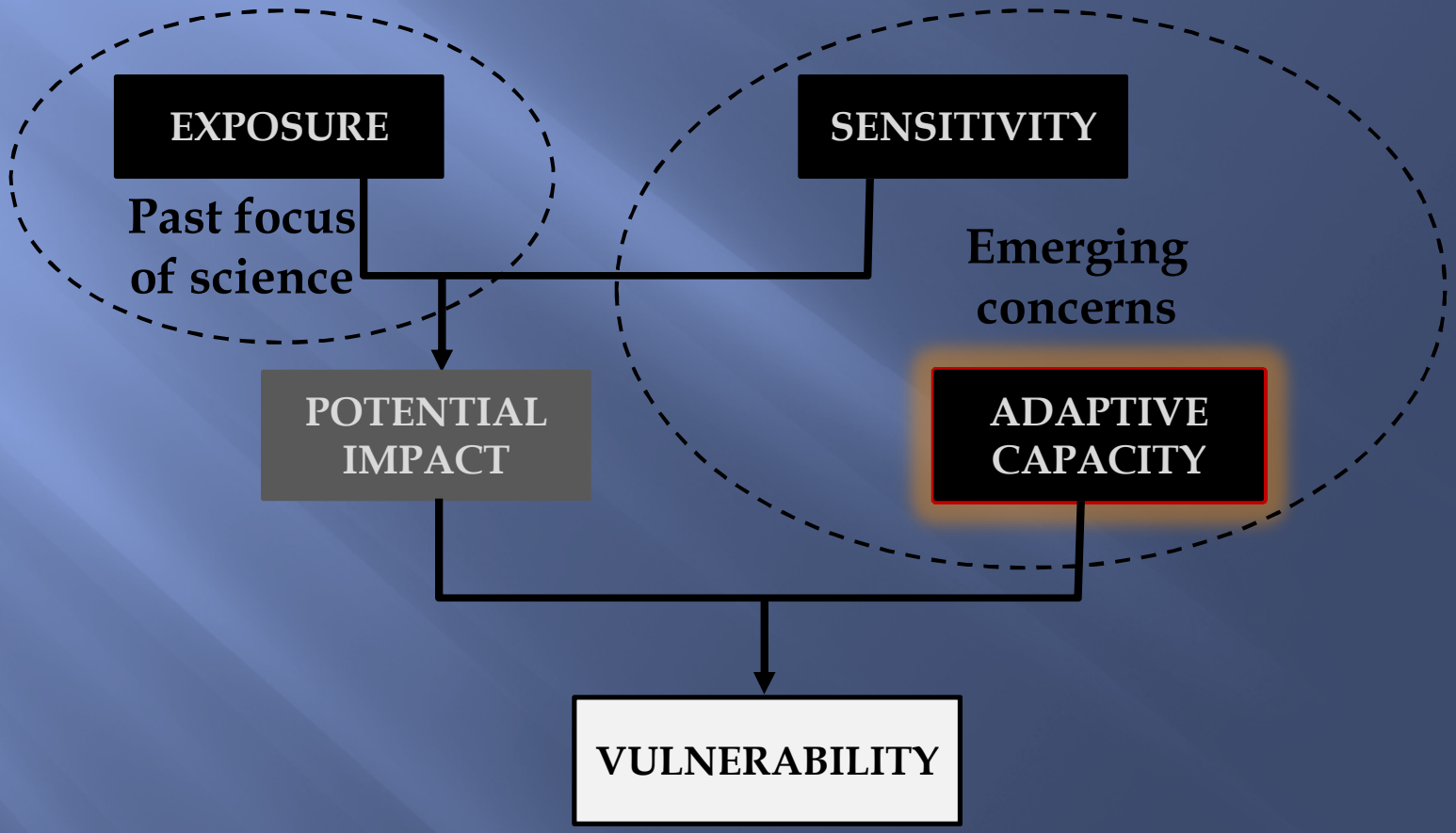
[a] % of households engaging in agriculture and other climate sensitive income sources

[b] % of Income from sensitive sources

Total Sensitivity Score

Hazard	Biophysical Sensitivity Potential (A)	Socio-economic Sensitivity Potential (B)	Total Sensitivity Score (A + B)/2
Typhoon			
Heavier rain			
Flood			
Drought			
Landslide			
Frost			

Measuring Adaptive Capacity



(Smith et al. 2001)

Adaptive Capacity

Type of Capacity	Data to be collected (Indicators)	Influence on Adaptive Capacity
Physical capacity	• Number of available family labor	More family labor higher capacity
Cognitive ability and linguistic capacity	• Literacy rate	High literacy rate generally have high adaptive capacity
Resource availability	• Access to transportation	Lack of access to transportation decreases adaptive capacity
Communication system	• Presence, effectiveness and efficiency of a communication system	Absence of an effective and efficient communication system reduces adaptive capacity
Degree of isolation	• Location and access	Isolation decreases adaptive capacity

Adaptive Capacity…

Type of Capacity	Data to be collected (Indicators)	Influence on Adaptive Capacity
Strength or availability of support systems	• Presence of support systems (e.g. neighbors, community self help, family, NGOs, or service providers, agricultural support	Availability of support services increases adaptive capacity
Economic capacity	• Income level	High income level increases adaptive capacity
	• Diversity of income sources (to include on-farm sources of income)	Dependency on on-farm sources of income decreases adaptive capacity
	• Cost of adaptation	High cost of adaptation reduces adaptive capacity

Adaptive Capacity…

Type of Capacity	Data to be collected (Indicators)	Influence on Adaptive Capacity
Technological ability	• Knowledge of technological adaptation	Lack of technological knowledge decreases adaptive capacity

Adaptive Capacity Score Sheet

Variable	Method	Qualitative Measure		
		Data	Description	Score
a. Number of available family labor in households	• Ask from KIP what is the working age in the barangay. Generally ages 15-65.	0	Very low availability	1
		1	Low availability	2
		2	Moderate availability	3
		3	High availability	4
		4 & above	Very high availability	5
b. Literacy rate (percent of literates of the population)	• Secondary data	0	None	0
		1-20%	Very low	1
		21-40%	Low	2
		41-60%	Moderate	3
		61-80%	High	4
		81-100%	Very high	5

Adaptive Capacity Score Sheet

Variable	Method	Qualitative Measure		
		Data	Description	Score
c. General knowledge of the hazards (percent of population who are knowledgeable)	Key informant interview			0
		1-20%	Very low	1
		21-40%	Low	2
		41-60%	Moderate	3
		61-80%	High	4
		81-100%	Very high	5
d. Availability of resources (e.g. transportation, communication facilities) (percent of population with available resources)	Key informant interview E.g. Transport, cellphones, TV/radio		None	0
		1-20%	Very low availability	1
		21-40%	Low availability	2
		41-60%	Moderate availability	3
		61-80%	High availability	4
		81-100%	Very high availability	5

Adaptive Capacity Score Sheet

	Variable	Method	Qualitative Measure Description	Score
e.	Presence, effectiveness and efficiency of a community early warning system	Key informant interview E.g. bell and bottle, etc.	Without	0
			With, very poor	1
			With, poor	2
			With, moderate	3
			With, good	4
			With, very good	5
f.	System of disseminating information within the community about the hazards	Key informant interview	Without	0
			With, very poor	1
			With, poor	2
			With, moderate	3
			With, good	4
			With, very good	5
g.	Presence and accessibility of support systems	Key informant interview or Venn Diagramming	Without	0
			With, very poor	1
			With, poor	2
			With, moderate	3
			With, good	4
			With, very good	5

Adaptive Capacity Score Sheet

Variable	Method	Qualitative Measure		
		Data	Description	Score
h. Wealth level (percent of population who can afford to spend for adaptation cost)	Key informant interview or wealth ranking	0	None	0
		1-20%	Very low	1
		21-40%	Low	2
		41-60%	Moderate	3
		61-80%	High	4
		81-100%	Very high	5

Listing of technological adaptations

Hazard	Known Adaptation	% of Households Knowledgeable	% of Households Implementing	Effectiveness (Yes/No)	Reason for not Implementing
Typhoon					
Total					
Heavier rain					
Total					
Flood					
Total					
Drought					
Total					
Landslide					
Total					

* Use the following scoring:

Technological Adaptation [a]	Description	Score
0	None	0
1-20%	Very low	1
21-40%	Low	2
41-60%	Moderate	3
61-80%	High	4
81-100%	Very high	5

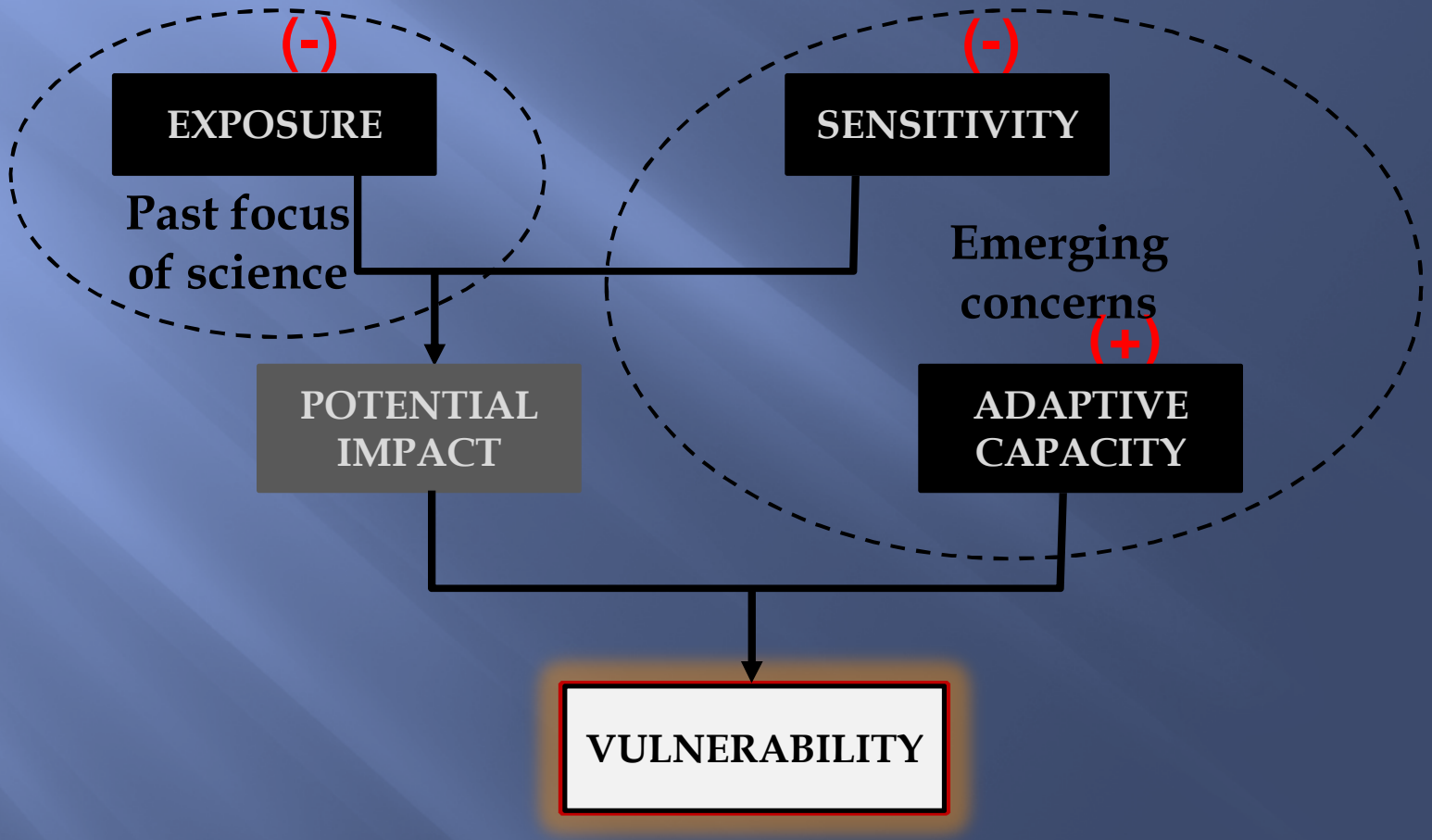
[a] Percent households implementing effective measures

Total adaptive Capacity Score

Hazard	Adaptive Capacity (A)	Technological Adaptation (B)	Total Adaptive Capacity Score (A + B)
Typhoon			
Heavier rain			
Flood			
Drought			
Landslide			
Frost			

Calculation of Vulnerability Index

Vulnerability Index



(Smith et al. 2001)

Vulnerability Index (VI) = Adaptive Capacity Index (ACI) – Potential Impact Index (PII)

$$ACI = \frac{\text{Total Adaptive Capacity Score (TACS)}}{\text{Total Maximum Adaptive Capacity Score (TMACS)}}$$

$$PII = \frac{\text{Total Exposure Score (TES) + Total Sensitivity Score (TSS)}}{\text{Total Max Exposure Score (TMES) + Total Max Sensitivity Score (TSS)}}$$

Score Summary

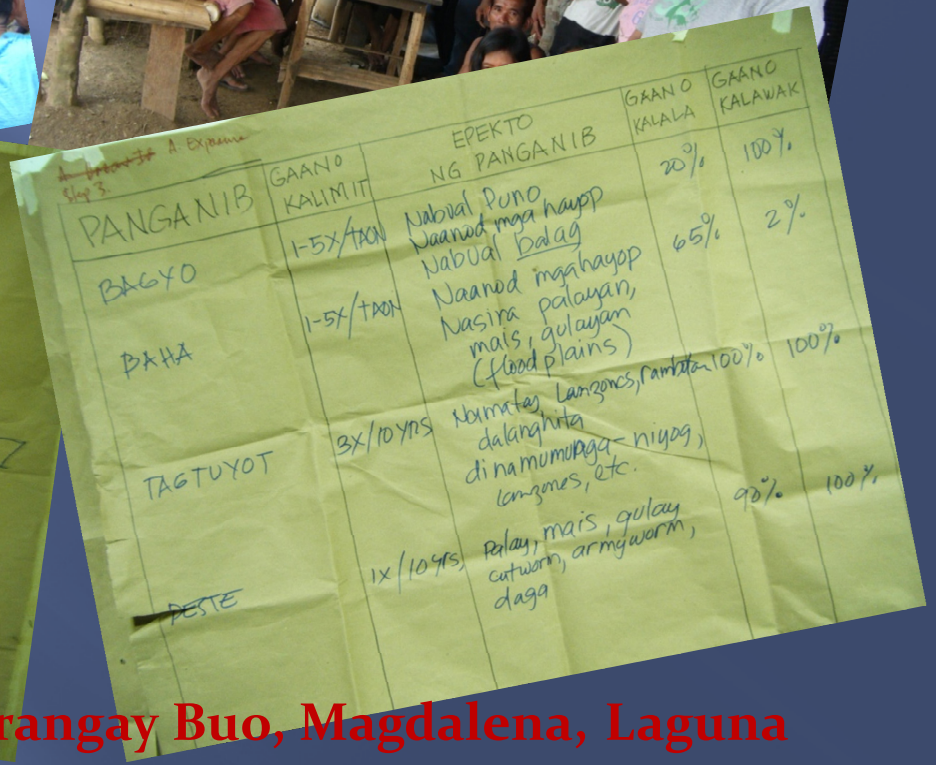
Variables	Typhoon	Heavier rain	Flood	Drought	Landslide	Frost	Others
Scores							
Exposure (ES)							
Sensitivity (SS)							
Adaptive Capacity (ACS)							
Maximum Scores							
Exposure (MES)	5	5	5	5	5	5	5
Sensitivity (MSS)	10	10	10	10	10	10	10
Adaptive Capacity (MACS)	45	45	45	45	45	45	45
Indices							
Exposure (EI)							
Sensitivity (SI)							
Adaptive Capacity (ACI)							
Potential Impact Index (PII)							
Vulnerability Index							
Over-all Vulnerability Index*							

* Average of all the vulnerability indices of climate hazards identified

Qualitative Interpretation of Vulnerability Index

Index Value	Qualitative Interpretation
0.80 - 1.00	Extremely resilient
0.50 - 0.79	Highly resilient
0.20 - 0.49	Moderately resilient
-0.19 - 0.19	Vulnerable
-0.49 - -0.20	Moderately vulnerable
-0.79 - -0.50	Highly vulnerable
-1.00 - -0.80	Extremely vulnerable

Pretesting



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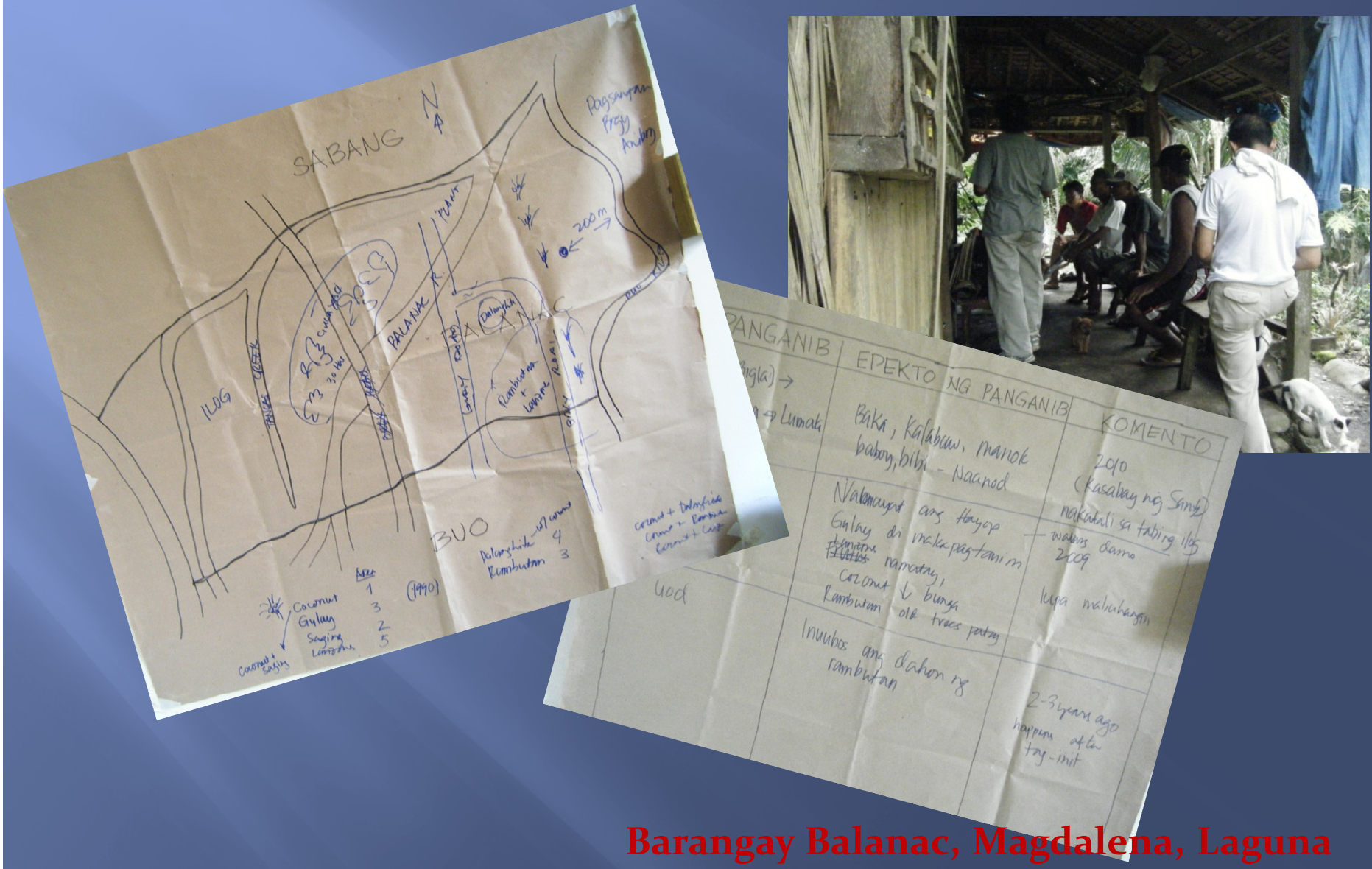
Pretesting



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Comparison of Vulnerabilities of Two Sites

Variables	Buo				Alipit			
	Typhoon	Flood	Drought	Pests	Typhoon	Flood	Drought	Pests
Scores								
Exposure	5	5	3	1	5	5	2	1
Sensitivity	4.5	3	5	3	4.5	2.5	3	4
Adaptive Capacity	23	21	22	26	40	35	40	40
Maximum Scores								
Exposure	5	5	5	5	5	5	5	5
Sensitivity	5	5	5	5	5	5	5	5
Adaptive Capacity	45	45	45	45	45	45	45	45
Indices								
Exposure	1.0	1.0	0.6	0.2	1.0	1.0	0.4	0.2
Sensitivity	0.9	0.6	1.0	0.6	0.9	0.5	0.6	0.8
Potential Impact	1.0	0.8	0.8	0.4	1.0	0.8	0.5	0.5
Adaptive Capacity	0.5	0.5	0.5	0.6	0.9	0.8	0.9	0.9
Vulnerability Index	-0.4	-0.3	-0.3	0.2	-0.1	0.0	0.4	0.4
Over-all Vulnerability Index*	-0.23				0.19			
	Moderately vulnerable				Vulnerable			

Conclusion

- Assessment of vulnerability of a community to climate change can be conducted using participatory methods
- Vulnerability to climate change can be measured using an index, which is useful for comparison purposes
- Assessment at the municipal level must be explored

Maraming Salamat Po !!!

Are you vulnerable to the hazards of climate change?