Insights, Lessons and Challenges from A TRANSDISCIPLINAL ASSESSMENT OF CLIMATE CHANGE – RELATED VULNERABILITY

Building Capacity to Adapt to Climate Change in Southeast Asia

MARIA EMILINDA T. MENDOZA

Assistant Professor

University of the Philippines Los Baños

SEARCA AGRICULTURE AND DEVELOPMENT SEMINAR SERIES
SEARCA, UPLB
August 13, 2013

IDRC CRDI

ECONOMY AND ENVIRONMENT PROGRAM FOR SOUTHEAST ASIA

SEAMEO SEARCA

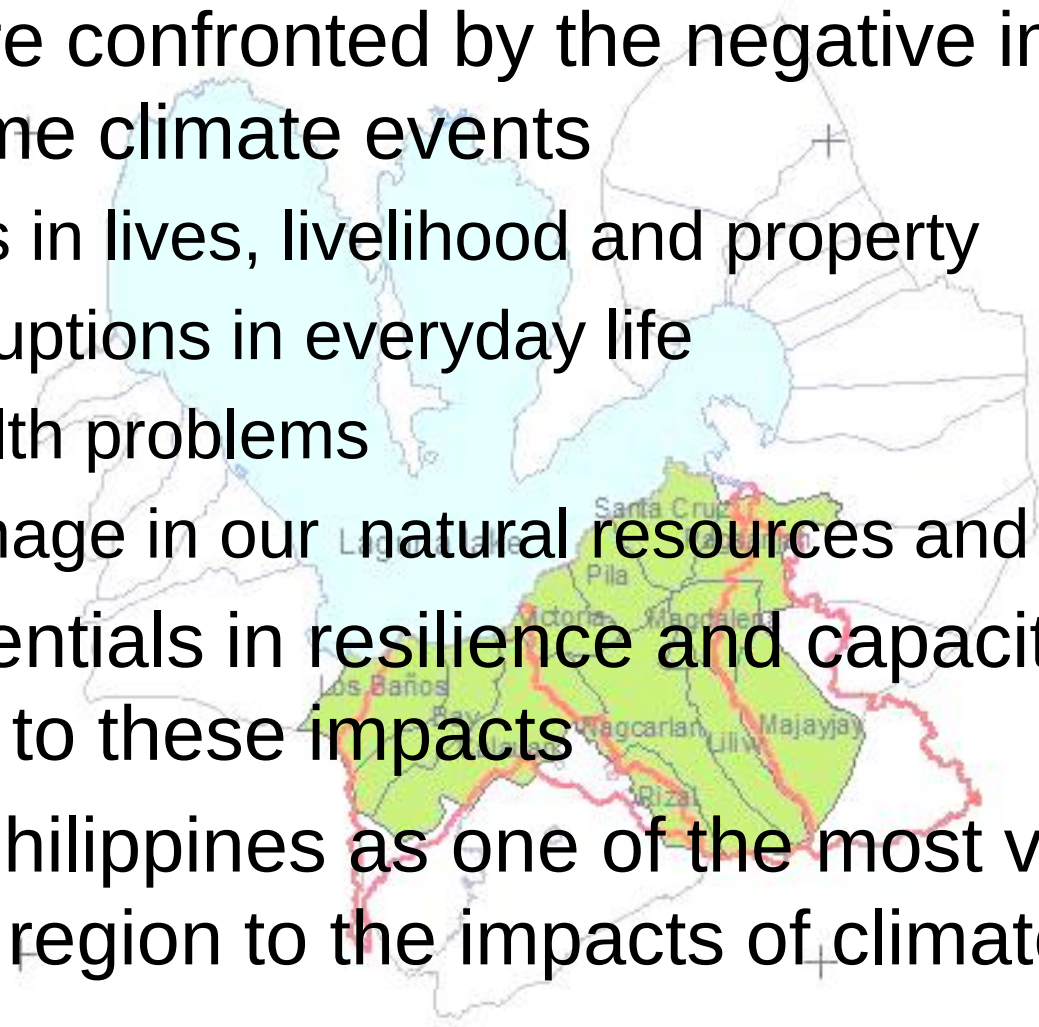
UNIVERSITY OF THE PHILIPPINES LOS BAÑOS

Outline

I. Introduction
II. Project Research Goal and Objectives
III. The Approach
IV. The Methods
V. Significant Findings
VI. Insights, Lessons and Challenges
VII. Recommendations

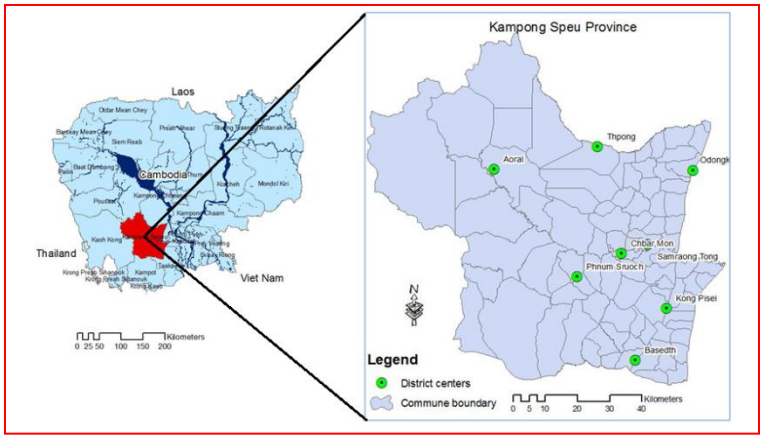
Introduction: The Impetus

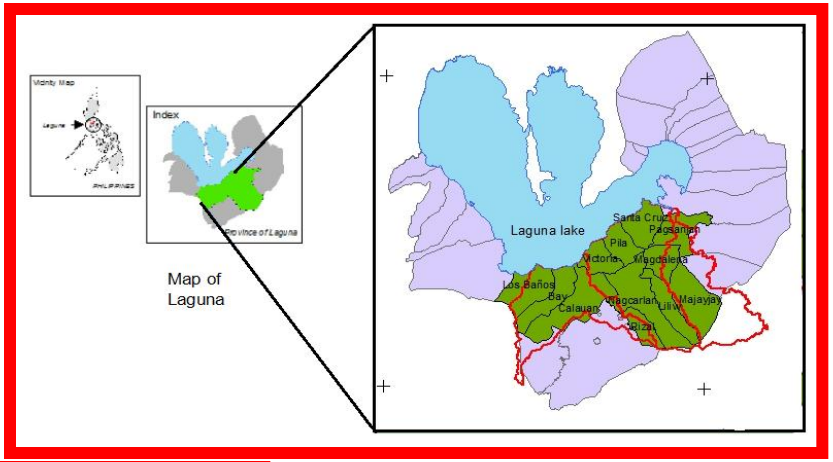
- We are confronted by the negative impacts of extreme climate events
  - Loss in lives, livelihood and property
  - Disruptions in everyday life
  - Health problems
  - Damage in our natural resources and biodiversity
- Differentials in resilience and capacities to adapt to these impacts
- The Philippines as one of the most vulnerable in the region to the impacts of climate change

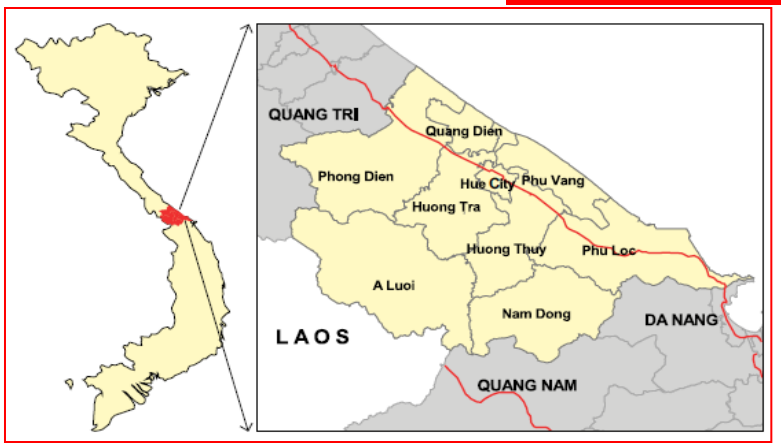


Introduction: Project Brief

"Building Capacity to Adapt to Climate Change in Southeast Asia"





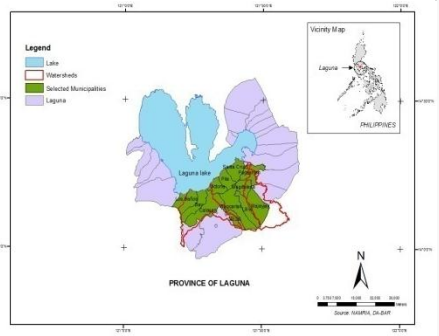


Introduction: Project Brief

Table 3. Total number of districts and barangays/ commune included in the vulnerability assessment

Study site	Number of districts/ municipalities	Number of barangays/ communes
Kampong Speu, Cambodia	7	82
Laguna, Philippines (3 watersheds)	**12**	**194**
Thua Thien Hue, Vietnam	9	152
Total	28	428

The Study Site



- Watershed approach
- proposed watershed includes municipalities that have experienced flooding and heavy typhoon damages in recent years
- chosen watershed will include the agricultural area of Laguna

Province of Laguna

- 30 municipalities
  - 676 barangays
- 1,760 km^2
- 2007 Population: 2, 473, 530

The Study Site

- ✓ 12 municipalities
  - ✓ 274 → 194 barangays
- ✓ 568 km^2
- ✓ 2007 population: 568, 690 (23% share)

Laguna Lake:

- largest living lake in Southeast Asia
- 90,000 ha
- serves as a catchment basin for 21 major tributaries with a total catchment area of 45,000 km^2
- Seventeen of the tributaries draining to the lake are within Laguna
- has only a single outlet into Manila Bay through the Napindan Channel

Why Laguna?

- The selection of Laguna as the project area of this study is based on two key reasons:
  1) its being among the top ten provinces vulnerable to climate change hazards;
  2) the province having made headway in responding to the expected risks of climate change through its development, adoption and implementation of a Disaster Risk Reduction Management (DRRM) program.
- Despite this program and initiative, however, the Province still experience huge damages from flooding, heavy rains and strong typhoons

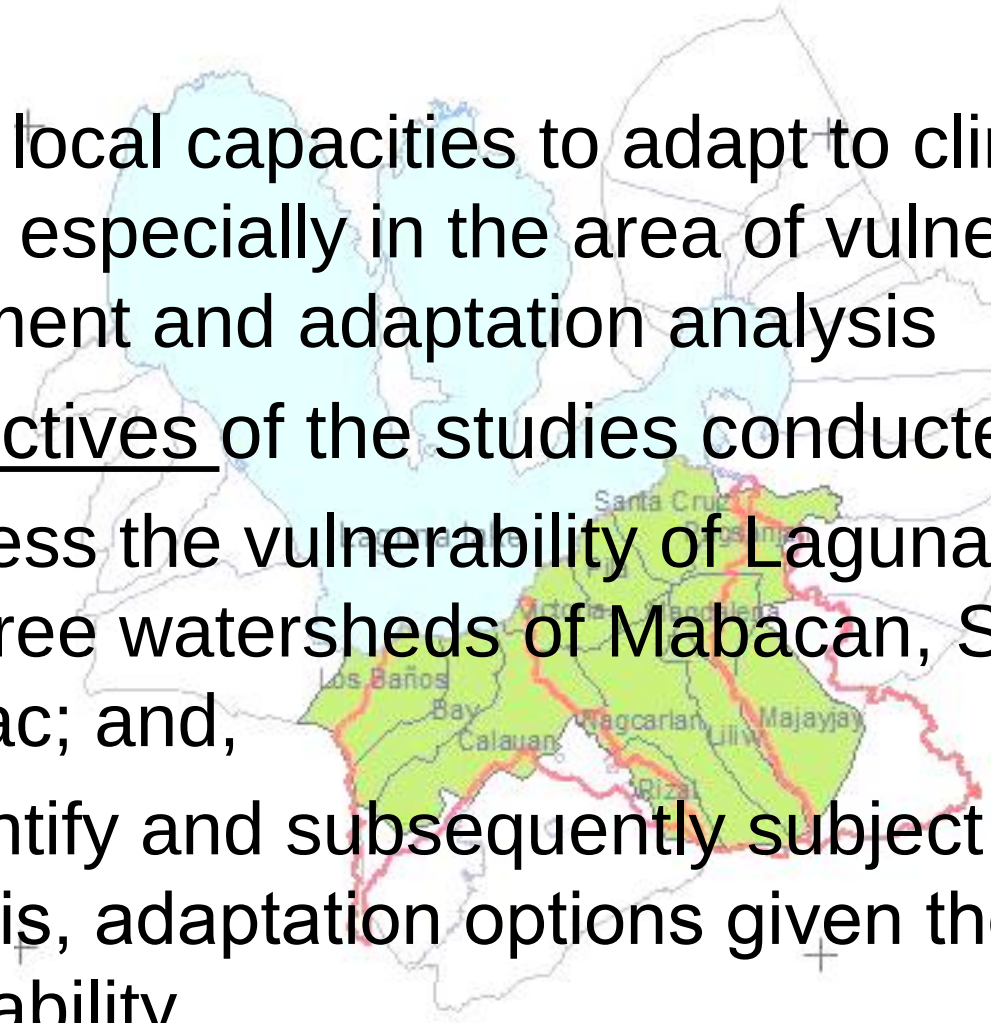
Project Goal and Objectives

Goal:

- To build local capacities to adapt to climate change, especially in the area of vulnerability assessment and adaptation analysis

Main objectives of the studies conducted:

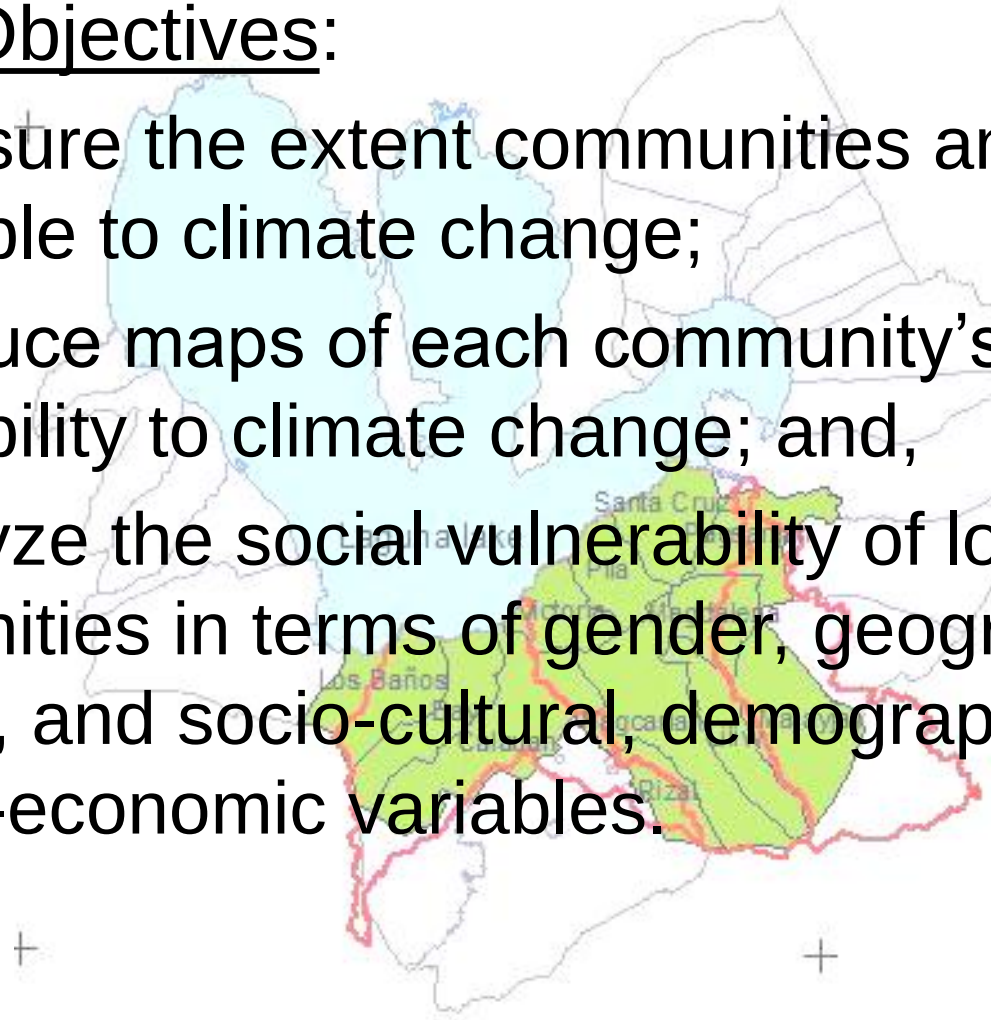
1) to assess the vulnerability of Laguna covered by the three watersheds of Mabacan, Sta. Cruz and Balanac; and,
2) To identify and subsequently subject to economic analysis, adaptation options given the site's major vulnerability



Project Goal and Objectives

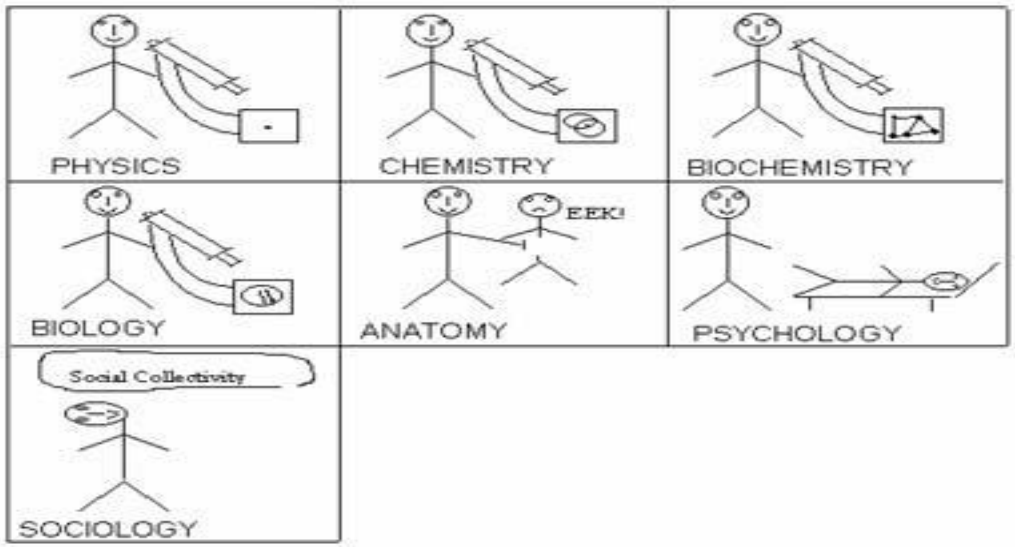
Specific Objectives:

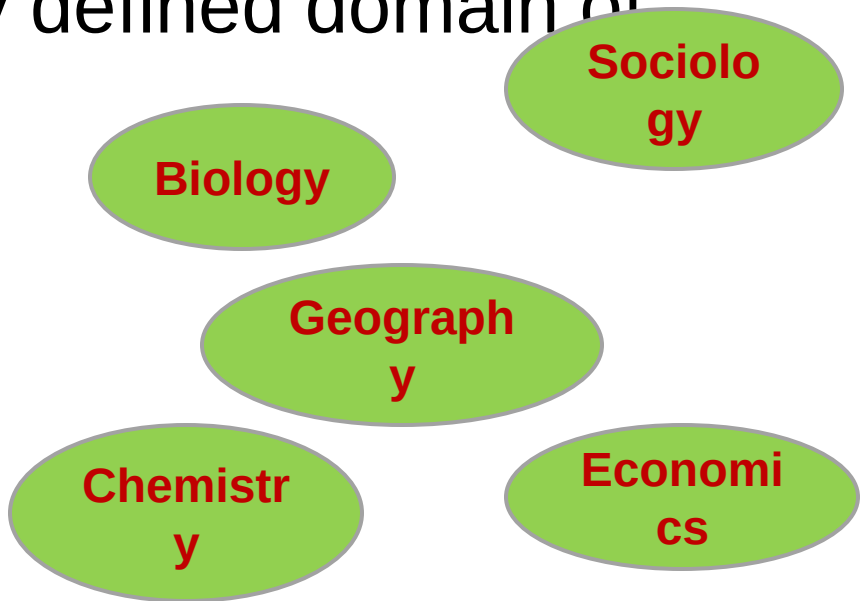
- To measure the extent communities and HHs are vulnerable to climate change;
- To produce maps of each community's relative vulnerability to climate change; and,
- To analyze the social vulnerability of local communities in terms of gender, geographic location, and socio-cultural, demographic and political-economic variables.



Disciplinary approach:

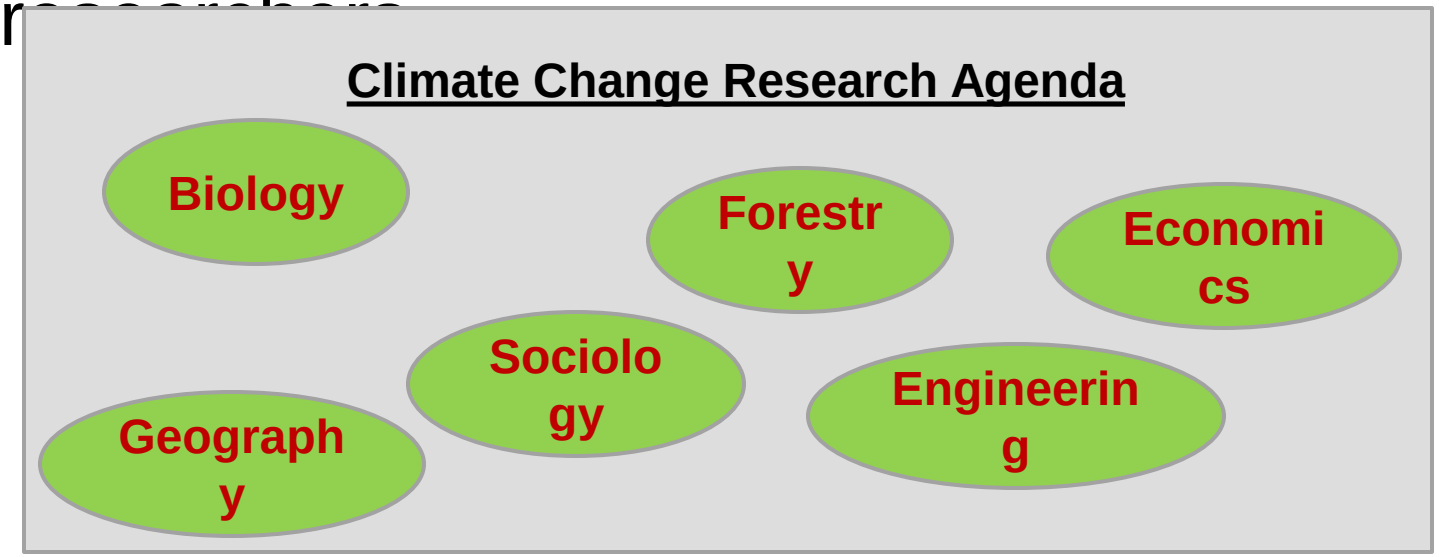
- Disciplinarity refers to the specialization and fragmentation of academic disciplines especially since the 19th century.
- Each discipline has its own concepts, definitions, and methodological protocols for the study of its precisely defined domain of





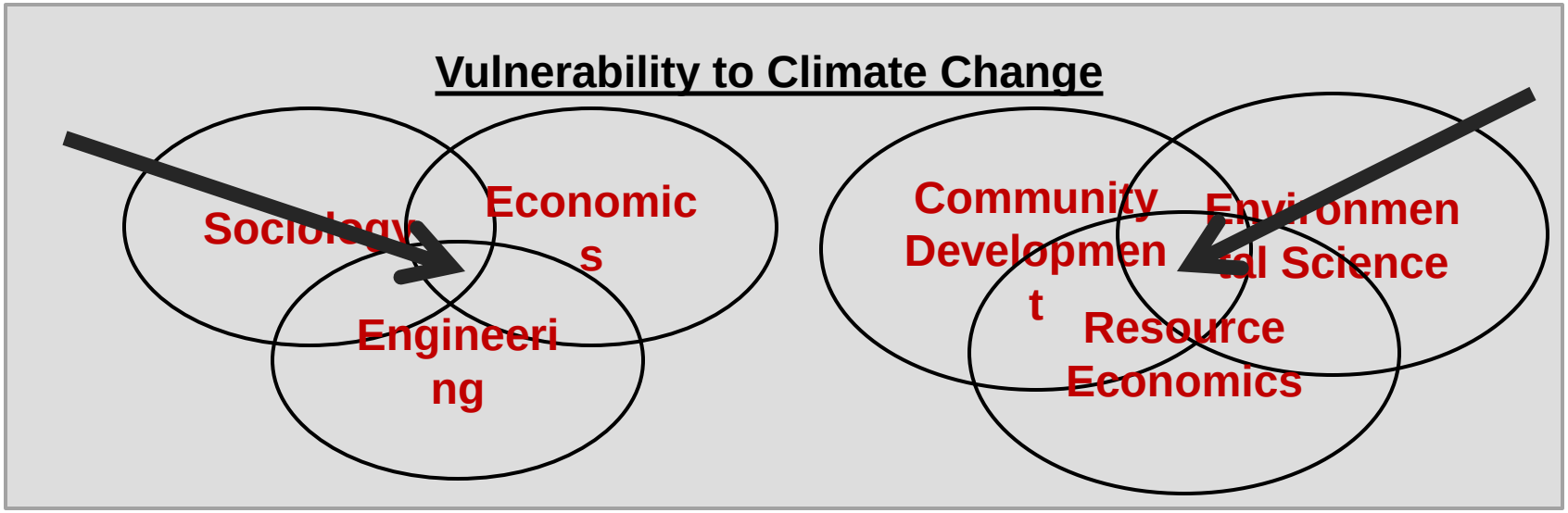
Multidisciplinary approach:

- Multi-disciplinary refers to an additive research agenda in which each researcher remains within his or her discipline and applies its concepts and methods without necessarily sharing a common goal with other r



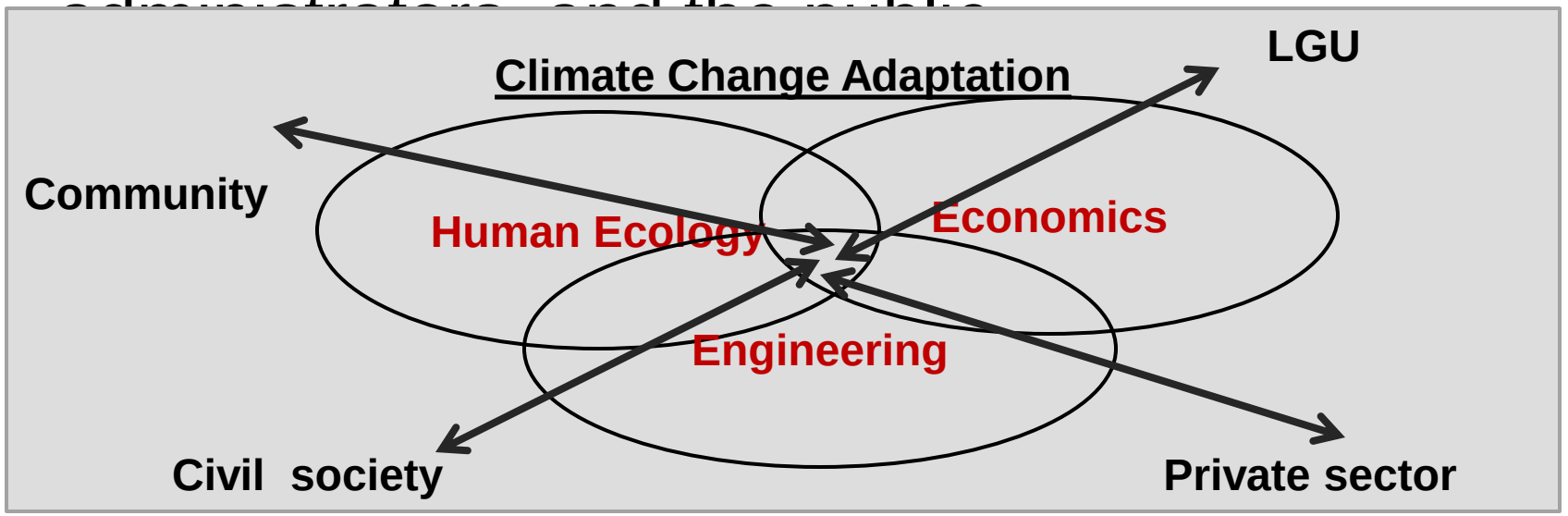
Interdisciplinary approach:

- Interdisciplinary studies are those in which concerted action and integration are accepted by researchers in different disciplines as a means to achieve a shared goal that usually is a common subject of study.



Transdisciplinal approach:

- Transdisciplinary contributions incorporate a combination of concepts and knowledge not only used by academics and researchers but also other actors in civic society, including representatives of the private sector, public



Where we were..

Year 1	Year 2	Year 3
VULNERABILITY ASSESSMENT	ECONOMIC ANALYSIS OF ADAPTATION	ADAPTATION PROPOSAL WRITING

TRAINING AND RESEARCH → TRAINING

- Barangay Vulnerability Index
- HH Vulnerability Analysis
- Vulnerability Maps

- Cost-effectiveness Analysis
- Benefit-Cost Analysis
- Multi-criteria Analysis

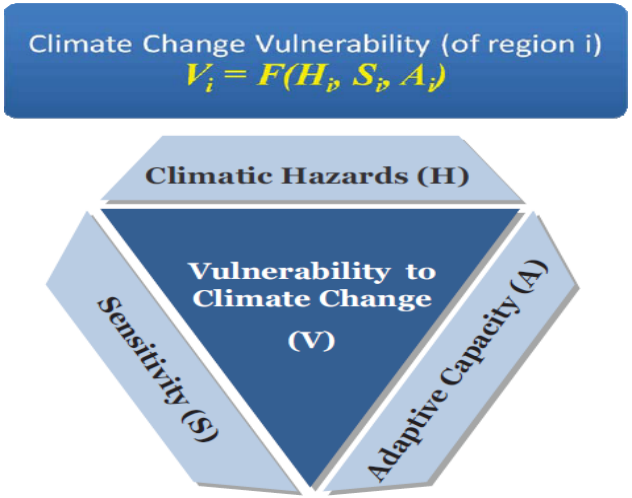
Sharing and Dissemination of Project Results

Social and Gender

Participation from local officials, communities and stakeholders → LGU point persons

Conceptual Framework

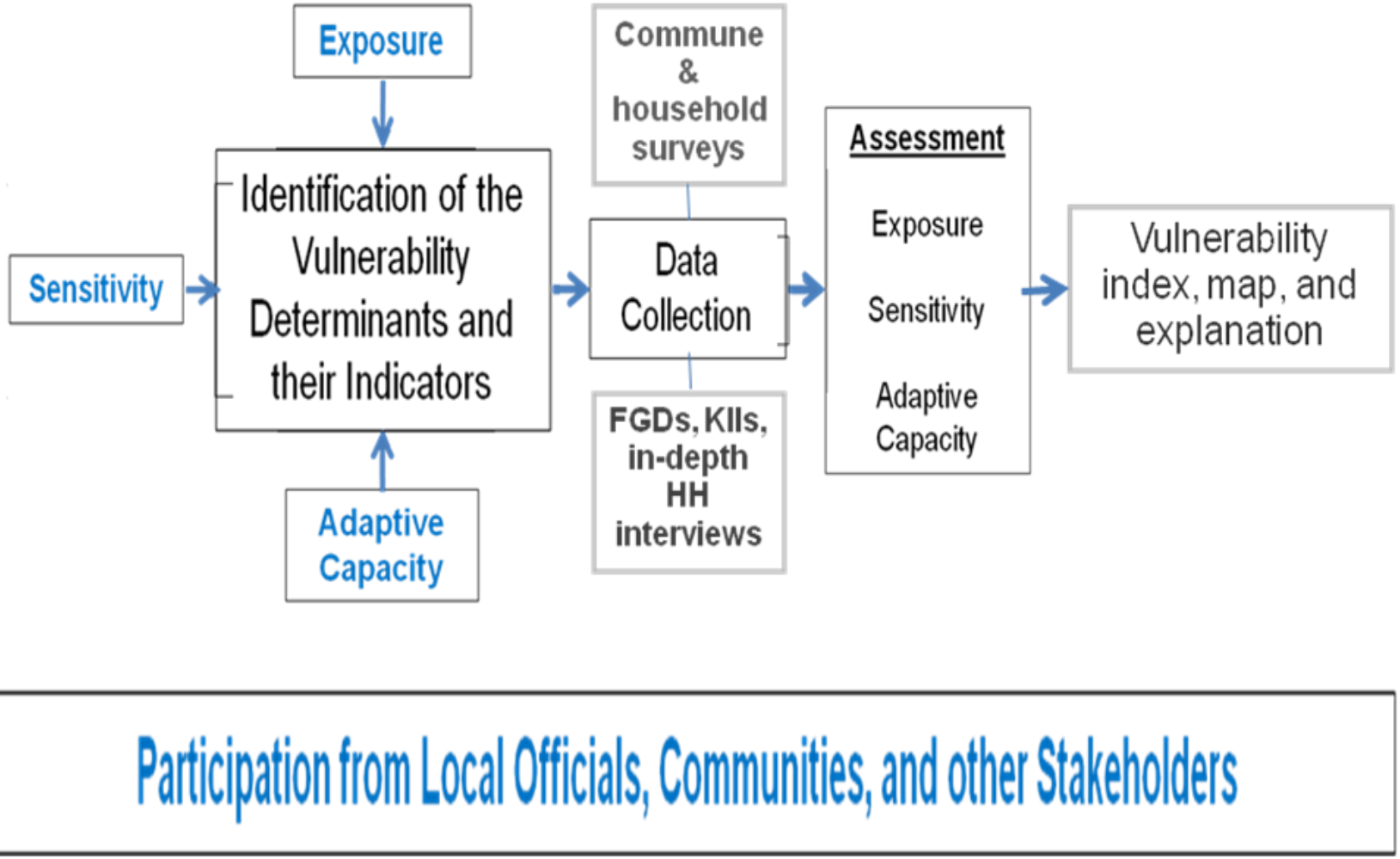
- *Vulnerability =(Exposure , Sensitivities , and Adaptive Capacity)*



(Adger et al. 2007; Yusuf and Francisco, 2009)

- E, S and AC have a socio-political and cultural character
- ***Social vulnerability***
  - focuses on demographic and socioeconomic factors that increase or alleviate the impacts of hazard events on local populations (Tierney et al., 2001)

The Approach



The Methods


Identification of indicators and assignment of weights

- ROL
- FGDs
- KIIs

Household Vulnerability

- Survey: 600 HHs
- Indicator Approach
- Vulnerabi
  Expected
  (VEP)

Barangay Vulnerability

- Survey: 94 barangays
- Indicator Approach

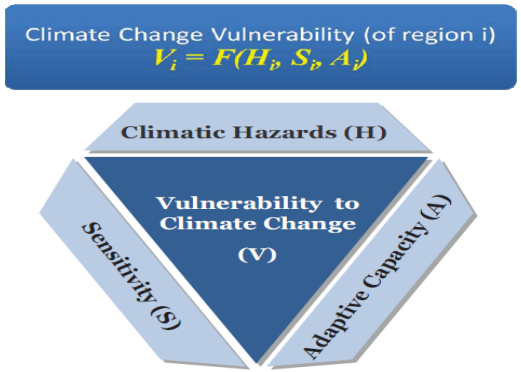
g


Social Vulnerability

+ 30 In-depth study
+11 Case studies
+6 FGDs


Conceptual Framework

- *Vulnerability =(Exposure , Sensitivities , and Adaptive Capacity)*



Adger, 2006

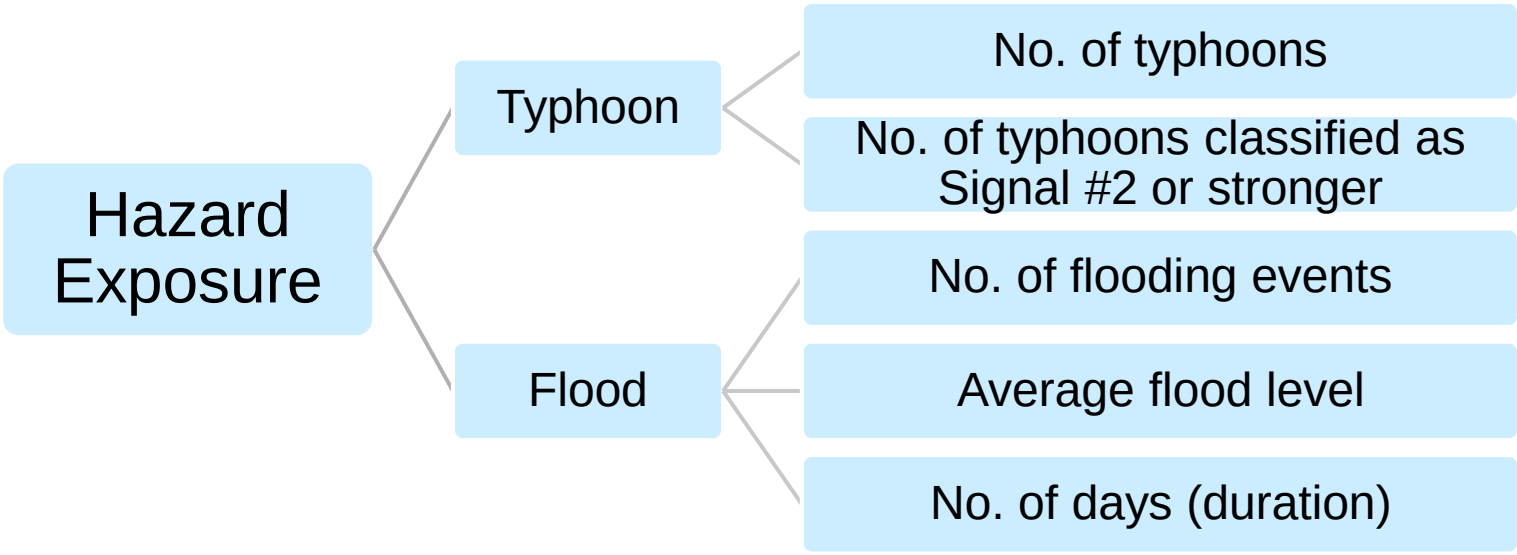
- E, S and CA have a socio-political and cultural character

EXPOSURE / HAZARD
- Typhoon
- Flood

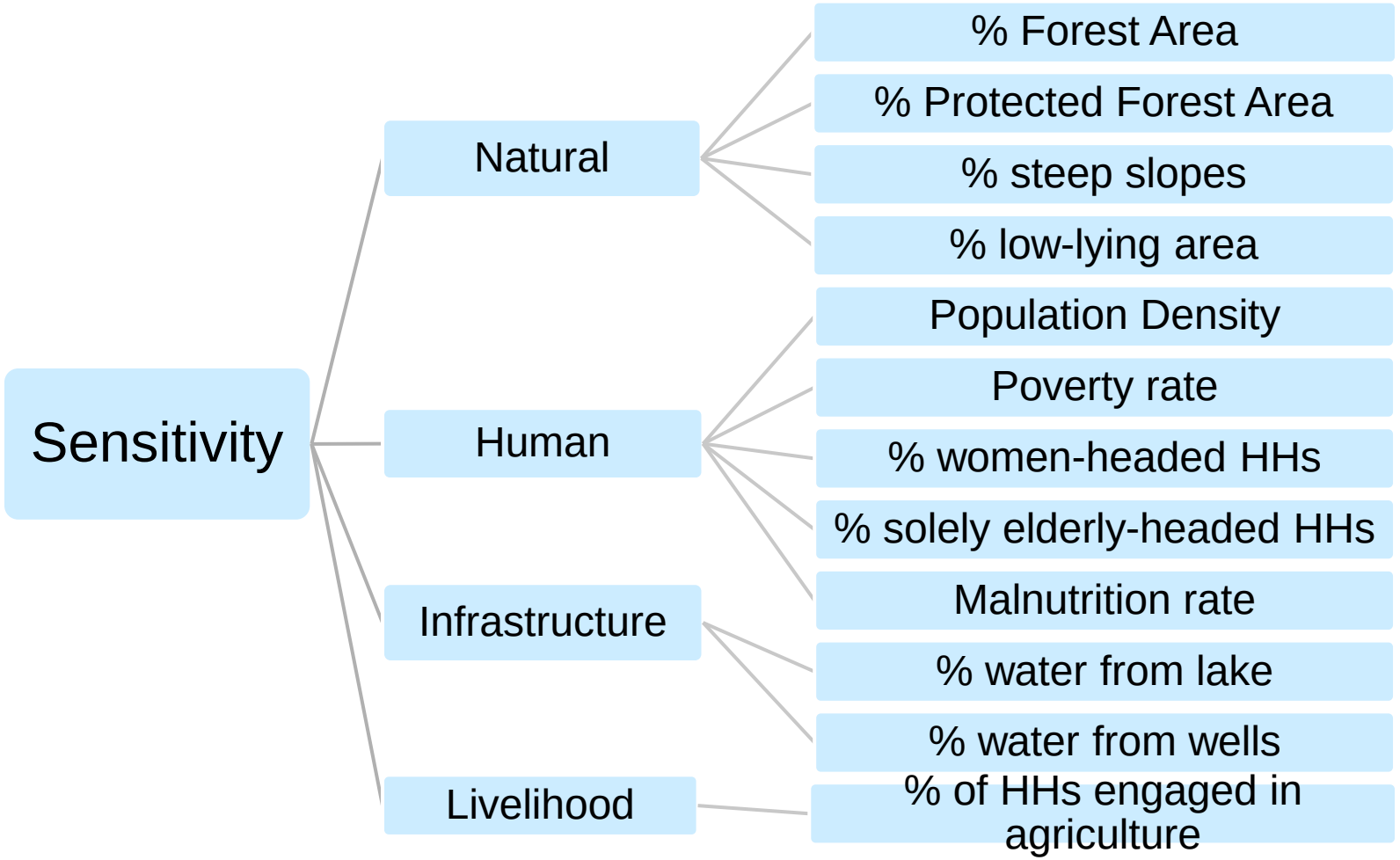
SENSITIVITY
- Natural
- Human
- Infrastructure
- Livelihood

ADAPTIVE CAPACITY
- Infrastructure
- Economic
- Technology
- Social
- Human

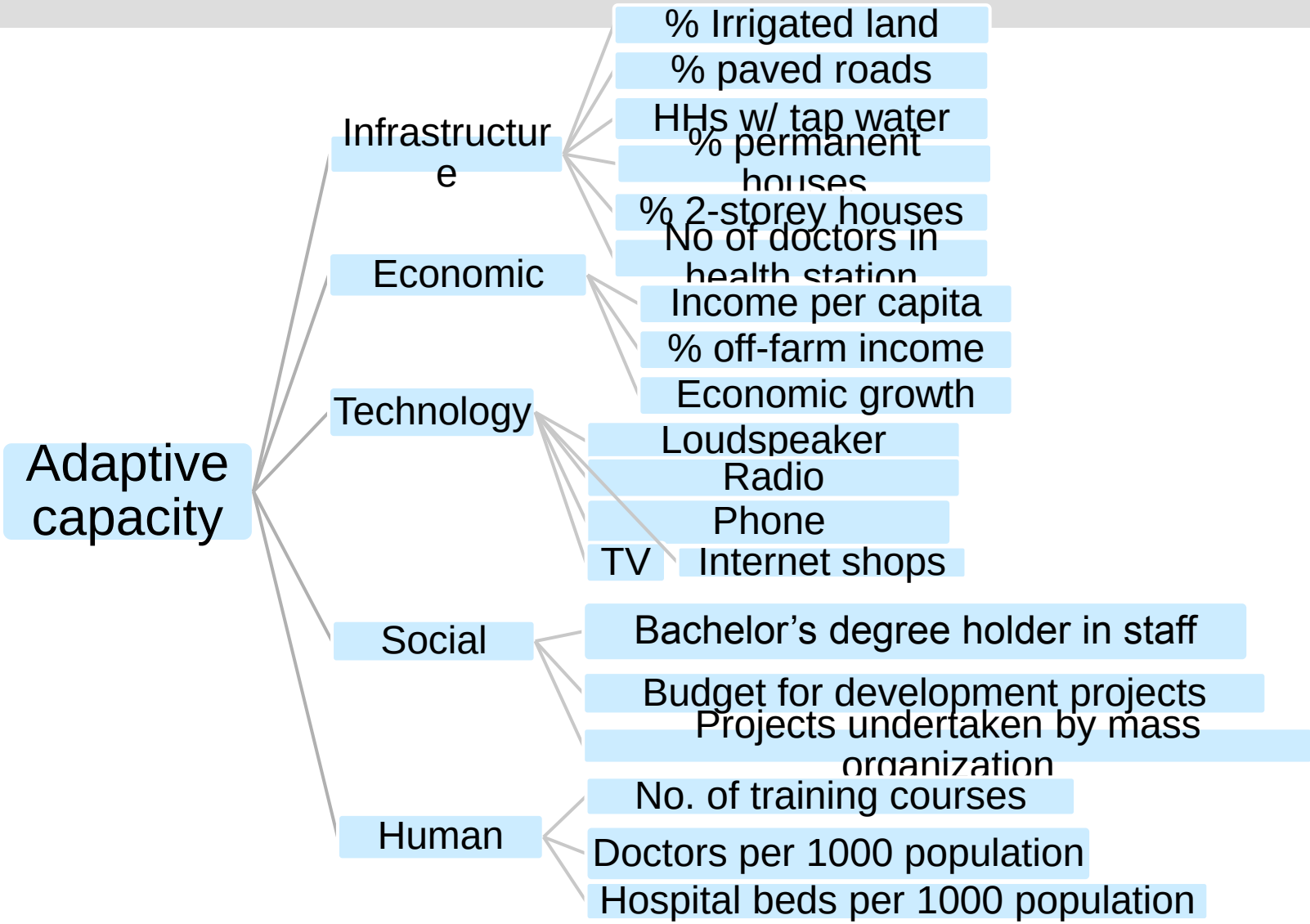
Indicators of Barangay Vulnerability



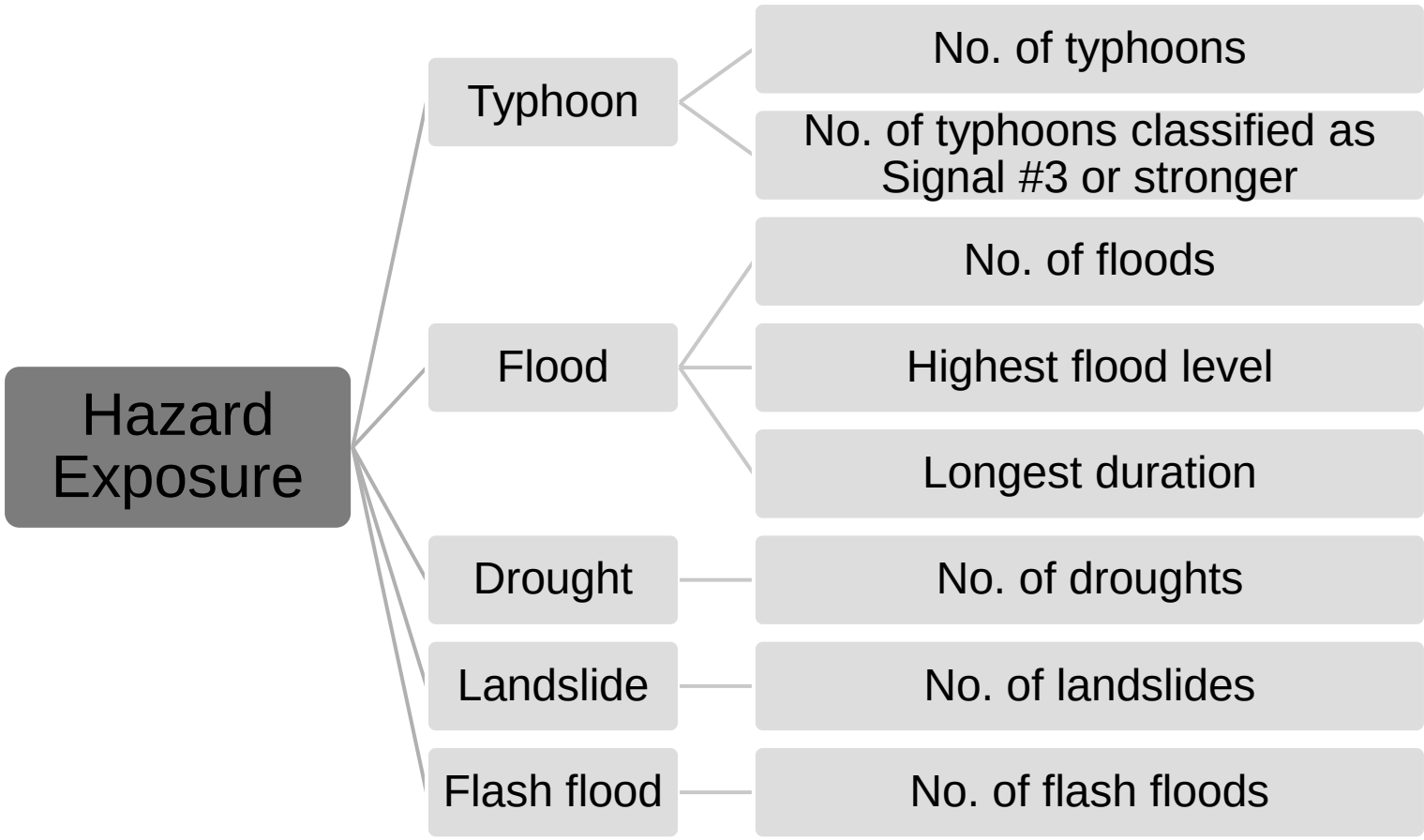
Indicators of Barangay Vulnerability



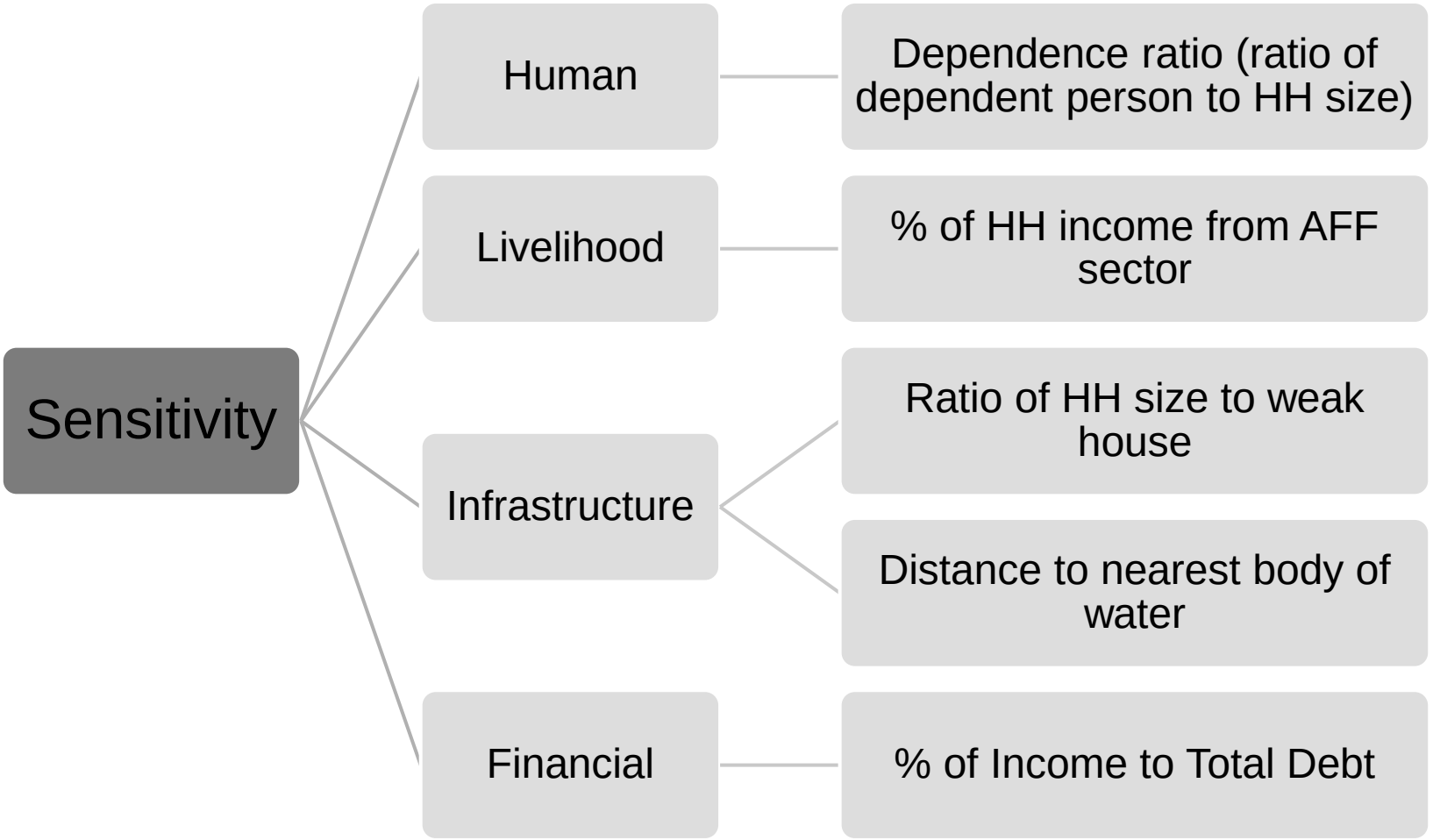
Indicators of Barangay Vulnerability



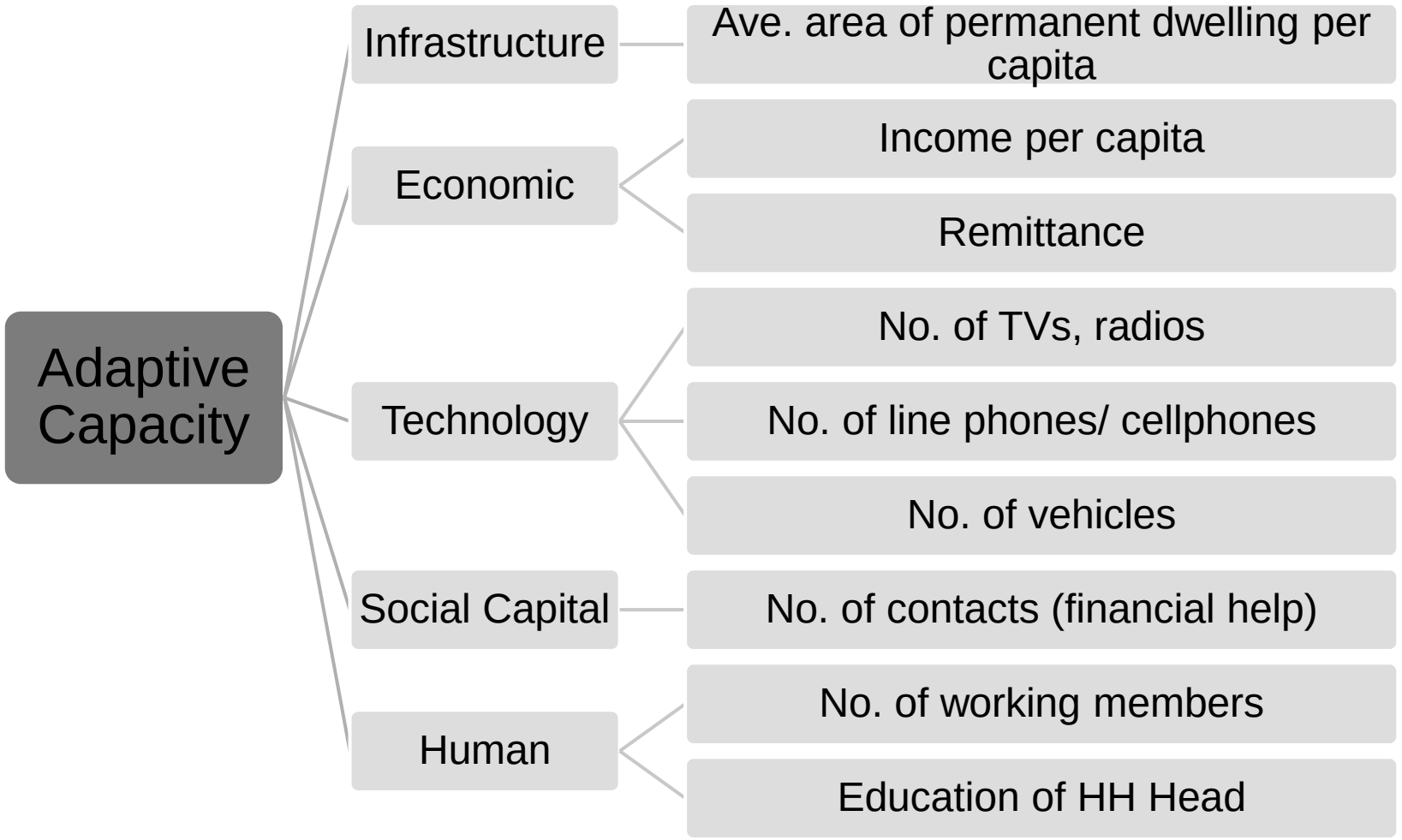
Indicators of HH Vulnerability



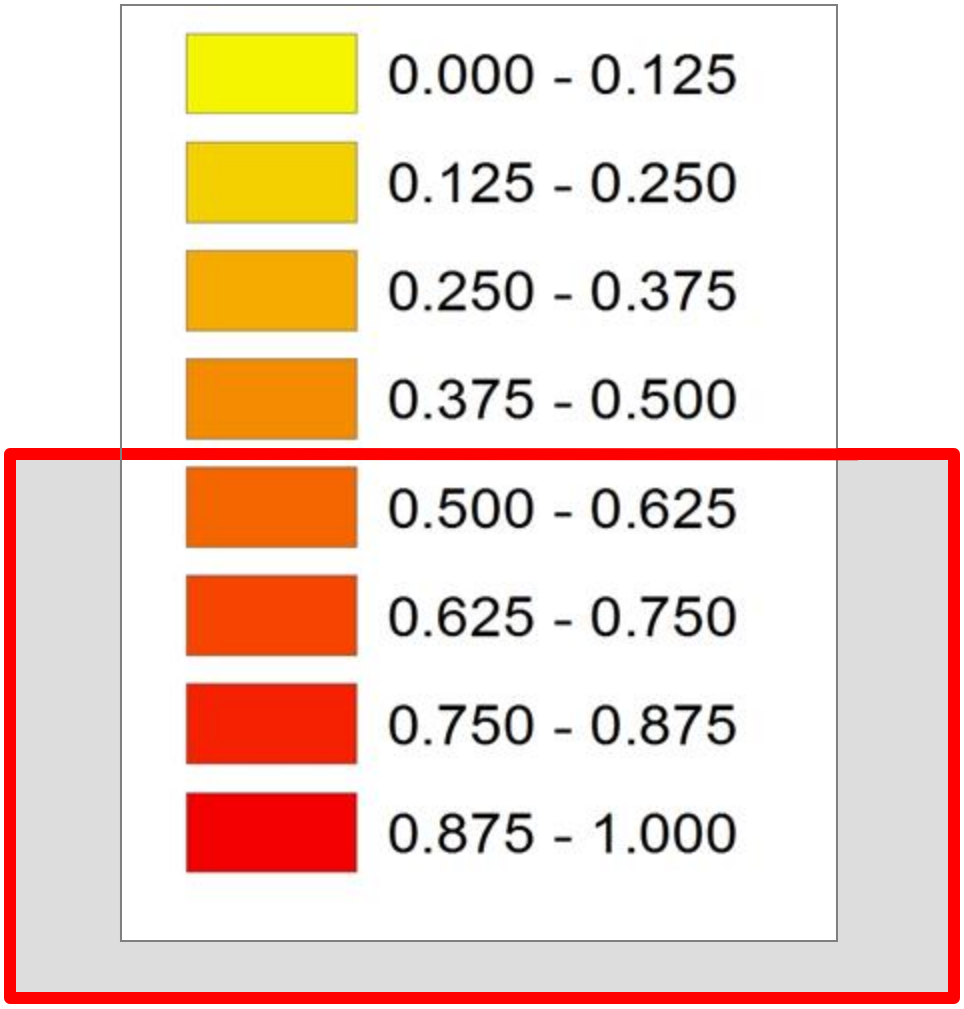
Indicators Used



Indicators Used



Barangay Vulnerability Index



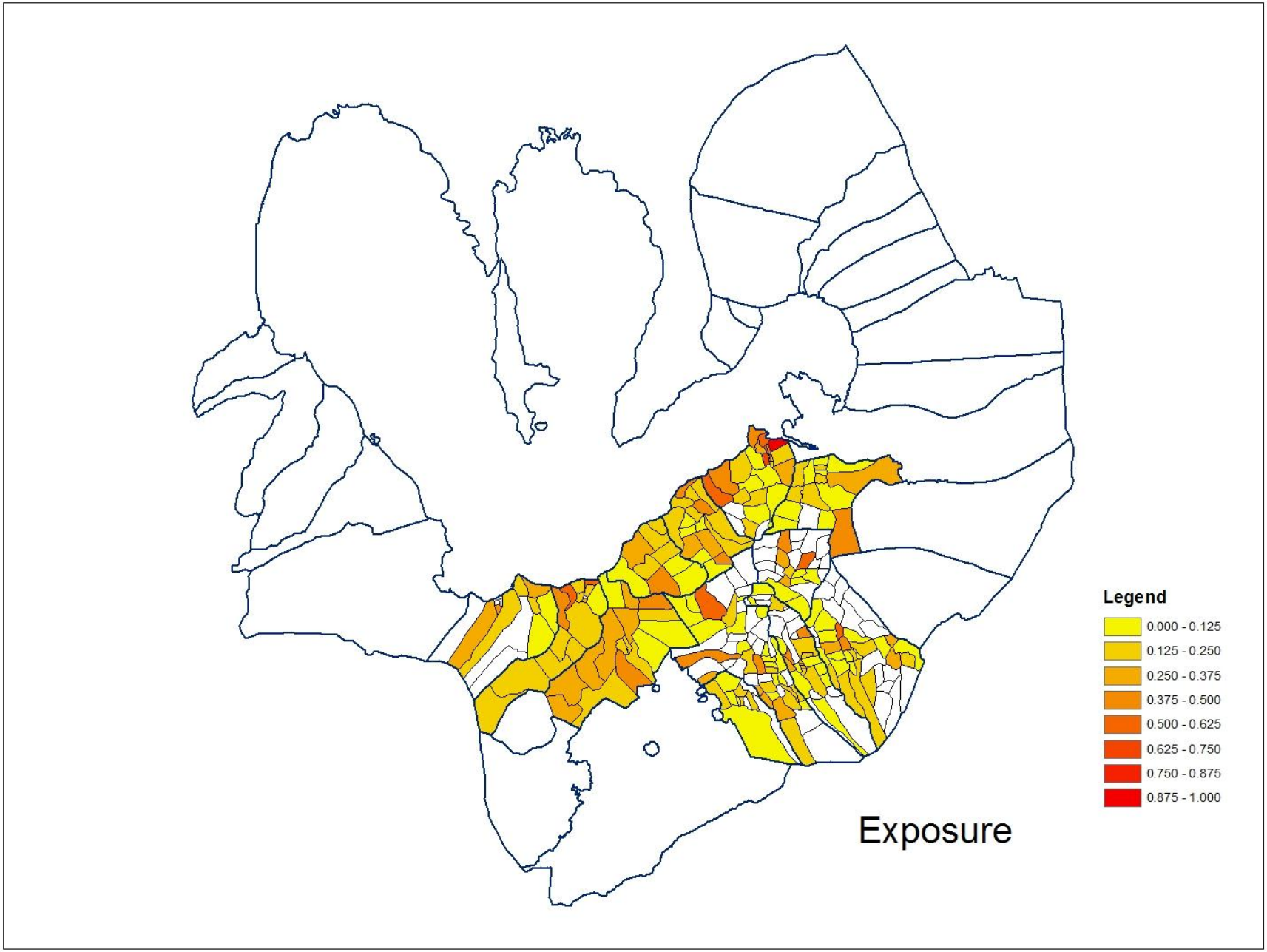
Vulnerable barangays are those within this range

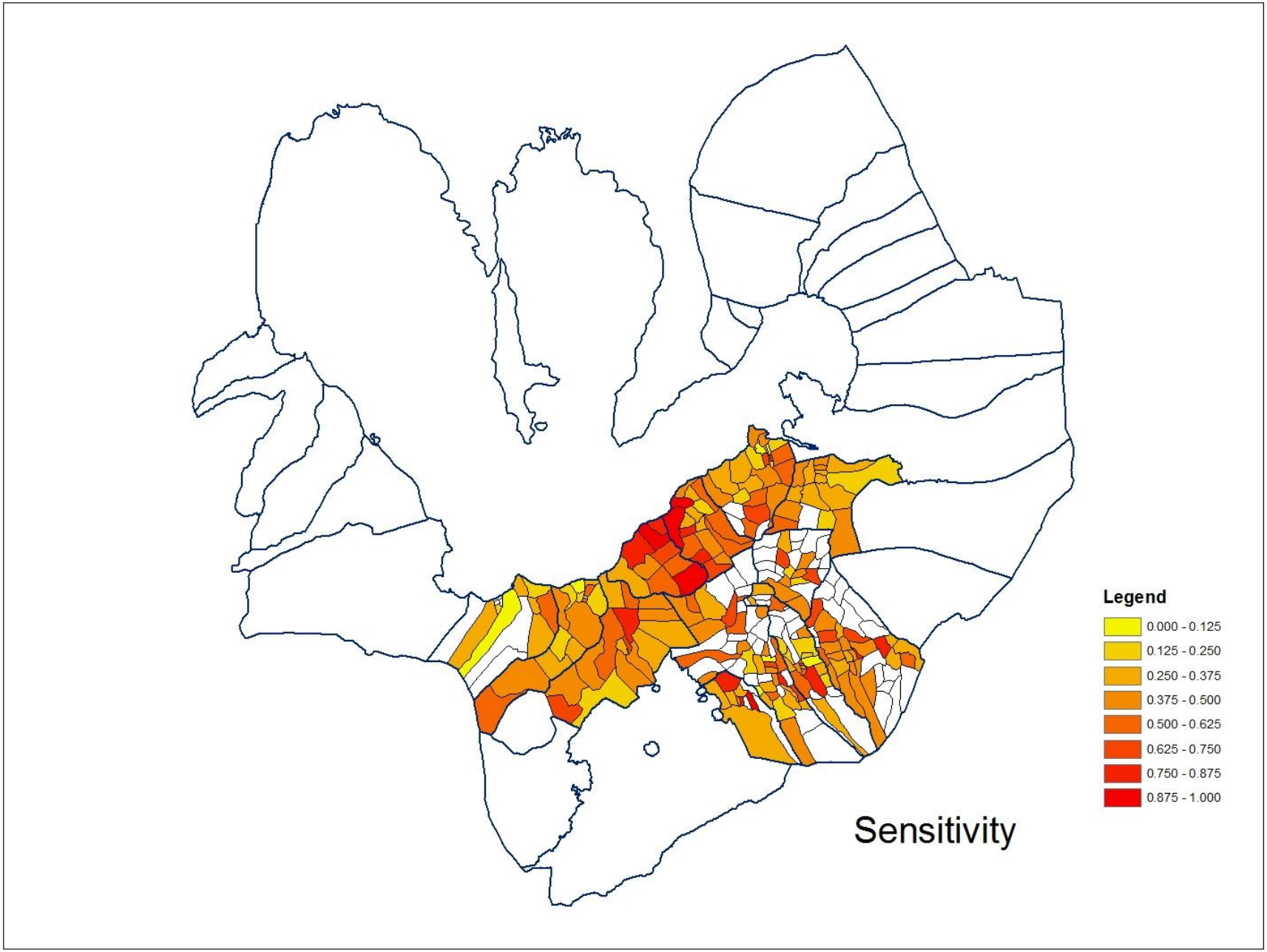
HH Vulnerability Analysis

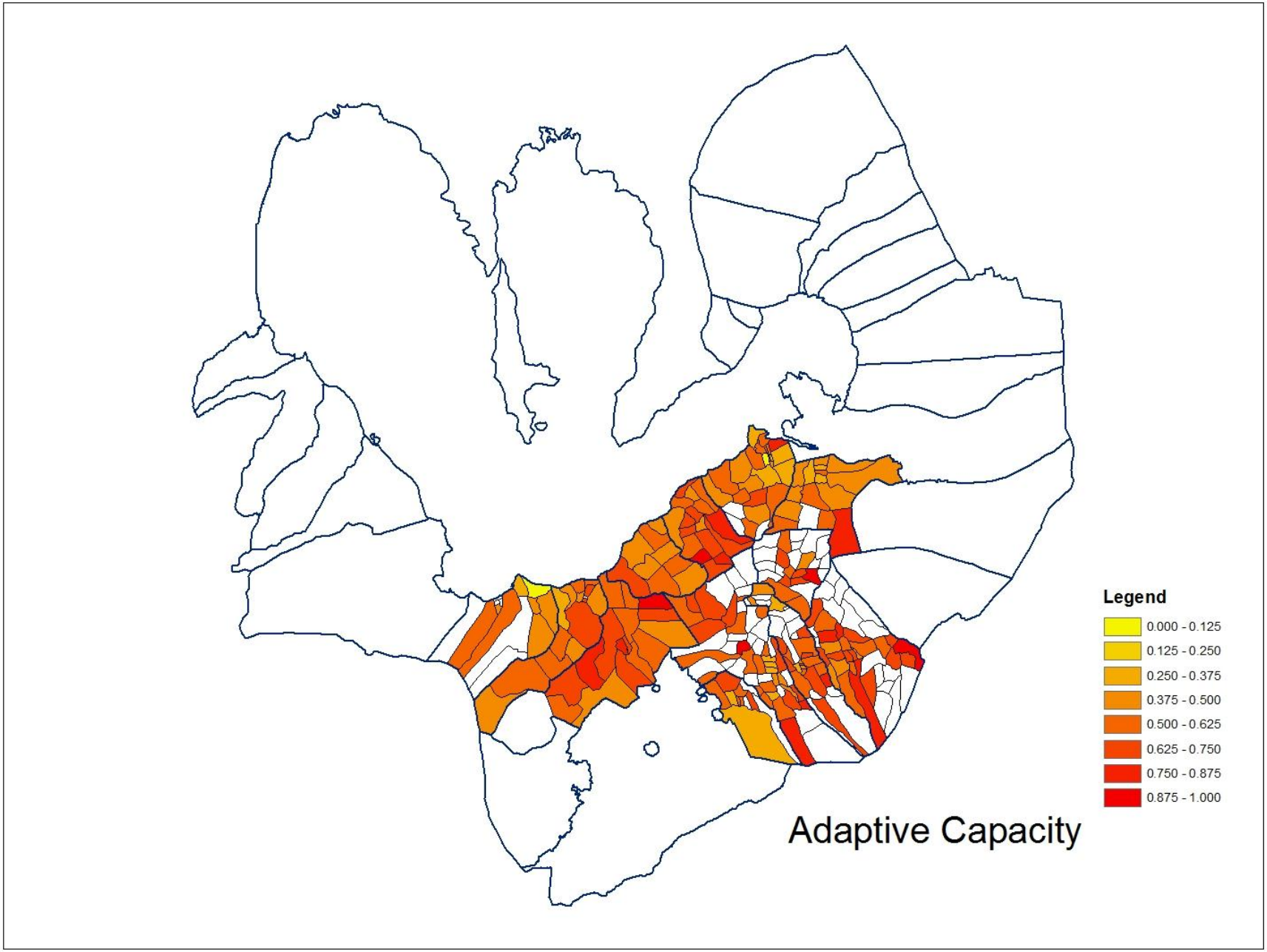
HH Category	VI/VEP Value
Not vulnerable	0.00 – 0.49
Moderately vulnerable	0.50 – 0.79
Highly vulnerable	0.80 – 1.00

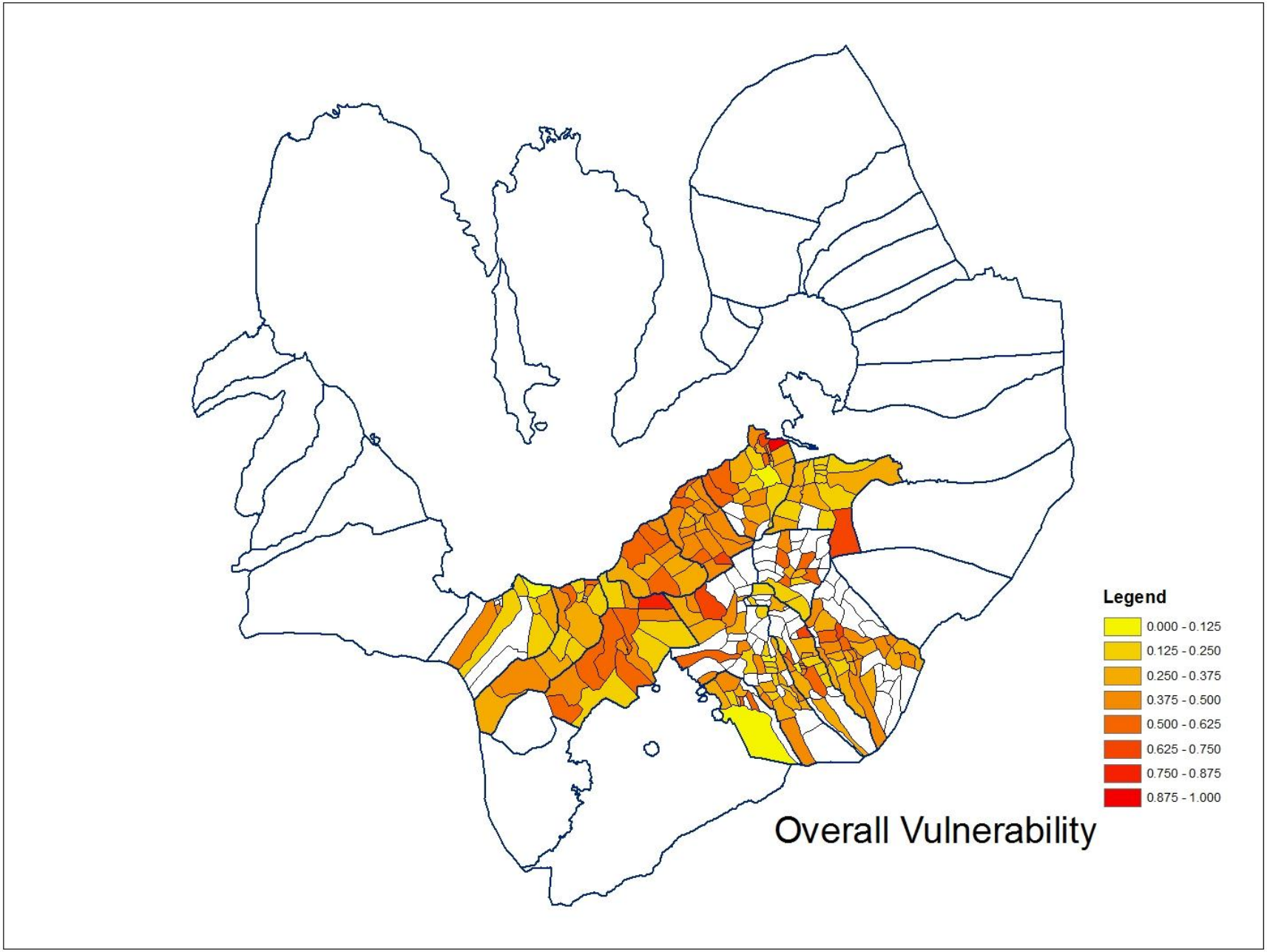
Findings: Barangay Vulnerability

	BARANGAY / COMMUNE		
Determinants	**No. of Vulnerable Municipalities**	**No. of Vulnerable Barangays**	**Most Vulnerable Barangay**
EXPOSURE	**5**	**10**	**San Pablo Norte, Sta. Cruz**
SENSITIVITY	**12**	**60**	**Pinagbayanan, Pila**
ADAPTIVE CAPACITY	**12**	**131**	**Ilayang Atingay, Magdalena**
OVERALL	**11**	**37**	**San Pablo Norte of Sta. Cruz**


Legend
0.000 - 0.125
0.125 - 0.250
0.250 - 0.375
0.375 - 0.500
0.500 - 0.625
0.625 - 0.750
0.750 - 0.875
0.875 - 1.000
Exposure


Legend
0.000 - 0.125
0.125 - 0.250
0.250 - 0.375
0.375 - 0.500
0.500 - 0.625
0.625 - 0.750
0.750 - 0.875
0.875 - 1.000
Sensitivity


Legend
0.000 - 0.125
0.125 - 0.250
0.250 - 0.375
0.375 - 0.500
0.500 - 0.625
0.625 - 0.750
0.750 - 0.875
0.875 - 1.000
Adaptive Capacity


Legend
0.000 - 0.125
0.125 - 0.250
0.250 - 0.375
0.375 - 0.500
0.500 - 0.625
0.625 - 0.750
0.750 - 0.875
0.875 - 1.000
Overall Vulnerability

Who are vulnerable?

- Barangay/ Community vulnerability in the province of Laguna is obviously a function of exposure of varying human ecosystems to typhoons and floods, with coastal barangays having a higher exposure to flooding and prolonged inundation.

- However, it is also significant to note that human, social and economic sensitivity to these hazards also has major contributions to overall vulnerability.

For instance…

- 8 barangays within the study site were not found to be highly exposed yet they are among the 20 most vulnerable barangays.
  - Anibong in Pagsanjan (7th)
  - Masapang and Nanhaya in Victoria (10th and 15th)
  - San Isidro and Masiit in Calauan (12th and 20th)
  - Bukal and Pinagbayanan in Pila (14th and 18th)
  - and Ibabang Butnong in Magdalena (17th)
- The examination of their vulnerability indicates that their high vulnerability can be attributed more either to human, social and economic indicators of sensitivity and/or low adaptive capacity of the communities.

For instance…

- Barangay Pinagbayan in the municipality of Victoria ranked highest in terms of sensitivity but slides to 79th in terms of exposure (ranks 18th in overall).

- Its vulnerability is clearly a function of its sensitivity as indicated by its sensitivity in terms of infrastructure and human indicators, poverty, as well as its significant number of women and elderly-headed households. It is also a predominantly agriculture-based community.

For instance…

- Barangay Dayap in the municipality of Calauan
  - equally exposed to typhoons, although relatively low in flooding, but which registered high in overall vulnerability.
  - A closer look of other indicators of vulnerability showed that, Barangay Dayap is one of the highest in malnutrition rates which is indicative of high sensitivity to the impact of climate change – led threats; it also has low adaptive capacity as a result of low scores on technological, social and human indicators.

For instance…

- Barangay San Isidro also in Calauan
  - vulnerability of which is due to high sensitivity as a result of having many women-headed households in a predominantly agricultural community.

Findings: Who are vulnerable?

- Households with high incidence of poverty
  - Large HHs
  - Low income
  - Livelihood activities affected by climate-related hazards and disasters
    - Agriculture-based (including rice farmers, vegetable /cash crop farmers; duck raisers)
    - Contractual labor / underemployed / seasonal laborers
- Agricultural Sector
- Informal Settlers
- Residents on / near lakeshore and rivers

Who are vulnerable? (HH Vulnerability)

- About 36% of the household respondents in Laguna can be considered vulnerable
- A large percentage of the vulnerable households do not have knowledge about climate change and its impacts, hence it is important to conduct information dissemination and education activities
- Majority of the vulnerable HH are headed by those working in the commercial & services sector and agriculture sector, hence it is strategic to focus interventions toward this sector and consider livelihood programs that can augment the income of the vulnerable HH in Laguna

Findings: Who are vulnerable?

- Communities /sectors vulnerable to floods and typhoons

  - ✓ Residents on / near lakeshore and rivers
  - ✓ Households with high incidence of poverty
    - Low income
    - Livelihoods affected by climate-related hazards and disasters
      - ✓ **Agriculture-based**
      - ✓ **Contractual labor / underemployed / seasonal laborers**
  - ✓ Women-headed HHs
  - ✓ Elderly-headed HHs
  - ✓ Agricultural sector
  - ✓ Informal settlers
  - ✓ Large households
  - ✓ Children

HH Livelihood and Vulnerability

Livelihood	VI			VEP		
	Moderate	High	Total	Moderate	High	Total
Farming	42	6	48	10	13	23
Fishing	63	13	76	-	57	57
Government	10	-	10	3	15	18
Manufacturing	18	-	18	-	42	42
Commercial/ Services	25	1	26	17	24	41
Academic	-	-	0	-	17	17

- Livelihoods with the highest vulnerability incidence:
  - VI: Fishing, Farming, Services
  - VEP: Fishing, Manufacturing, Services

Level of exposure, sensitivity and adaptive capacity and overall vulnerability

Sector / Group	Exposure	Sensitivity	Adaptive Capacity *	Overall Vulnerability
Elderly and elderly-headed HHs	1.71	1.75	2.38	1.95
Children	1.71	1.50	2.50	1.90
Women-headed HHs	1.71	2.00	2.38	2.03
Residents on/ near lakeshore and rivers	2.36	2.50	2.13	2.33
Poor households	2.00	3.00	2.75	2.58
Large families/ HHs	1.71	2.50	2.00	2.07
Agriculture-based HHs (including fishing, livestock and duckraising raising)	2.29	2.50	2.25	2.35
Informal settlers	2.00	2.75	2.25	2.33

Findings: Why are they vulnerable?

- **Poor households**
  - Low income
  - Low disaster preparedness
  - Usually into livelihood activities affected by climate-related hazards and disasters
    - Agriculture-based
    - Contractual labor / underemployed / seasonal laborers
  - With residences easily effected by typhoons and floods
    - Location – near waterways
    - Materials – light materials
  - Disaster responses for HH limit their income

Assistance Needed by Households

Assistance/Interventions Needed	% of all HH	Rank	% of vulnerable HH (VI)	Rank	% of vulnerable HH (VEP)	Rank
Financial assistance	47	1	42	1	47	1
Relief goods	31	2	8	5	10	5
Information	17	3	5	6	6	7
Medical assistance	15	4	11	3	12	4
Infrastructures	11	5	30	2	30	2
Insurance	6	6	4	7	5	8
Shelter/Relocation	5	7	1	9	2	9
Emergency evacuation and shelter	4	8	4	7	6	7
Construction materials	4	9	-	10	-	10
Provide livelihood assistance	2	10	9	4	16	3
Proper waste management	2	11	1	9	0	10
Inputs for production	1	12	2	8	2	9
Trainings	0	13	4	7	7	6

Findings: Why are they vulnerable?

- **Agricultural Sector**
  - including rice farmers, vegetable /cash crop farmers; duck raisers
  - damage to agricultural crops and livestock/ poultry/ducks during typhoons and flooding
  - the immediate effect of decrease in farmers'/raisers' yield
  - Lower prices for lower yields

Findings: Why are they vulnerable?

- **Agricultural Sector**
  - Costs for inputs increases after disasters
  - Disaster response is double burden: living conditions + source of livelihood
    - Time and energy is divided and affects level of productivity
    - Available resources to cope is divided into productive and domestic use
  - In terms of hazards, typhoons were discussed as more damaging since even high value crops in areas which do not suffer from inundation are affected.

Findings: Why are they vulnerable?

- **Informal Settlers**
  - Less resources for preparedness
  - Vulnerable livelihoods
  - Light materials of houses
  - Location of residence: lakeshore and waterways
  - Cannot access DRRM services
  - Less access to credit
  - Less access to information

- **Residents on / near lakeshore and rivers**

Experience of HH on Climate-related Hazards

- Typhoons and floods have the widest impact in terms of the number of households exposed to the hazard

Hazard Indicators	%
% of HH who experienced typhoons in the last 10 years	98
% of HH who experienced typhoons with Signal No. 3 or higher in the last 10 years	86
% of HH who experienced floods in the last 10 years	57
% of HH who experienced droughts in the last 10 years	49
% of HH who experienced landslides in the last 10 years	4
% of HH who experienced flashfloods in the last 10 years	8

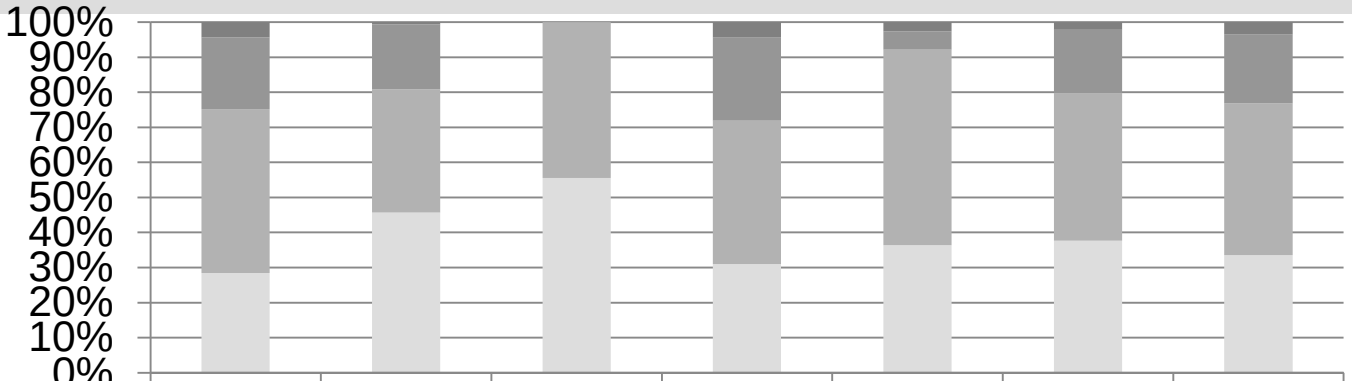
Mean HH Vulnerability Estimates

	VI	VEP
Hazard	0.08	-
Sensitivity	0.26	-
Adaptive Capacity	0.17	-
OVERALL VULNERABILITY	0.43	0.37

Distribution of Households according to Vulnerability Level

	VI			VEP		
	Not Vulnerable	Moderately Vulnerable	Highly Vulnerable	Not Vulnerable	Moderately Vulnerable	Highly Vulnerable
Percentage of Households	71	28	1	64	13	23

Information and Knowledge about Climate Change Issues



	Not Vulnerable	Moderately Vulnerable	Highly Vulnerable	Not Vulnerable	Moderately Vulnerable	Highly Vulnerable	All Household
	VI			VEP			
Fully knowledgeable	4	1	-	4	3	2	4
Adequate knowledge	20	19	-	24	5	18	20
A little bit of knowledge	47	35	44	41	56	42	44
No information/knowledge	28	46	56	31	36	38	34

- A high proportion of vulnerable households have no information/knowledge about climate change issues (56%, VI)

Findings: Gender and Vulnerability

Approach	Vulnerability Level	Incidence in Male-headed Households	Incidence in Female-headed Households
VI	Moderate	27	29
	High	2	0
	All Vulnerable	29	29
VEP	Moderate	13	12
	High	20	39
	All Vulnerable	33	51

- Based on VEP estimates, there is a higher incidence of vulnerability in female-headed households than in male headed households.

Findings: Gender and Vulnerability

- Gendered division of labor during and after disasters show overrepresentation of women.
- This is usually most apparent in agriculture and among informal settlers. In agriculture-based households, the indepth interviews indicated that although husbands and sons also tend to contribute more work in production, harvesting and marketing activities as a result of climate-related hazards and disasters, the same was reflected for women.
- Men → rebuilding; women →marketing
- Women engaged in vulnerable livelihood activities
  - ✓ Duckraisers
  - ✓ Informal livelihood sector

Findings: Gender and Vulnerability

- Non-productive work such as household chores and many care-giving tasks, such as caring for the children, sick, elderly, the home and assets increases for women, but not so much for men.
- Women focused on the effects of disasters at the household level: how they were not able to wash their clothes, and iron them because of power outages.
- At the community level, they are also very particular to services and resources that should be present in a barangay health center, because these health centers often provide services to pregnant women and children.

Conclusions

- Cross-cutting of spatially-based and sectoral-based sensitivity
  - Lakeshore
  - Riverbanks
  - Irrigation canals
  - **Informal settlers; the poor**
- Variation in sensitivity and adaptive capacities of communities and sectors / groups
  - Based on indicators
  - Social capital

Conclusions

- Residents on/ near lakeshore, coastal and riverbanks more vulnerable to the impacts of CC-related hazards
  - Livelihood
  - Poor
  - High sensitivity based on physical characteristic of houses
- Social and cultural nature of CC vulnerability
  - Social and livelihood systems
  - Population age and sex structure aside from size and density
  - Knowledge-based adaptive capacities

Conclusions

- Vulnerable groups and sectors
  - Must be looked closely in terms of adaptation options
    - **The poor: less access to resources**
    - **The agriculture sector**
    - **Residents in lakeshores, along rivers and other waterways**
    - **Informal settlers**
    - Elderly; solitary elderly; elderly-headed HHs
    - Handicapped
    - Women; women-headed HHs; women in difficult circumstances

Conclusions

- Vulnerability of the agriculture sector
  - Variation based on specific livelihood activity, knowledge and past adaptations
- Gender: women more vulnerable than men
  - Productive work + domestic roles
  - Sensitivity to health and sanitation
  - Less access to off-farm livelihood options
  - Physical demands of coping with hazards
- Social capital
  - Strengthening of bridging and linking social capital

Lessons: Some policy implications

- Vulnerability is more than exposure; it is importantly due to the sensitivities and level of adaptive capacity of various sectors of our society.
- Collaborative work is necessary in vulnerability assessments.
  - Complex issues must be dealt with in an atmosphere of cooperation and openness to a variety of solutions.
  - A transdisciplinal approach necessarily embraces the possible contributions of various disciplines as well as the contributions from people and sectors beyond academic and disciplinal contexts.

Lessons: Some Policy Implication

- When dealing with complex subjects, such as climate change vulnerability and CCA, it is necessary to shift from mono-disciplinary to interdisciplinary and transdisciplinary concepts and methods.
  - In order to be effective, this shift should be founded on a claricaton of definitions, goals, and methods.
  - These contributions enable the cross-fertilisation of knowledge and experiences from diverse groups of people that can promote an enlarged vision of a subject, as well as new explanatory theories.
  - Rather than being an end in itself, this kind of research is a way of achieving innovative goals.

Challenges:

- Arriving at common understanding beyond disciplinal boundaries.
  - Concepts
  - Methodology
- Engaging local government within the frame of the academe and research insitutions.
- Adjusting to the frame of the LGUs and local communities.


SEARCA

References:

- Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi. 2007: Assessment of adaptation practices, options, constraints and capacity. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, (Eds.) Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press, 717-743.
- Lawrence, Roderick J. (2010*). "Dicephering Interdisciplinary and Transdisciplinary Contributions,"* Journal of Engineering & Science,Vol. 1, pp. 111-116, December2010
- Mendoza, Maria Emilinda T. (2007). *"Towards Clarity and Integration: The Human Ecosystem Approach in Human Ecology,"* Occasional Papers in Human Ecology, November 2007
- Peden, D.G. (1999). Mono-, Multi-, Inter-, and in IDRC Research Activities. Ottawa: IDRC.
- Technical Reports (2011; 2012). Developing Capacity to Adapt to Climate Change in Southeast Asia, IDRC-funded Project.

Thank you.

~ end ~