Vulnerability Assessment of Livelihoods in the Nariva Watershed, Trinidad and Tobago

Afiya De Sormeaux[1] and Sharon Hutchinson[2]

[1]MPhil Student, SALISES and [2]Lecturer, Department of Agricultural Economics and Extension, Faculty of Food and Agriculture.

The University of the West Indies, St. Augustine.

Email: afiyades@gmail.com; sharon.hutchinson@sta.uwi.edu

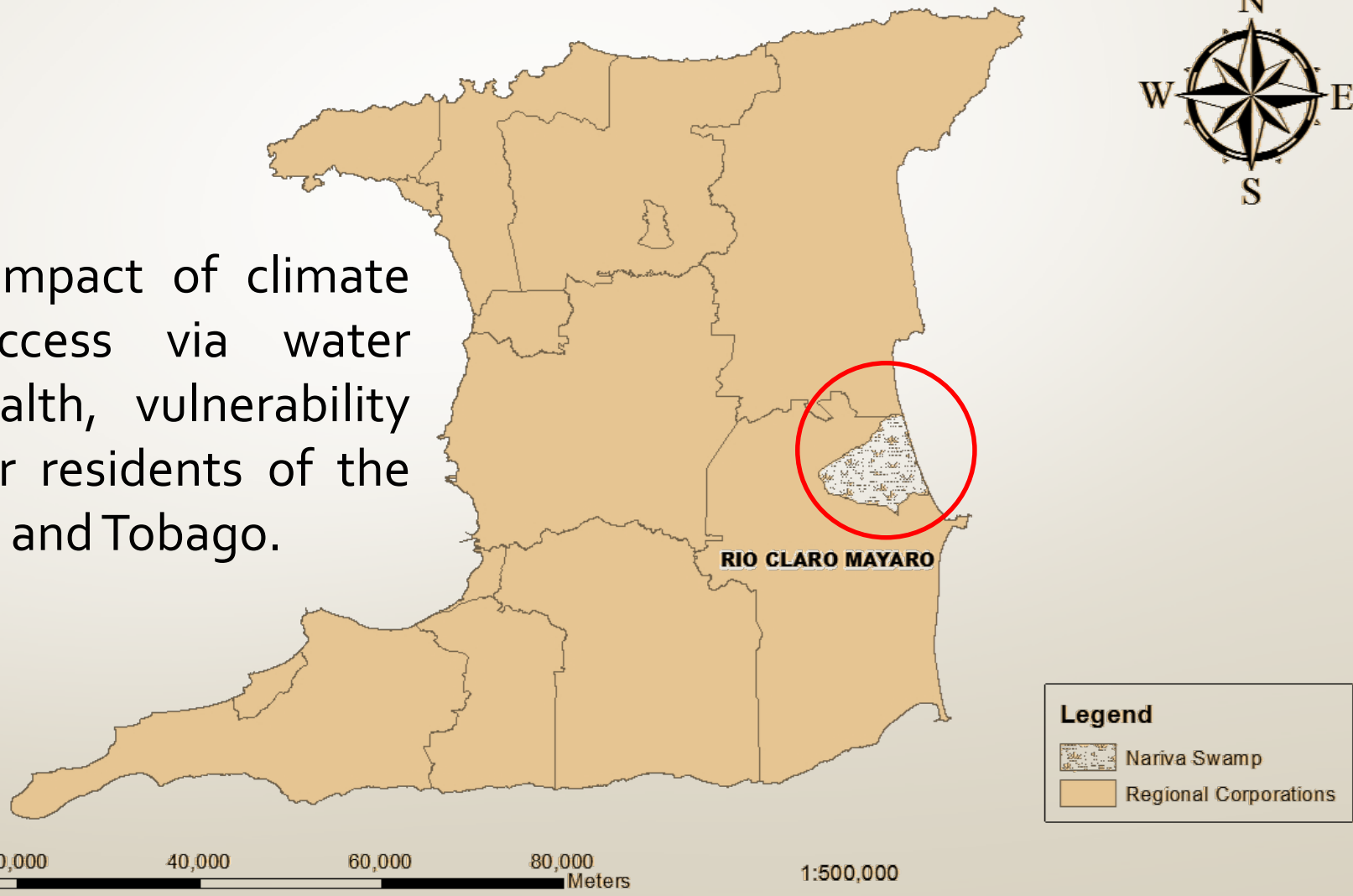
Introduction

"Vulnerability is 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 2007)

- Vulnerability is defined by three (3) distinct factors;
  - 1. Exposure, 2. Sensitivity and 3. Adaptive Capacity
- High vulnerability – high exposure + high sensitivity + low adaptive capacity
- Less vulnerable – low exposure + low sensitivity + high adaptive capacity

Introduction

To assess the potential impact of climate variability on water access via water resources, ecosystem health, vulnerability and adaptive capacity, for residents of the Nariva watershed, Trinidad and Tobago.



Introduction - Objectives

- To construct a Livelihood Vulnerability Index (LVI) to assess the vulnerability of households in the Nariva watershed.
- To calculate the Livelihood Vulnerability Index (LVI) for each household and for the watershed.
- To identify the key sources of this vulnerability.

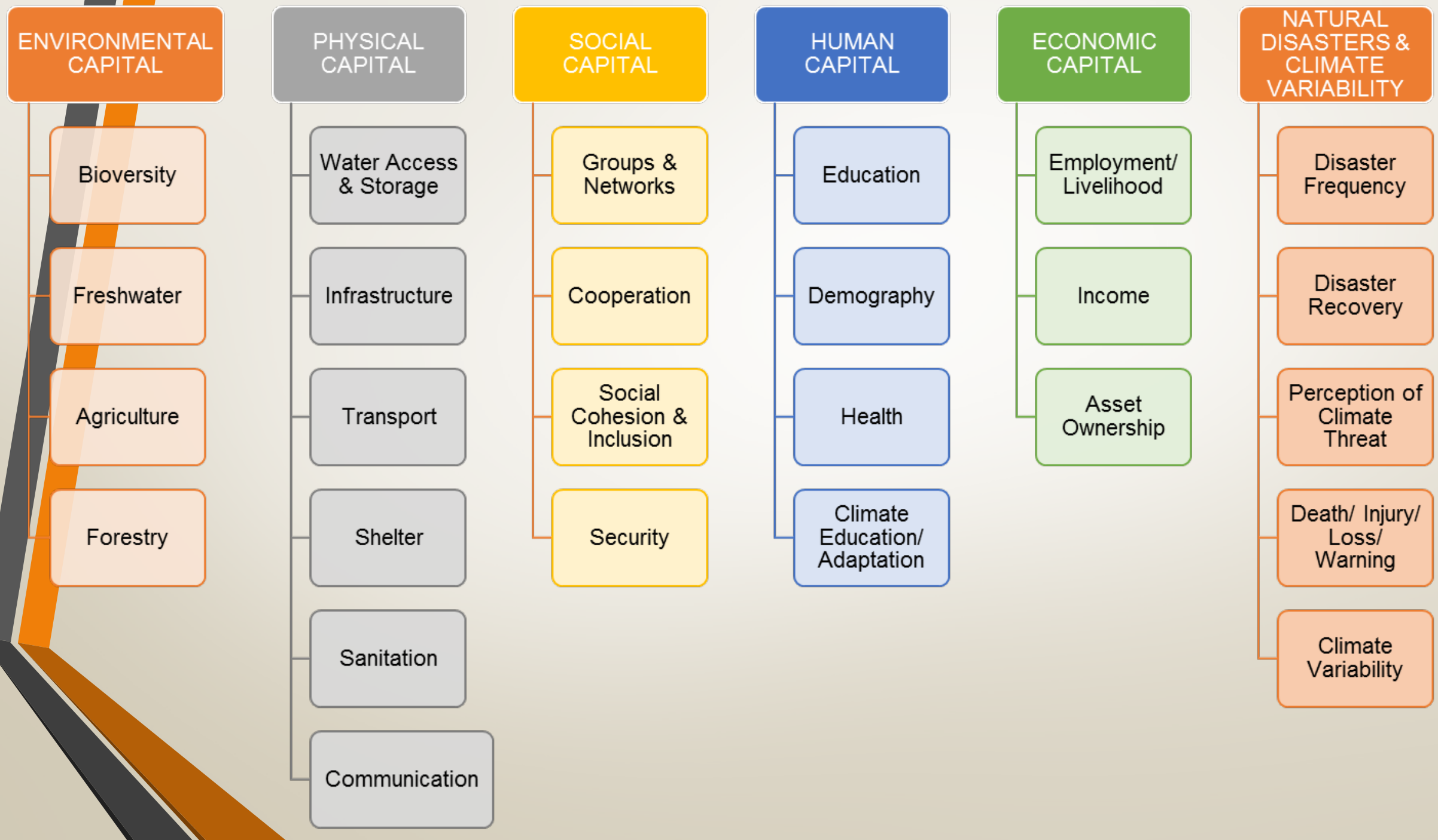
Methodology

- A survey of 343 householders from three communities in Nariva, Biche, Cascadoux/Kernahan and Plum Mitan.
- The data was collected through questionnaires via face to face interviews during the period August to October 2014.
- Data was collected in six (6) general areas:

  (1) General environment; (2) Change of climate; (3) Benefits from nature; (4) Access to water and quality of life; (5) Family and community ties; and (6) Socio-demographic information.

Methodology

- Six (6) pillars were defined with a number of sub-components under each pillar.
- Indicators (questions) were selected to represent each sub-component.
  - **Water Access & Storage:** What kind of access to water do you have? How much water can you store?
  - **Freshwater:** has there been any deterioration in the *quantity / quality* of water in rivers and streams in your community in the past 10 years?
  - **Sanitation:** Type of sanitation in dwelling?


ENVIRONMENTAL CAPITAL
Bioversity
Freshwater
Agriculture
Forestry
PHYSICAL CAPITAL
Water Access & Storage
Infrastructure
Transport
Shelter
Sanitation
Communication
SOCIAL CAPITAL
Groups & Networks
Cooperation
Social Cohesion & Inclusion
Security
HUMAN CAPITAL
Education
Demography
Health
Climate Education/ Adaptation
ECONOMIC CAPITAL
Employment/ Livelihood
Income
Asset Ownership
NATURAL DISASTERS & CLIMATE VARIABILITY
Disaster Frequency
Disaster Recovery
Perception of Climate Threat
Death/ Injury/ Loss/ Warning
Climate Variability

s_d

Methodology

STEP 1: Questions were assigned to each sub-component of each pillar and the direction of vulnerability clearly established. Some questions such as *"How much water from all sources can you store at home?"* had to be recoded as the ability to store more water was deemed to have lower vulnerability.

- Normalize each indicator value so that they have the same range, **0 to 1** using the min-max normalization formula $\frac{s_d - s_{\min}}{s_{\max} - s_{\min}}$ where ;
  - where s_d is the response for household *d*; s_{min} (s_{max}) is the minimum (maximum) values of the responses for each question.

s_d

Methodology

Step 2: The average of all question scores for each sub-component ➔ Household sub-component score

Step 3: The average of all sub-components ➔ Household LVI

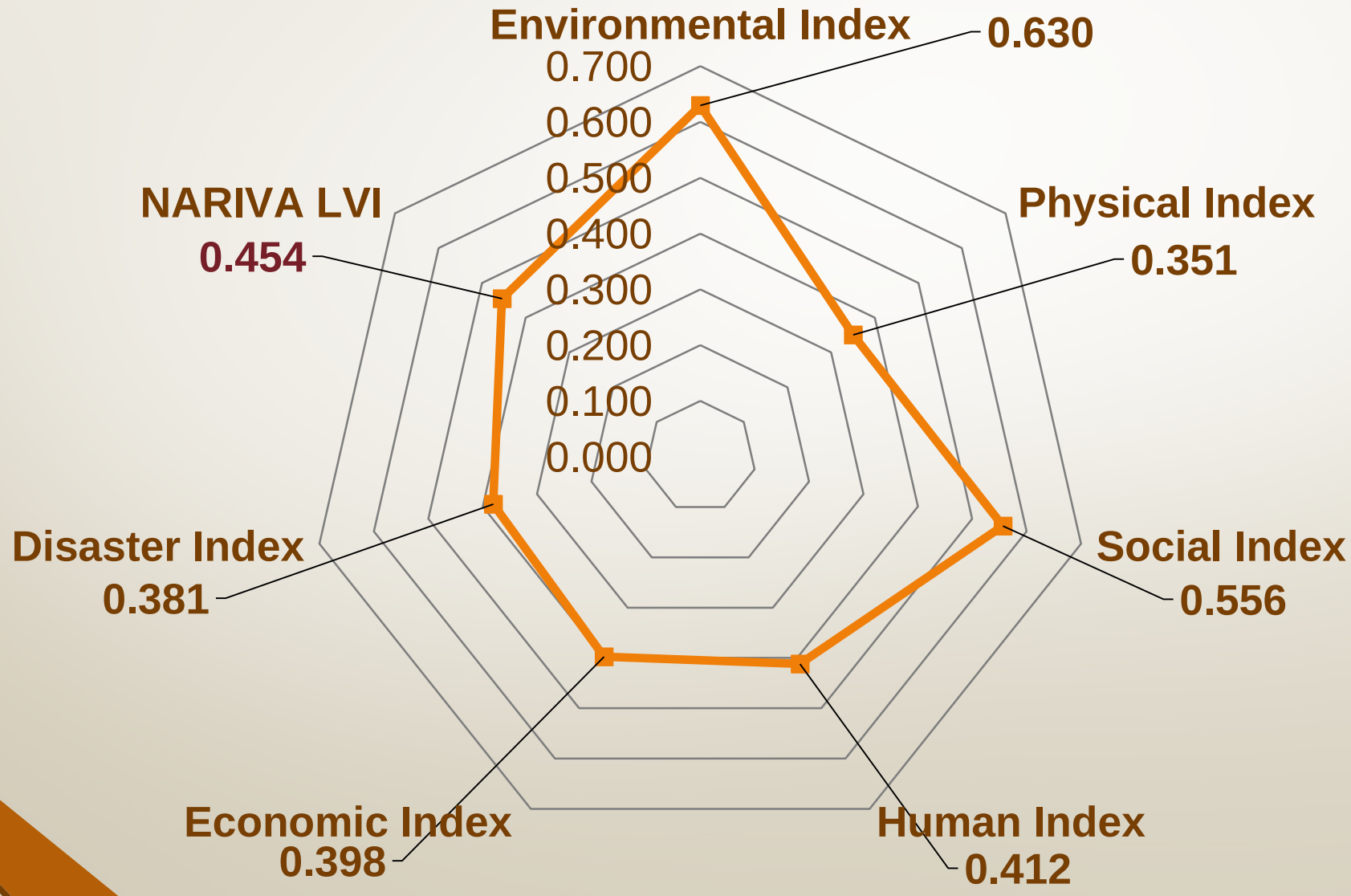
Step 4: The weighted average of community LVI score ➔ Overall Livelihood Vulnerability Index (LVI) for the Watershed.

The LVI is scaled from

0 (very low vulnerability) to 1 (very high vulnerability)

Very Low	Low	Medium Low	Medium	Medium High	High	Very High
0 - 0.14	0.15 - 0.28	0.29 - 0.42	0.43 - 0.56	0.57 - 0.70	0.71 - 0.84	0.85 - 1.00

Index Results by Pillar



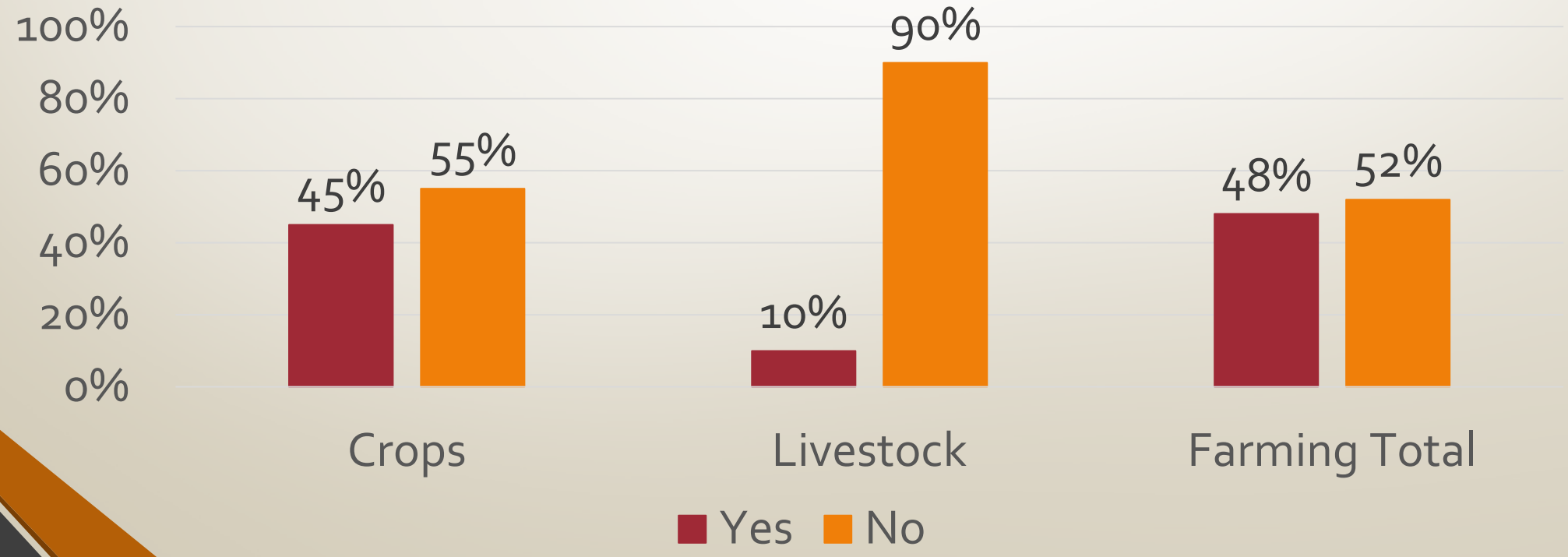
Results

- Overall Nariva was found to have a **medium** level of vulnerability; **LVI = 0.454**

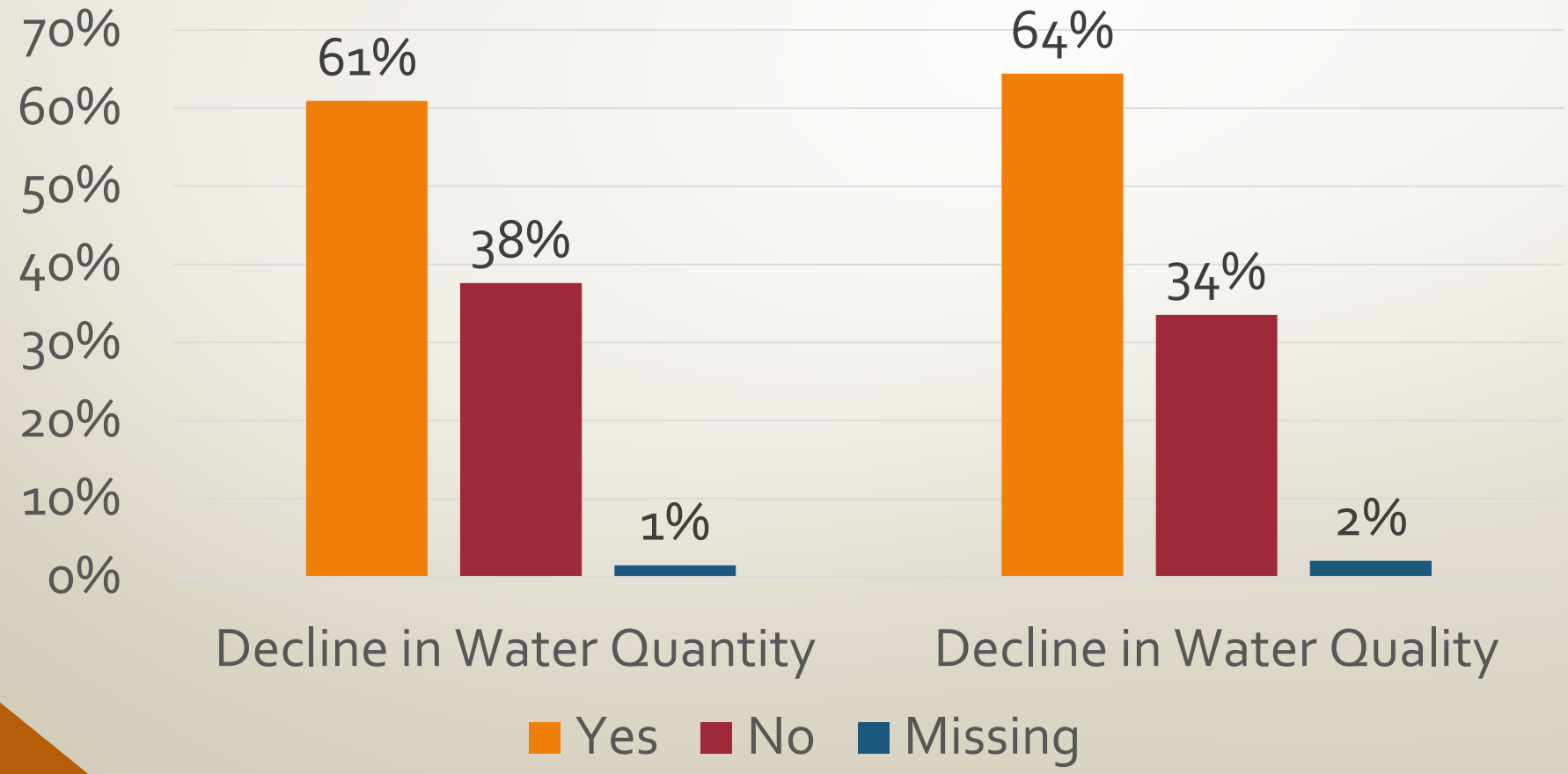
- Environmental pillar accounts for most of the vulnerability; **LVI = 0.630, medium high vulnerability.**
  - This vulnerability is attributed to the Agriculture sub-component

Farming

- Average Farm Size – 3.81 acres
- The mean LVI of the Farmers versus the Non-Farmers was the same, they were not statistically significant.



Deterioration in the Quantity & Quality of Water in Waterways



Results

- Social pillar is subsequently the second most vulnerable pillar; **LVI = 0.556, medium vulnerability.**
- This vulnerability is attributed to the cooperation and groups & networks sub-components as reflected in the responses.
  - **38%** indicated that they are an active member of a community group or organization. **16%** of those who responded indicated that they obtained information from community groups. **22.4%** indicated strongly that they could obtain assistance from persons in their community if necessary.
- Strong social ties tend to reduce vulnerability.

Results

- **Physical pillar** accounts for least of the vulnerability; **LVI = 0.351, medium low vulnerability.**
  - While 18% of respondents selected the option of having "WASA piped to dwelling" more than half the respondents (**58 %)** indicated that they can store more than **800 gallons of water.**
  - Householders are not as vulnerable due to their ability to adapt through large water stores although they are vulnerable in terms of lack of direct water access to their dwellings.

Conclusions

- Nariva watershed had a medium level of vulnerability, LVI – 0.454.
  - There is room to further reduce their vulnerability.
- Majority of vulnerability is attributed to the Environmental Capital pillar, LVI = 0.630
- Second most to the Social Capital pillar, LVI = 0.556
- Lowest vulnerability is attributed to the Social Capital pillar, LVI = 0.351

Conclusions

- A valuable method of identifying communities' vulnerability levels and to pinpoint the exact source of the vulnerability.

- The LVI can be used to assess how effective a policy change such as improved water access to communities (physical capital). This improvement may be incorporated (new indicator values) to produce new LVI scores.

References

Federal Emergency Management Agency (FEMA). http://www.fema.gov/pdf/plan/prevent/rms/155/e155_unit_iv.pdf

Hahn, Micah B., Anne M. Riederer, and Stanley O. Foster. 2009. "The Livelihood Vulnerability Index: A Pragmatic Approach to Assessing Risks from Climate Variability and Change-A Case Study in Mozambique." *Global Environmental Change* 19 (1): 74–88. DOI: 10.1016/j.gloenvcha.2008.11.002.

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 976pp.

Sullivan, Caroline and Jeremy Meigh. 2005. "Targeting Attention on Local Vulnerabilities using an Integrated Index Approach: The Example of the Climate Vulnerability Index." *Water Science and Technology* 51:5.

Sullivan, Caroline; Cohen, Alasdair; Faures, Jean-Marc; Santini, Guido. 2008. "The Rural Water Livelihoods Index," FAOWATER

Acknowledgements

This output is from the *Water-aCCSIS Project* (Sustainable Water Management under Climate Change in Small Island States of the Caribbean) funded by the Canadian International Development Research Centre (IDRC) in collaboration with:

- The University of the West Indies (UWI):
  - Sir Arthur Lewis Institute of Social and Economic Studies (SALISES);
  - Centre for Resource Management and Environmental Studies (CERMES);
- Caribbean Community Climate Change Centre (CCCCC); and
- Caribbean Institute for Meteorology and Hydrology (CIMH).

The authors would like to express their sincere gratitude and to acknowledge the generous support of all communities, researchers and institutions (in Trinidad and Tobago), specifically, SALISES, UWI, St. Augustine and the Principal Researcher Dr. Adrian Cashman.

THANK YOU!

Vulnerability Assessment of Livelihoods in the Nariva Watershed, Trinidad and Tobago

Afiya De Sormeaux[1] and Sharon Hutchinson[2]

[1]MPhil Student, SALISES and [2]Lecturer, Department of Agricultural Economics and Extension, Faculty of Food and Agriculture.

The University of the West Indies, St. Augustine.

Email: afiyades@gmail.com; sharon.hutchinson@sta.uwi.edu