THE VULNERABILITY OF COASTAL COMMUNITIES TO SEA-LEVEL RISE:
A CASE STUDY OF GRANDE RIVIERE, TRINIDAD AND TOBAGO

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Objective

- **To outline the methodological framework employed in examining the impact of sea level rise on the Grande Riviere Coastal Community.**

Introduction

- **C-Change – a Community-University Research Alliance (ICURA) project jointly undertaken by SALISES, The University of the West Indies and Telfer School of Management, University of Ottawa.**

Community	University	Joint Community-University
- Establish Formal Community –University Alliance - Strengthen Community-Institutional Arrangements - Establish long-term linkages - Prepare Community Action Plans	- Develop academic alliances - Collaborate on global research - Develop new curricula	- Identify the short- and long-term vulnerabilities - Mobilize knowledge and innovation - Build capacity - Develop impact scenarios and prepare adaptation action plans

Introduction (continued)

Community	Canada	Caribbean	Characteristics
1	Charlottetown, Prince Edward Island	Georgetown, Guyana	Capital Cities
2	Iqaluit, Nunavut	Belize Barrier Reef, Belize	Native homeland communities
3	Gibsons, British Columbia	Grande Riviere, Trinidad and Tobago	Mainland Coastal Communities
4	Isle Madame Cape Breton Nova Scotia	Island of Bequia, St. Vincent & the Grenadines	Island Communities

Introduction (continued)

- **A major aspect of the research program is to involve the community and obtain community participation.**

- **A related goal is to provide the affected coastal communities with the educational capacity to deal with and adapt to sea level rise.**

- **There are three facets of the C-change Research Program:**
  - **Community**
  - **University**
  - **Joint Community-University**

Introduction (cont'd)

- **Multidisciplinary research project:**
  - **Profiling the community by collecting environmental, economic and social data**
  - **involves GIS spatial modeling of projected sea level rise scenarios**
  - **Spatially-represented baseline socioeconomic data can be spatially intersected with selected sea level rise projections.**

RESULT

Basis for estimating the socioeconomic impacts of the sea level rise projections upon Grande Riviere

Review of the Literature

- **The Climate Change Policy of Trinidad and Tobago (2009) summary document lists the objectives that will guide policy formulation:**

  - reduce or avoid greenhouse gas emissions from all emitting sectors
  - enhance carbon sinks
  - conserve and building resilience of human and natural systems to adapt to the adverse impacts of climate change protect of the natural environment and human health
  - enhance agricultural production and food security

Review of the Literature (cont'd)

- **The Trinidad and Tobago public:**
  - Do not strongly value protection of the environment
  - Do not have an awareness of climate change
  - Socioeconomic factors tend to influence the degree of their knowledge

- **Ecotourism module of questionnaire is vital**
  - If ecotourism can alter the way the public views preservation of the environment then it may well be a useful instrument in raising the knowledge and awareness of climate change in Grande Riviere.

Economic Methodology

- **Four surveys were designed to capture information from:**

  - **The Grande Riviere community**

  - **National tourists visiting the community**

  - **International tourists visiting the community**

  - **International tourists visiting Trinidad and Tobago**

Economic Methodology (cont'd)

- **The Grande Riviere Community Survey**

  - **Small community – approximately 125 households according to 2000 population census.**

  - **Sampling unit is the household.**

  - **Respondent is the 'head of household' or any adult at that address.**

  - **101 households were surveyed.**

Economic Methodology (cont'd)

- **National and International Visitors to Grande Riviere**

  - **Two questionnaires prepared – one for national visitors one for international visitors**

  - **Survey carried out through the April-May period to capture data from visitors on the Leatherback turtles**

  - **Sampling unit is a visitor to the Grande Riviere area**

  - **114 domestic tourists**

  - **107 international tourists**

Economic Methodology (cont'd)

- **Visitors to Trinidad and Tobago**

  - **Knowledge of a typical tourist to Trinidad and Tobago on sights, attractions**

  - **Sampling unit is a visitor to Trinidad and Tobago**

  - **Knowledge of a tourist on Grande Riviere and the other tourist attractions of the area**

  - **254 visitors were surveyed at the Piarco International Airport**

Questionnaire Design

- **The questionnaires in this study were all administered face-to-face .**
  - **Potential disadvantage is that interviewers could bias the delivery and interpretation of the questionnaire**

- **A highly intensive training session was held for the team of interviewers.**

- **Pilot survey was undertaken**

- **After the pilot a debriefing session was held to hone the questions and delivery of questions**

- **Questionnaires for this research project contained both open-ended and closed questions**

- **Length of survey – 30 minutes**

Questionnaire Description: Community

- **Five Sections**

  1. **General**

  2. **Demographic and Socioeconomic**

  3. **Ecosystem Services**

  4. **Eco-tourism and the leatherback turtles**

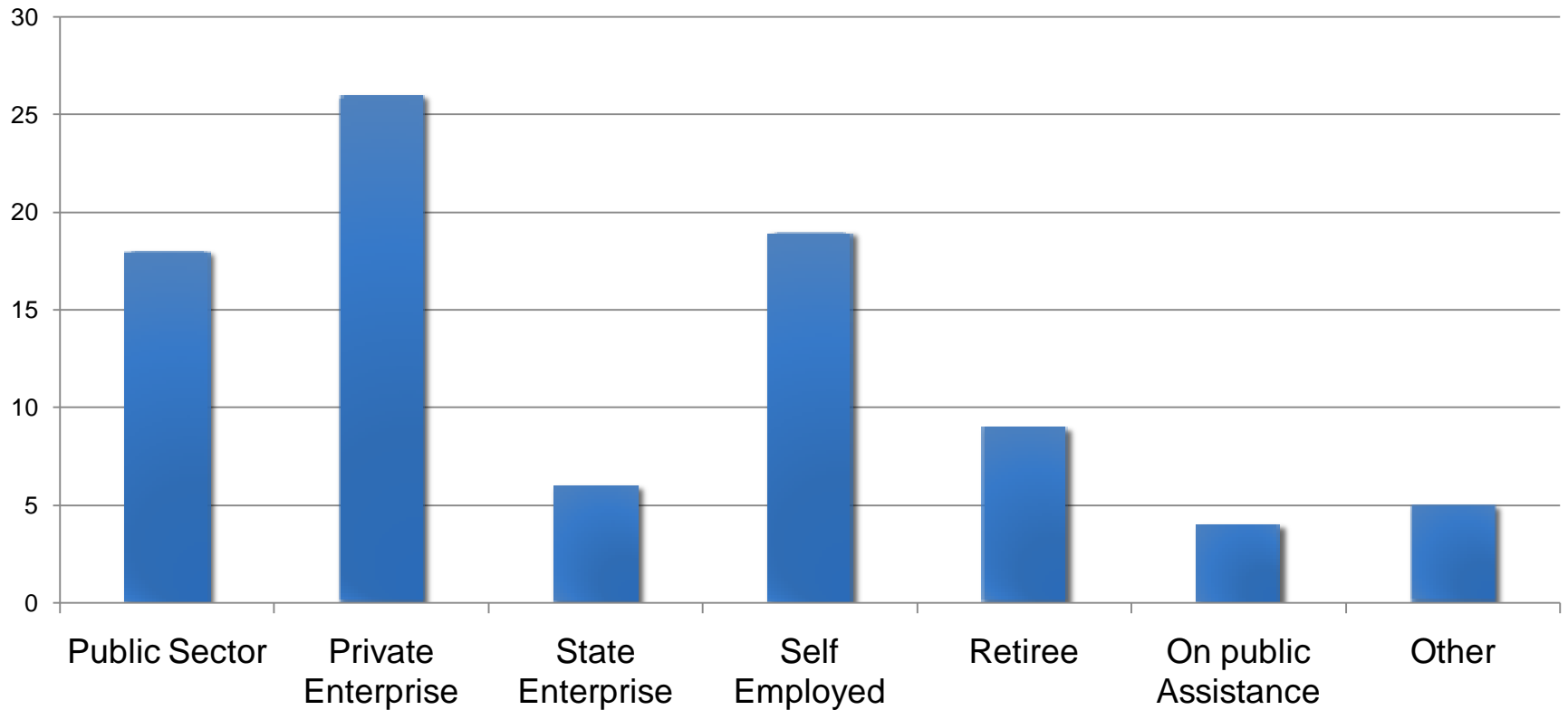 5. **Awareness/knowledge of climate change**

Preliminary Results: General

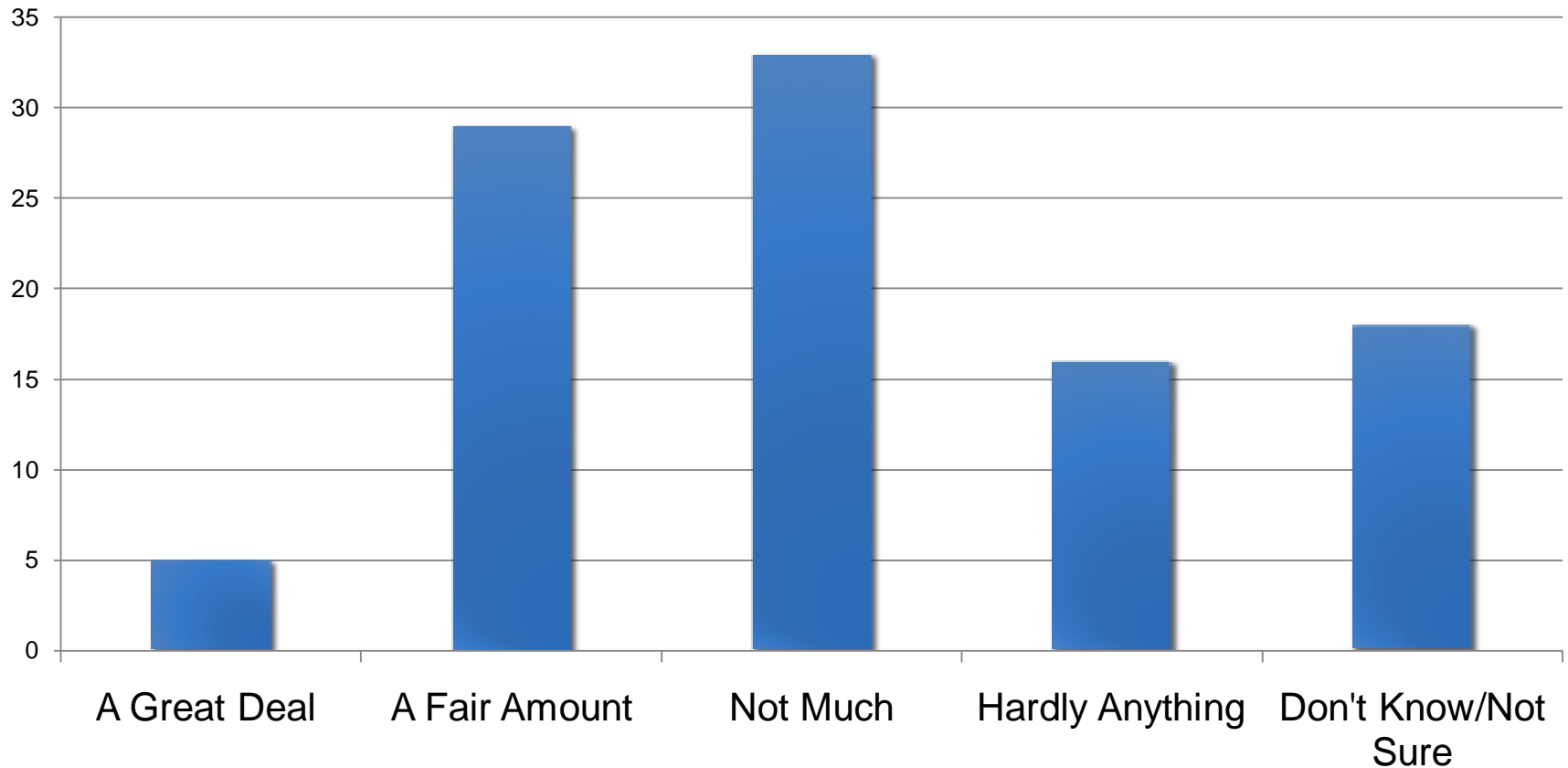**Perception of Sea Level Rise as a Future Challenge to Grande Riviere**

- Agree
- Disagree
- Don't Know
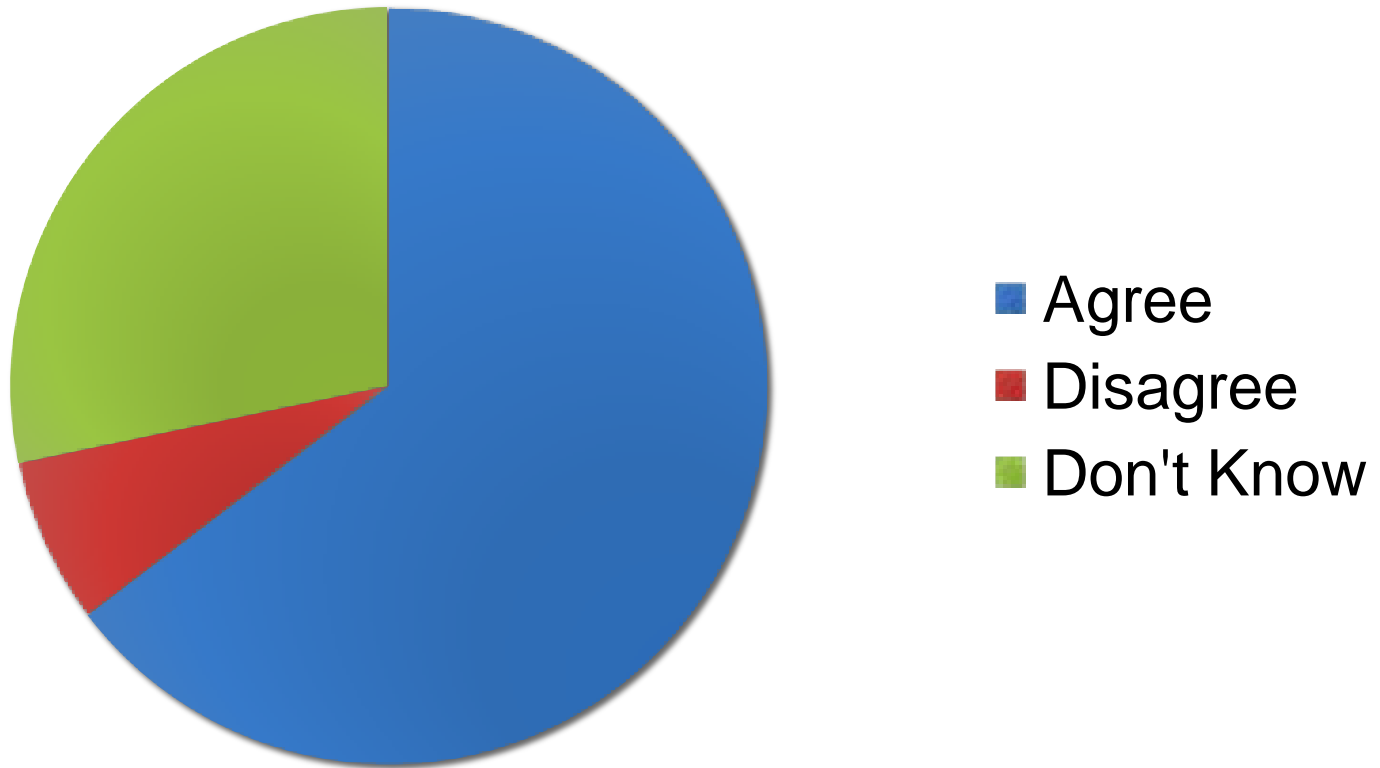
Preliminary Results: Demographic and Socioeconomic Information
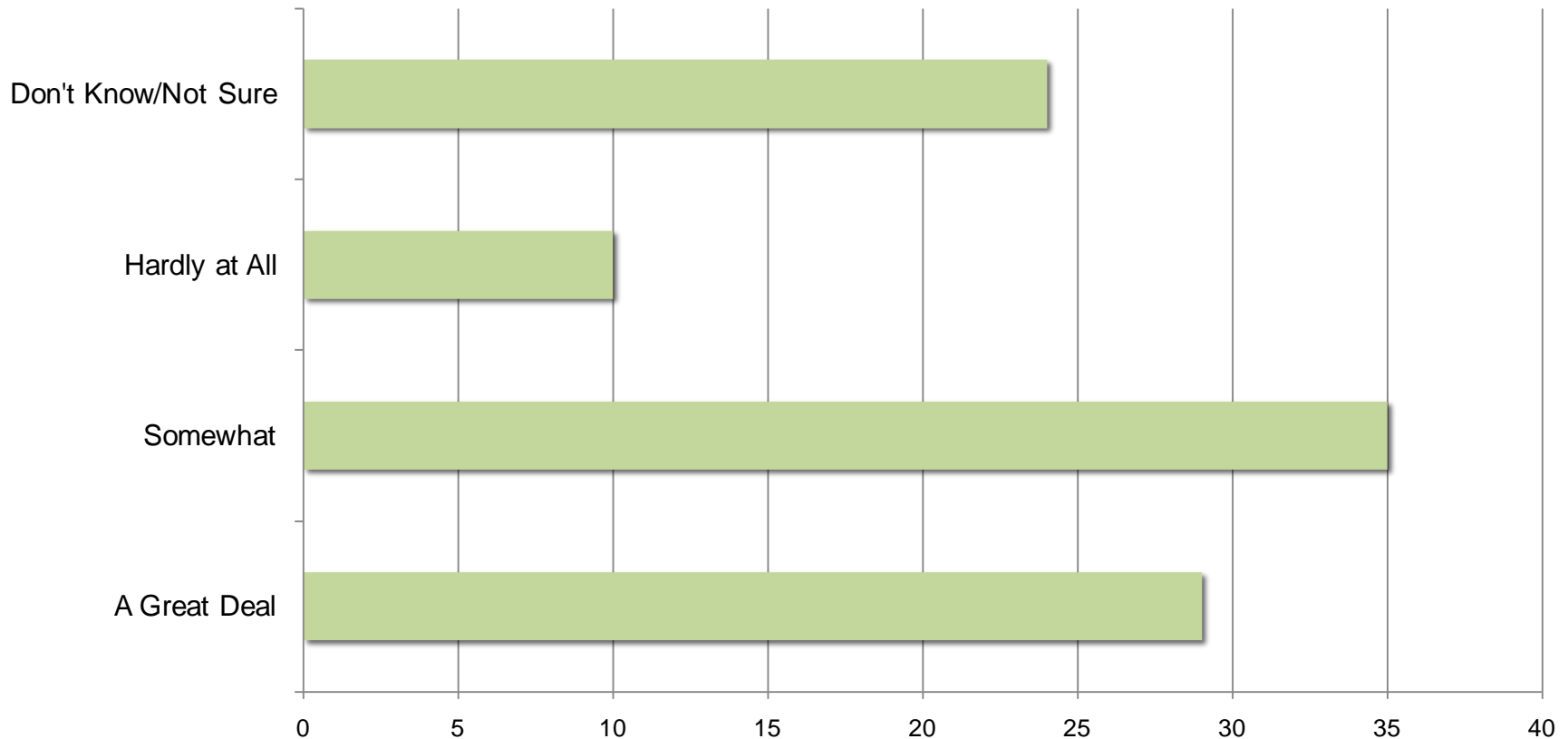
Sector Employed and Employment Status

Preliminary Results: Awareness/Knowledge of Climate Change
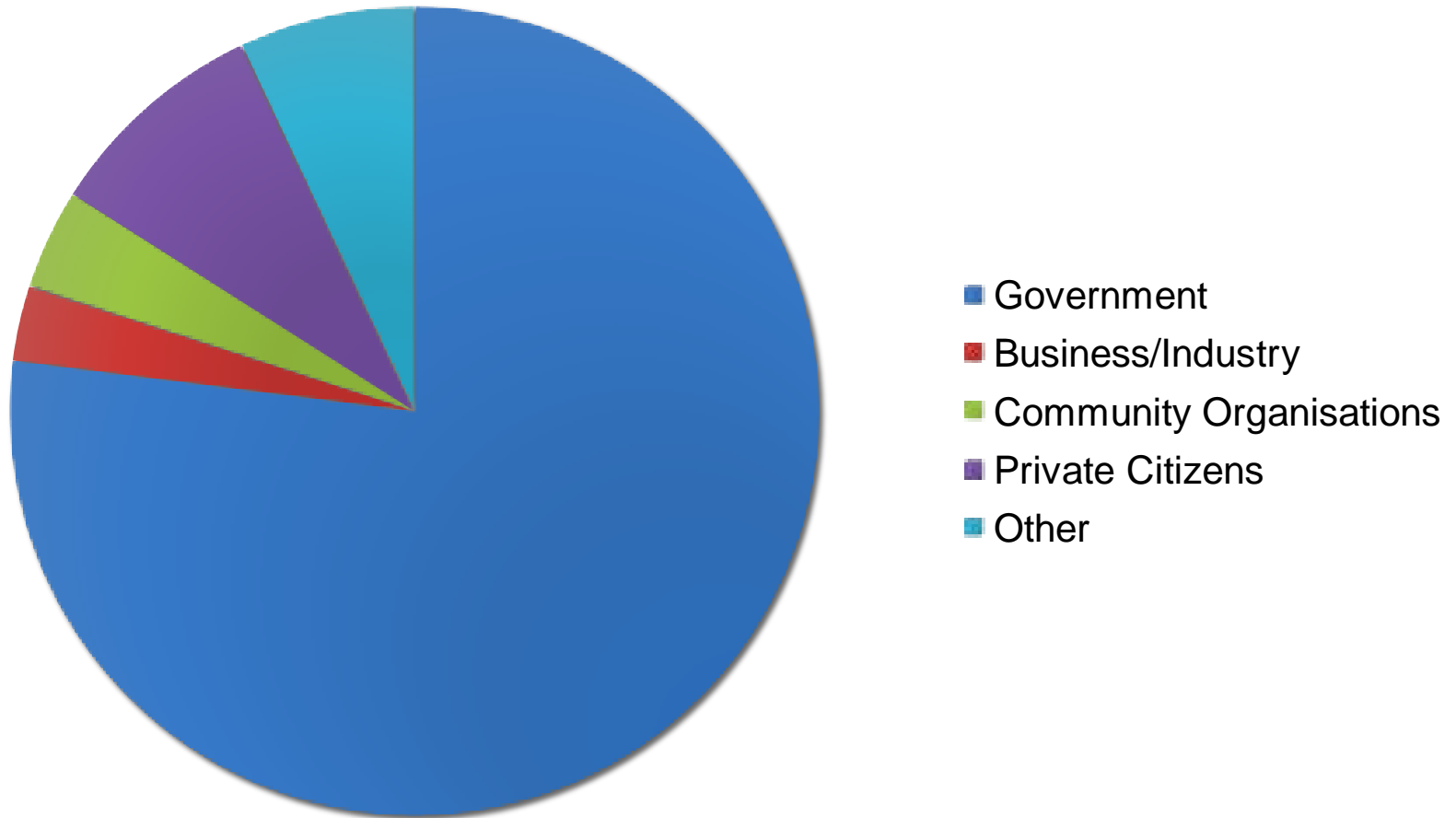
Knowledge of Climate Change

Preliminary Results: Awareness/Knowledge of Climate Change
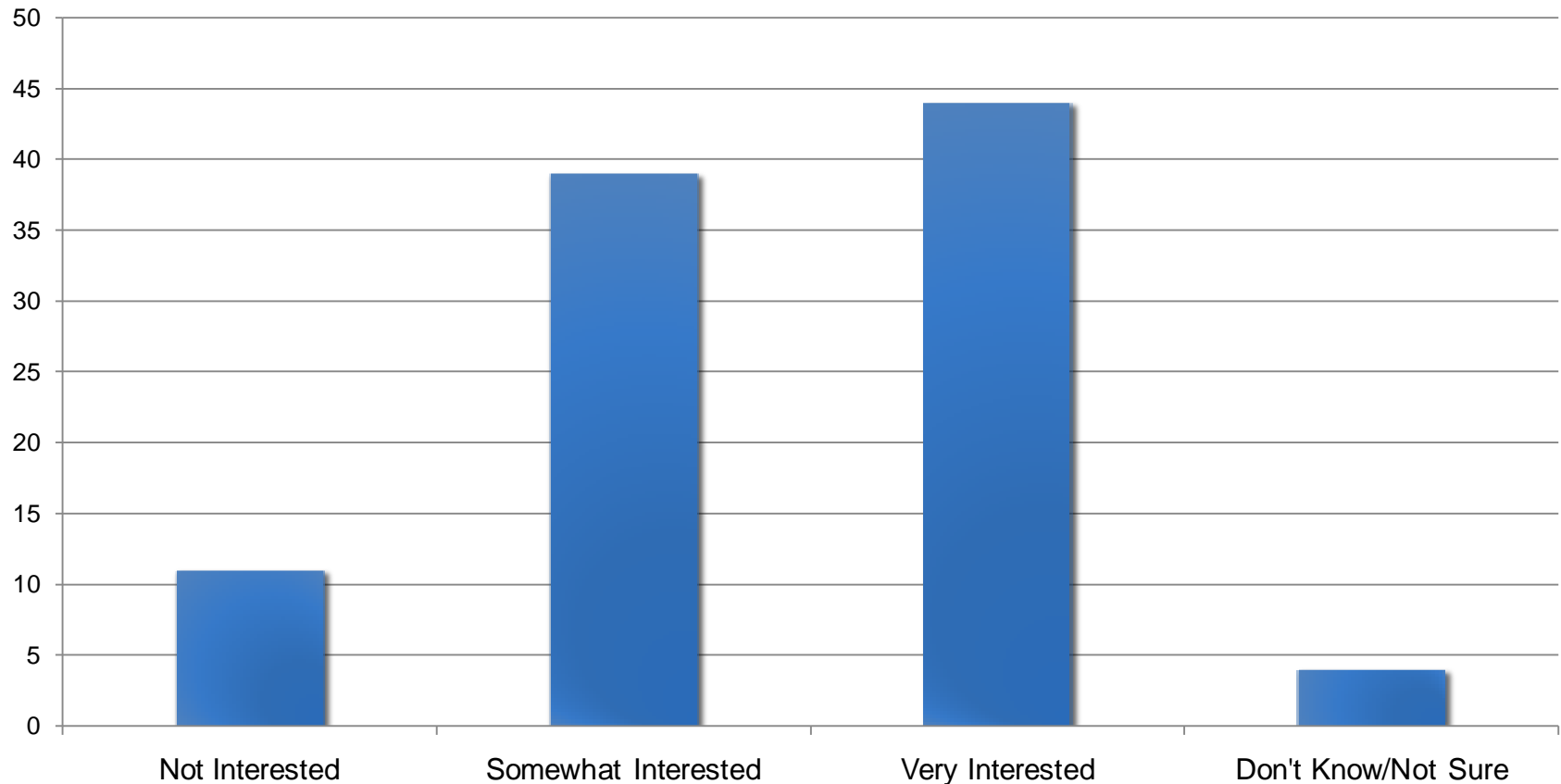
The risk of Sea Level Rise to Grande Riviere

Preliminary Results: Awareness/Knowledge of Climate Change

Responsibility for Addressing Climate Change

- Government
- Business/Industry
- Community Organisations
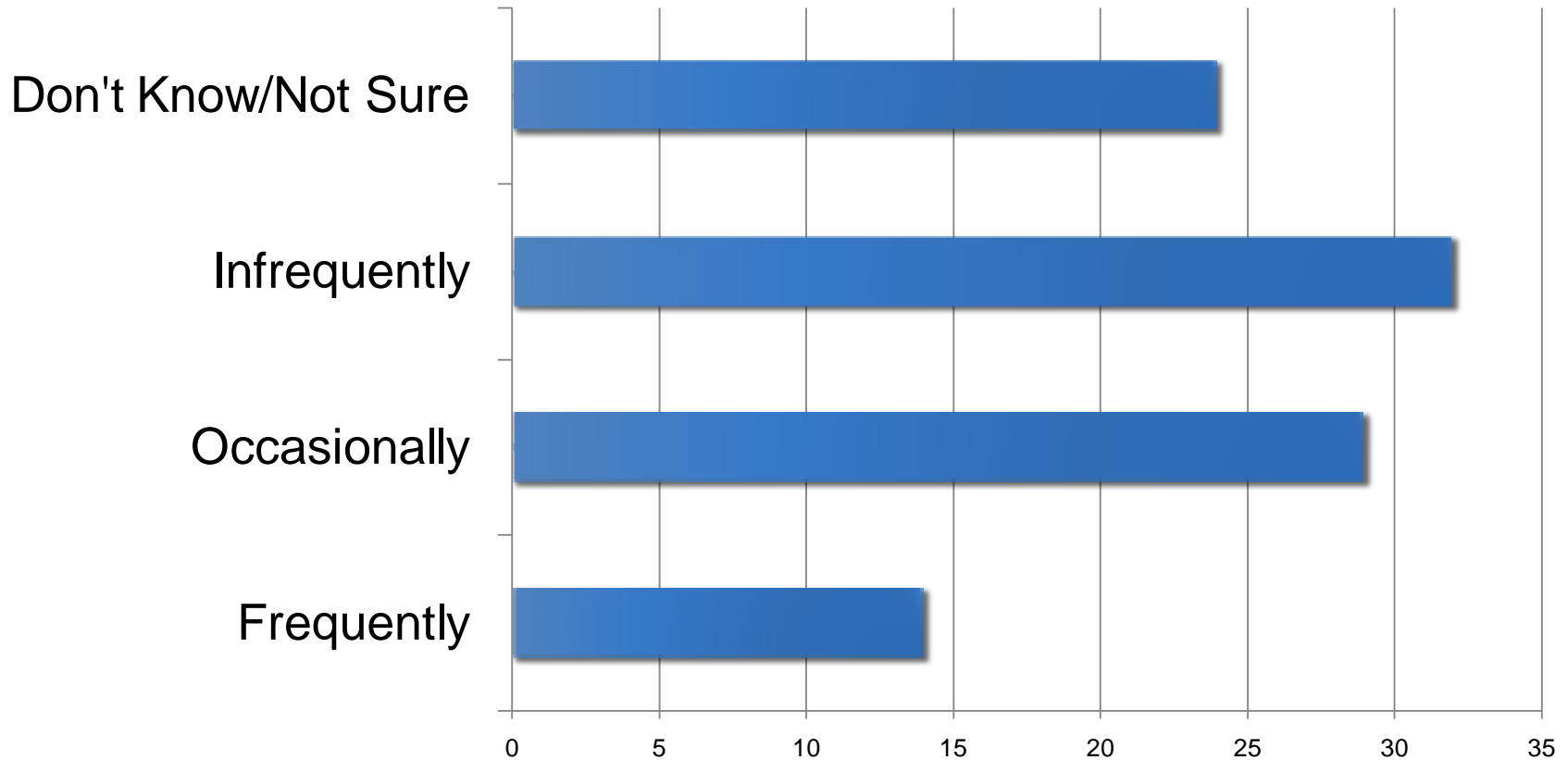- Private Citizens
- Other

Preliminary Results: Awareness/Knowledge of Climate Change

Interest in Climate Change and its Impact on Grande Riviere

Preliminary Results: Awareness/Knowledge of Climate Change

Knowledge Gained on Climate Change

SEA LEVEL RISE PROJECTIONS

Organization	Projection Stated
Climate Research Unit 2000	0.060m rise by 2100
University of Melbourne, School of Earth Sciences	0.030m-0.300m by 2040 and 0.090m-.880m by 2100
Environmental Protection Agency	0.700m by 2080
Centre for Sponsored Ocean Research, Division of the National Oceanic and Atmospheric Administration	0.040m-1.029m by 2095
Australian Academy of Science	0.090m-0.880m by 2100
National Centre for Atmospheric Research	1.9-2.6 ºC means 0.180m-0.200m rise 2.2-3.5 ºC means 0.190m-0.300m rise
American Geological Institute	6m or more over the next 140 years due to melting of ice sheet

SEA LEVEL RISE PROJECTIONS

IPCC Category	Projection Stated
1	0.4m – 1.4m 2000 - 2015
2	0.5m – 1.7m 2000 - 2020
3	0.6m – 1.9m 2010 - 2030
4	0.6m – 2.4m 2010 - 2060
5	0.8m – 2.9m 2050 - 2080
6	1.0m – 3.7m 2060 - 2090

SEA LEVEL RISE MODEL: Data

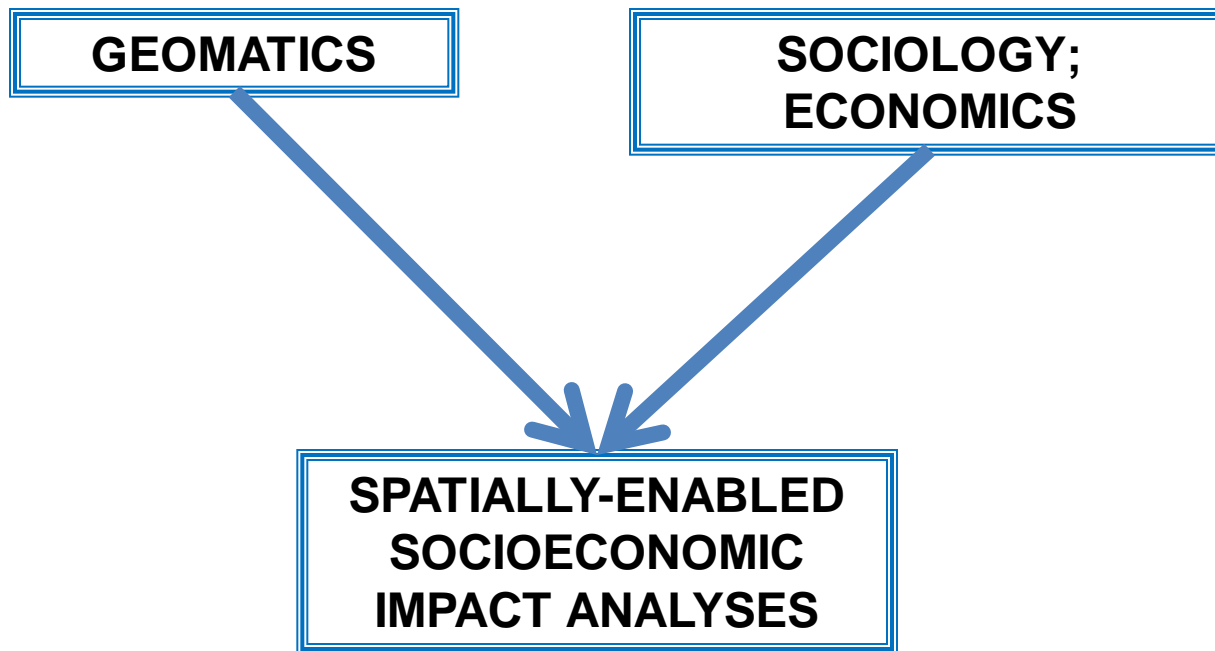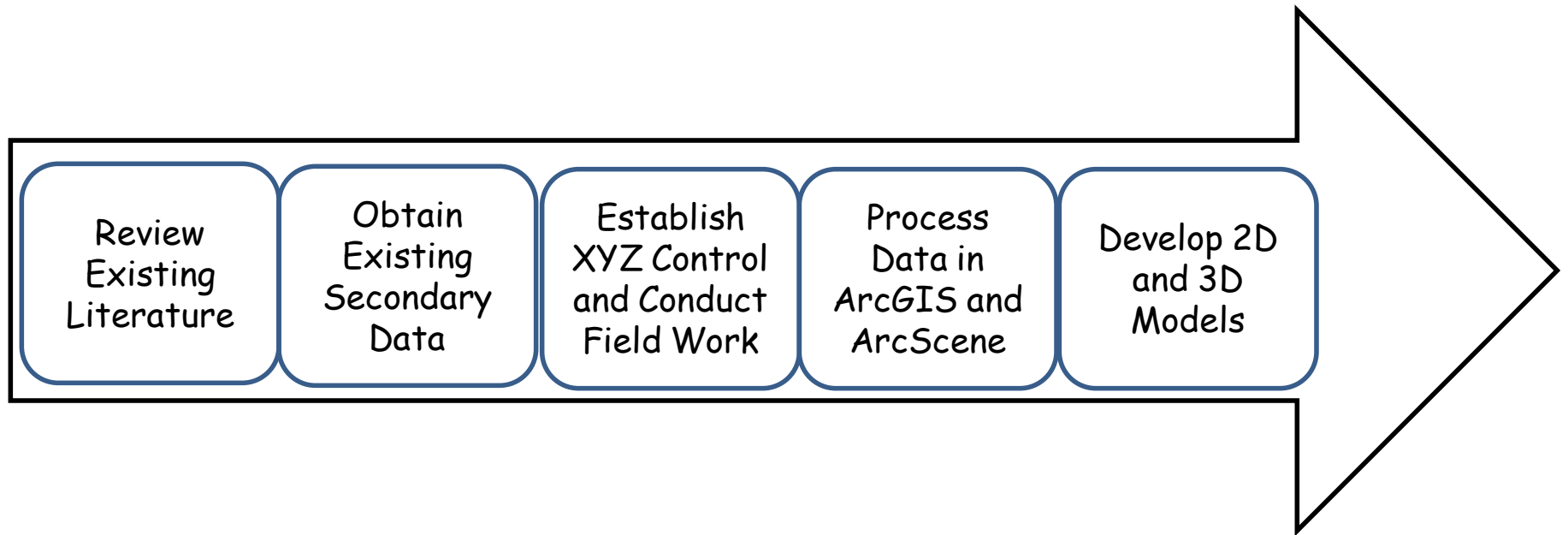| Collected Data	Purpose
Ground Control Points	To establish a reference control within the community, since existing controls were destroyed
Contour data	To get an accurate model of sea level rise and for the generation of 3D model
Topographic Data	To show what would be affected by the rise in sea level (Buildings, Property Boundaries, Roads, River etc.)
Arial Photograph (2007 with Colour)	To provide realistic visualization
Spot heights along the beach	To get a detailed contour shape of the beach
Mean Sea Level	To establish a vertical reference control at the site

SEA LEVEL RISE MODEL: Overall Methodology

SEA LEVEL RISE MODEL: GEOMATICS METHODOLOGY

Review Existing Literature → Obtain Existing Secondary Data → Establish XYZ Control and Conduct Field Work → Process Data in ArcGIS and ArcScene → Develop 2D and 3D Models

SEA LEVEL RISE MODEL: VISUALIZATION

Simulated MSL at Grande Riviere Beach

SEA LEVEL RISE MODEL: Visualization

Simulated 0.4m above MSL at Grande Riviere Beach

SEA LEVEL RISE MODEL: Visualization

Simulated 0.6m above MSL at Grande Riviere Beach

SEA LEVEL RISE MODEL: Visualization

Simulated 0.8m above MSL at Grande Riviere Beach

Conclusion

- **Communities in developing nations and SIDS are especially vulnerable to sea level rise and storm surges.**

- **Turtle nesting in Grande Riviere has increased over the past 10-15 years.**

- **Spatial models indicated serious physical impacts to the nesting beach at Grande Riviere.**

- **This could negatively affect the socioeconomic well-being of the community**

- **The multidisciplinary approach is valid**

Thank you for your attention