

Managing Adaptation to Environmental Change in Coastal Communities: Canada and the Caribbean

STATUS UPDATES



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Project Objectives



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- The creation and maintenance of mitigation and adaptation strategies for the impending threats to coastal communities from sea-level rise and storm surges
- To develop community awareness, infrastructure, and decision support tools for preparing for adaptation and mitigation strategies for the impacts of sea-level rise and storm surges on selected regional coastal communities in Canada and the Caribbean
- a multidisciplinary approach, incorporating aspects of sociology, economics, management science, and geomatics engineering

Case Study Sites



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- **Grande Riviere:** a small coastal village in Trinidad that surrounds a major spawning site for leatherback turtles, around which an eco-tourism industry is developing
- **Georgetown:** the capital of Guyana, an urban centre that is below sea level
- **Bequia:** a small island in the St. Vincent and the Grenadine chain that is the site of major tourism activities
- **Belize Barrier Reef:** a reef ecosystem that is vital to the fisheries of Belize



- Four Survey Instruments developed, targeted to (1) local community (2) national community (3) tourists, to be adapted and applied in each case
- Baseline socio-economic report and compilation of secondary data
- Administration of surveys and primary data collection
- GIS land-use mapping
- Data Analysis and Results

Work in Progress



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	Survey Designs	Baseline Report	Data Collection	GIS Mapping	Data Analysis
Grande Riviere					
Georgetown					
Bequia					
Belize Barrier Reef					



- Grande Riviere, Trinidad
 - Turtle Village Trust, Grande Riviere Tour Guides Association
 - Conference on Eco-Tourism and Leatherback Turtles in Trinidad, July 2009
 - Tour Guides assistance in data collection

- Georgetown, Guyana
 - Housing and Planning Authority



■ Economics

- 1 completed MSc student:
 - “Vulnerability to Sea Level Rise in an Urban Centre of a Developing Country: A Case Study of Georgetown, Guyana”

- 1 new MSc student:
 - Biodiversity, Eco-Tourism and Sustainable Livelihoods: Empirical Linkages in Grande Riviere, Trinidad

- 1 new PhD student:
 - Socio-Economic Vulnerability in Two Caribbean Coastal Sites: Bequia and Belize Barrier Reef



■ Engineering

- 4 completed undergraduate student projects (Geomatics Engineering and Land Management):
 - Developing a Predictive GIS Model of Sea Level Rise for a Selected Coastal Community
 - Social and economic impact of potential climate change on coastal communities
 - Social and economic impact of potential climate change on coastal communities
 - An Assessment of sea level scenarios and their impacts upon coastal communities. A case study of the coastal community of Grand Riviere



■ Engineering

- 1 completed MSc (Urban and Regional Planning) student:
 - “Adaptation Measures to Climate Change and Sea Level in Georgetown, Guyana”

- 2 ongoing MSc (Urban and Regional Planning) students:
 - Structural and Non-Structural Adaptation Measures to Climate Change and Sea Level in Belize City, Belize

 - Adaptation Measures to Protect Sea Turtle Nesting Habitat: Climate Change, Sea Level Rise and Beach Erosion in Grand Riviere, Toco



▪ Science and Agriculture

➤ 2 ongoing PhD students

- Sustainable Development of the Caribbean's Coastlines
- The effects of Seasonal Beach Dynamics on the Nests of the Leatherback Turtle (*Dermochelys coriacea*) at Matura and Grande Riviere, Trinidad



- The Importance of Nature to Rural Communities in Developing Countries: Community Perceptions of Biodiversity and Ecosystem Services in Grande Riviere, Trinidad
- A Rural Community Perspective of Climate Change in Developing Countries : State of Knowledge, Level of Concern and Perception of Risk
- Raising Awareness of Climate Change in Rural Communities of Developing Countries: The Role of Social Media
- Costing Adaptations to Climate Change and Sea Level Rise: The case of turtle nesting sites at Grand Riviere
- GIS Applications and Coastal Setbacks as an Adaptation Measure to Climate Change and Sea Level Rise: Sea Turtle Nesting in Grande Riviere



- Implications of Climate Change Impacts for Community-based Ecotourism: Grand Riviere Toco
- Sea Level Rise Modelling in Support of Socio-Economic Impact Analysis: Grande Riviere, Trinidad and Tobago
- Building Resilience in Georgetown, Guyana: Adaptation Measures for Climate Change and Sea level Rise
- Vulnerability to Sea Level Rise in an Urban Centre of a Developing Country: A Case Study of Georgetown, Guyana
- GIS Modelling and Socioeconomic Impact Analysis
- Difficulties in Sea Level Rise Modelling in SIDS



- Conference and Seminar Presentations
 - conference talks in 2009-2010
- Academic Papers
 - papers in progress
- Website <http://www.coastalchange.ca/>

Roadmap for 2011



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- **Data Collection Activities**
 - Bequia data collection to be completed in 2011
 - Belize data collection to begin in 2011

- **Data Analysis Activities**
 - To continue on Grande Riviere and Georgetown datasets

- **Community-Oriented Activities**
 - Town hall meetings, with formation of interest groups, communication of results, and dialogue on adaptation and mitigation strategies

- **Dissemination Activities**
 - planned conference talks in 2011
 - planned project conference for 2011
 - Paper publications in peer-reviewed journals
 - Newspaper articles

Thank You!



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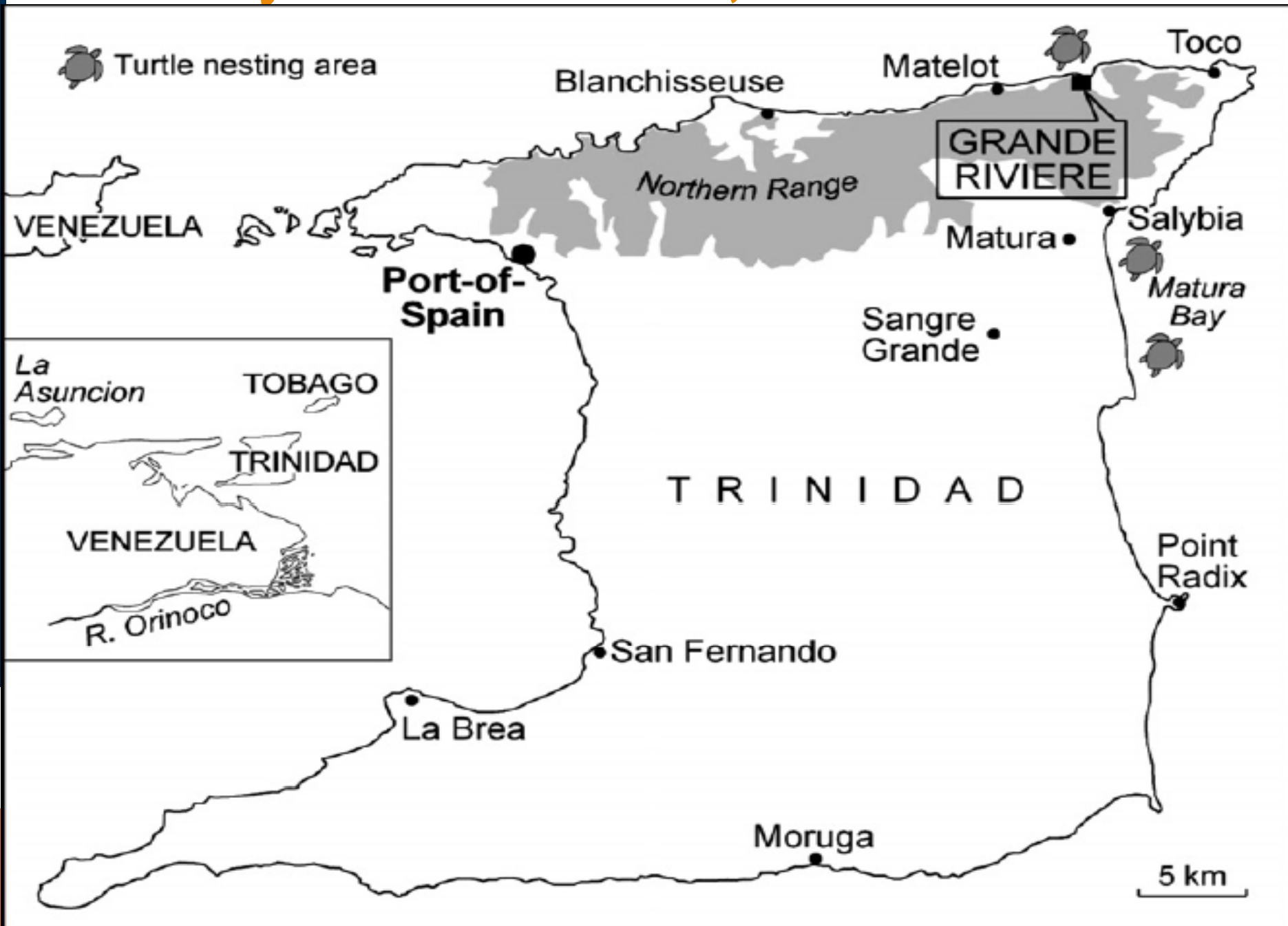
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BUT, if there is time for more.....

Case Study 1: Grande Riviere, Trinidad





- Community affected by sea level rise through potential loss of Grande Riviere beach where significant leatherback turtle nesting takes place
- Community therefore impacted by loss of existing and potential eco-tourism activities that surround the leatherback turtle nesting
- Surveys executed over the period April to July 2010
 - Community survey (101 households)
 - Domestic on-site visitors (114)
 - International on-site visitors (107)
 - Airport survey (254)
- Respondents mapped on a grid, we are therefore able to link the socio-economics to the spatial dimensions of the land management group

Basic Facts (2000 Census)



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- 298 individuals
- 147 households
- Population mainly of African descent (92%); remainder “Mixed”
- Income Levels:
 - More than \$2000 (319 CAN) per month: less than 9%
 - \$1000-\$1999 (159 - 319 CAN) per month: 18%
 - Less than \$999 (159 CAN): over 68%
- Two distinct types of terrain: slopes of the Northern Range as well as a narrow Land strip on the coastline of less than 100m

Grande Riviere: Environmental Threats



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- Hillside Deforestation
- Hunting of Turtles and Wildlife
- Reduction in Fish Stocks
- Oil Spills
- Waste Disposal from Beach Hotels
- Climate Change

Identification of Threats to Turtles



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- Underlying threats of climate change
 - Sea level rise can swamp small nesting beaches
 - Warming temperatures can affect gender
- threats to nesting (beaches)
- threats to foraging and migration (open waters)
- Threats to nesting can be dealt with at community and national level (beach patrols)
- Threats of open waters very difficult to manage

Grande Riviere: Economic Potential



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- Rich in biodiversity and natural fauna
- A popular eco-destination despite its remote location (4000 on turtle tours estimated yearly)
- 4 small eco-resorts, 10 guesthouses
- The Grande Riviere Nature Tour Guide Association managed by local residents
- Community initiatives to protect the nesting turtles increasingly famous worldwide
- Recently identified by British Airways Magazine as one of the top 50 beaches in the world

Grande Riviere Survey Instruments



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- Community Survey: to assess the attitudes and opinions of the community on (1) climatic issues (2) their interactions with nature
- On Site National Visitors: To estimate and profile existing and potential national demand for eco-tourism surrounding the leatherback turtles in Grande Riviere
- On Site International Visitors: To estimate and profile existing and potential international demand for eco-tourism surrounding the leatherback turtles in Grande Riviere
- Off Site Visitors / Airport Surveys: To determine the potential demand for eco-tourism surrounding the leatherback turtles in Grande Riviere



- to assess their attitudes and opinions on:
 - A. their interactions with nature
 - B. the eco-tourism surrounding the turtle nesting
 - C. climatic issues

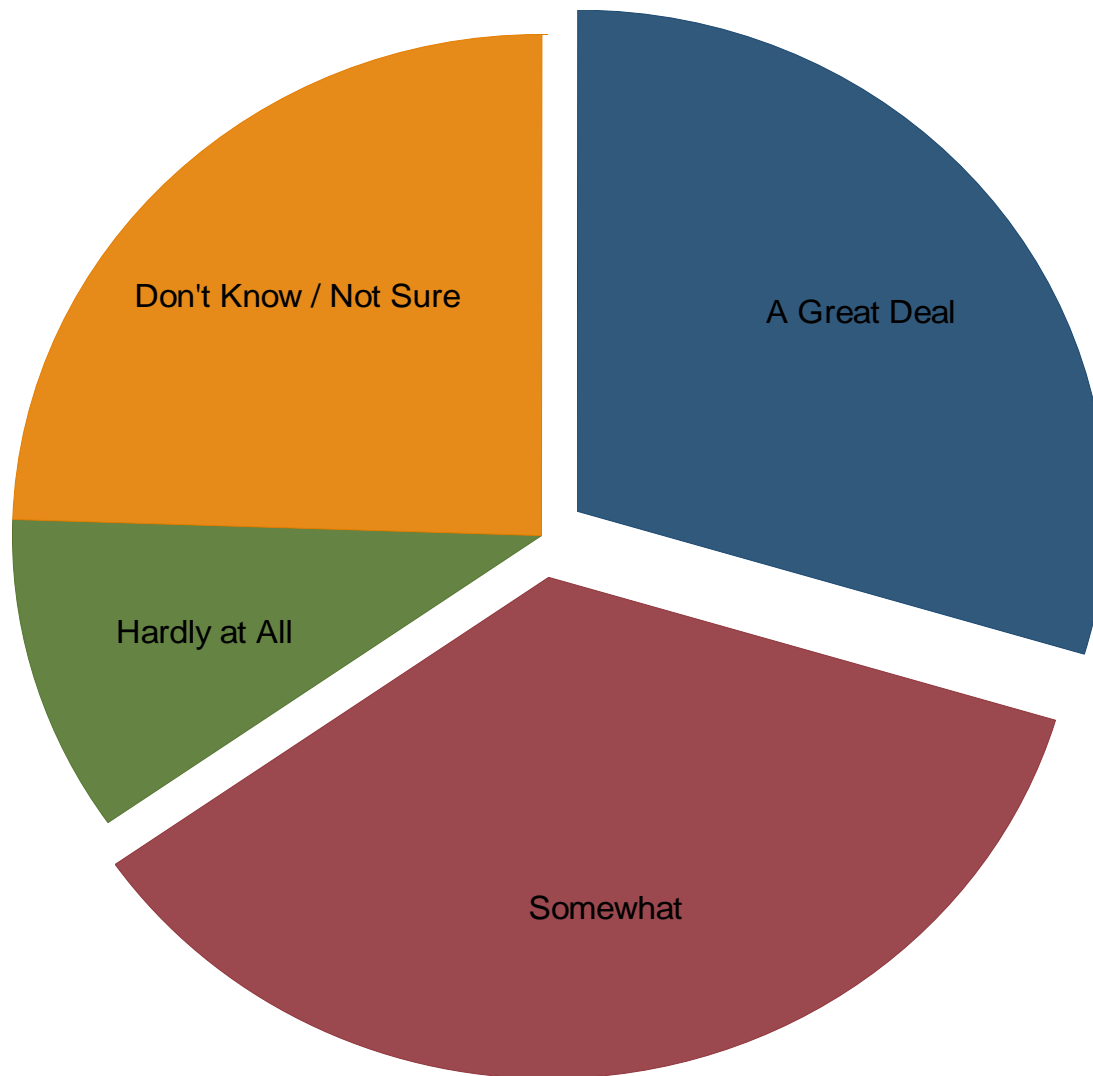
- 5 sections consisting of:
 1. General
 2. Demographic
 3. Ecosystem Services
 4. Eco-Tourism and Leatherback Turtles
 5. Climate Change

Grande Riviere, Descriptive Statistics

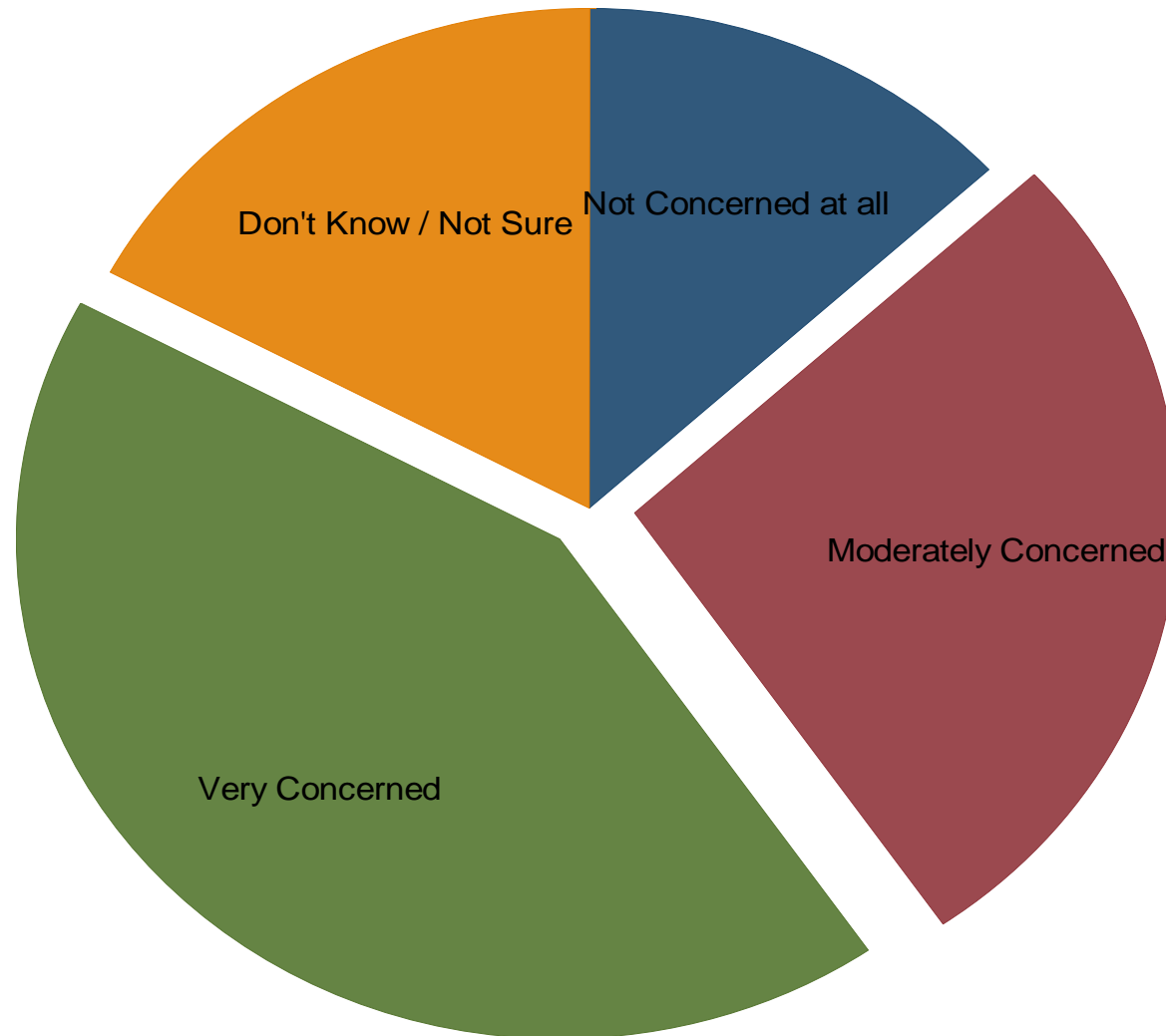


Variable	Descriptive Measure
Age	Mean = 48.2
Income	Modal Category = 494 –957 CAD
Gender	51% Female 49% Male
Employer	29% “Private Enterprise” 21% “Self Employed”
Education	47% “Secondary School”, 47% “No Qualifications”
Ethnicity	75% “African” 25% “Mixed”
Farmers	43%
Fishermen	19%
Tour Guides	15%

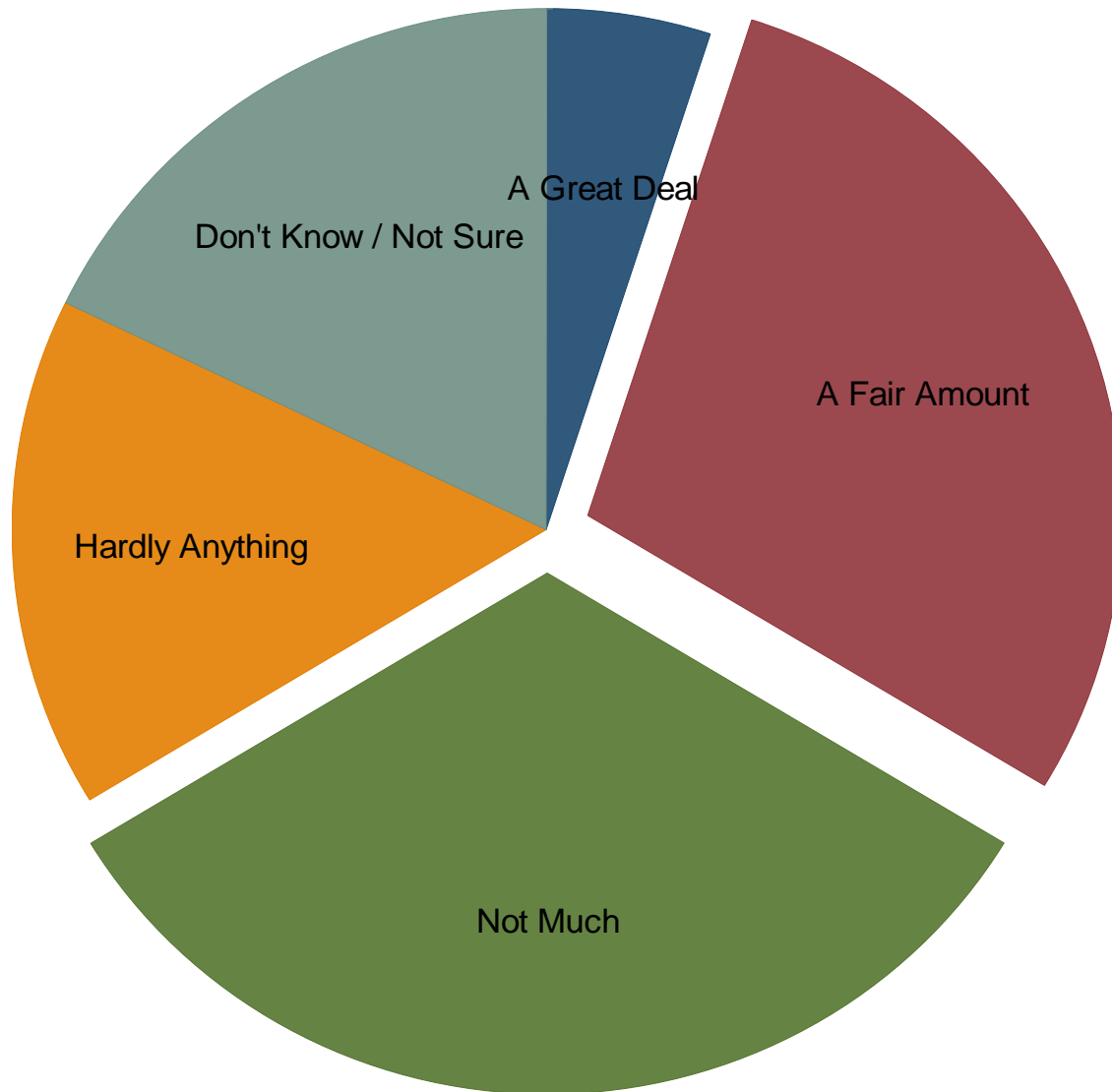
Is Grande Riviere at Risk from Climate Change?



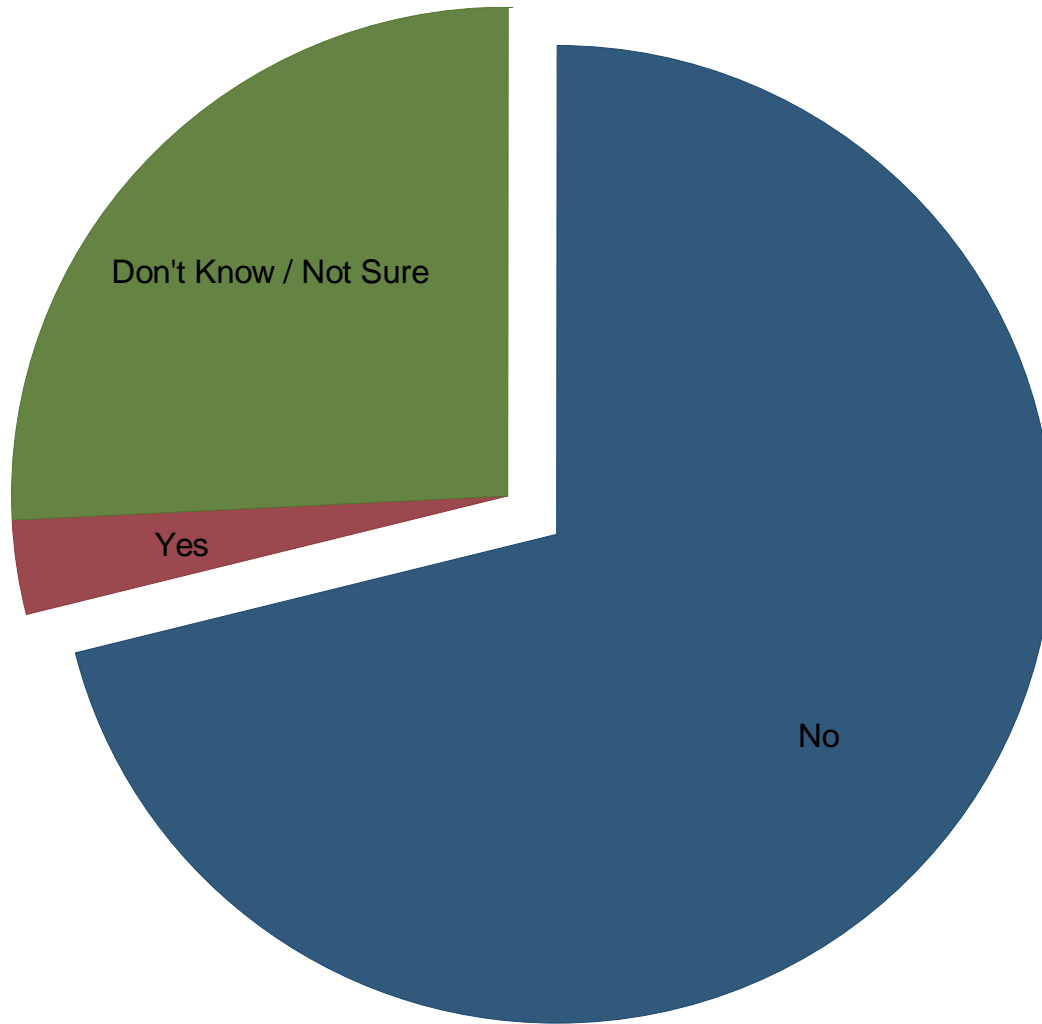
How Concerned are You about Climate Change?



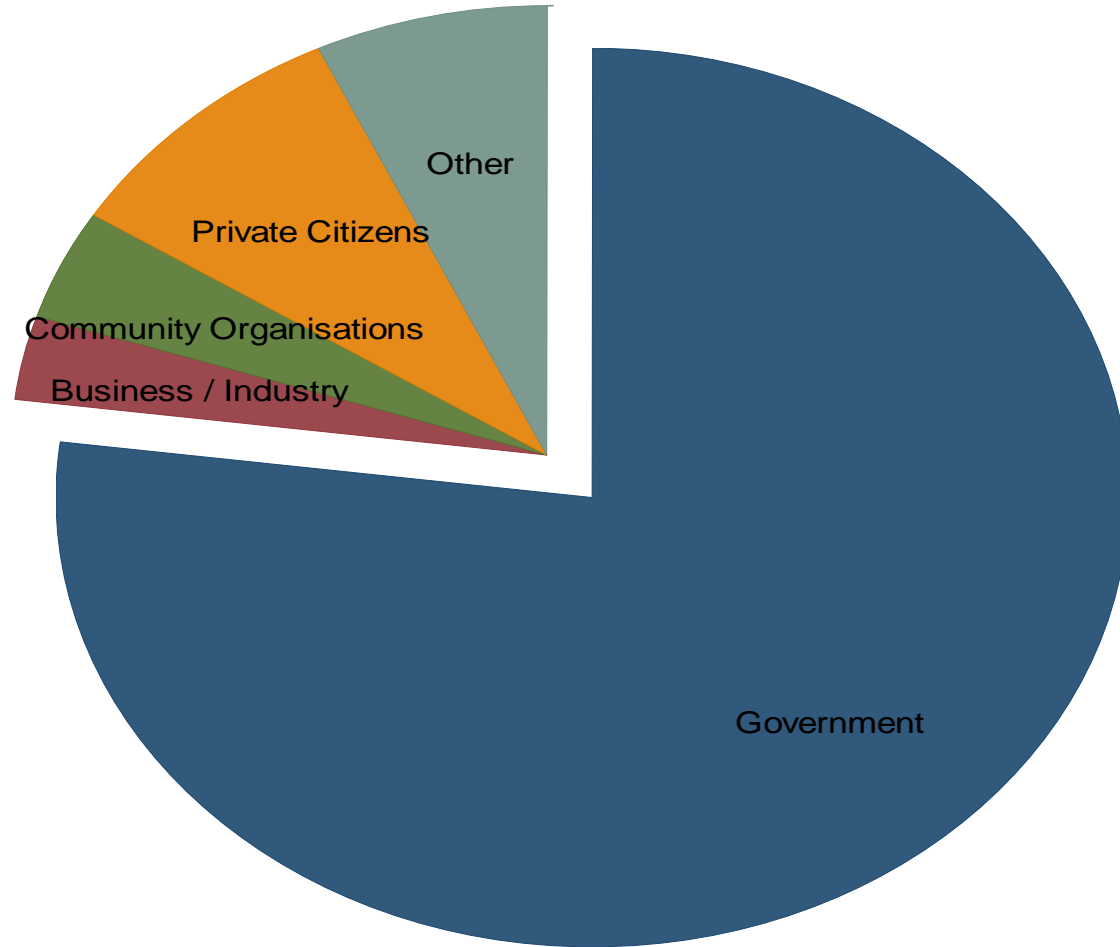
How Much do You Know about Climate Change?



Is Trinidad and Tobago Prepared to Handle Extreme Weather Events?



Who is Mainly Responsible for Dealing with Climate Change?



Case Study 2: Georgetown, Guyana



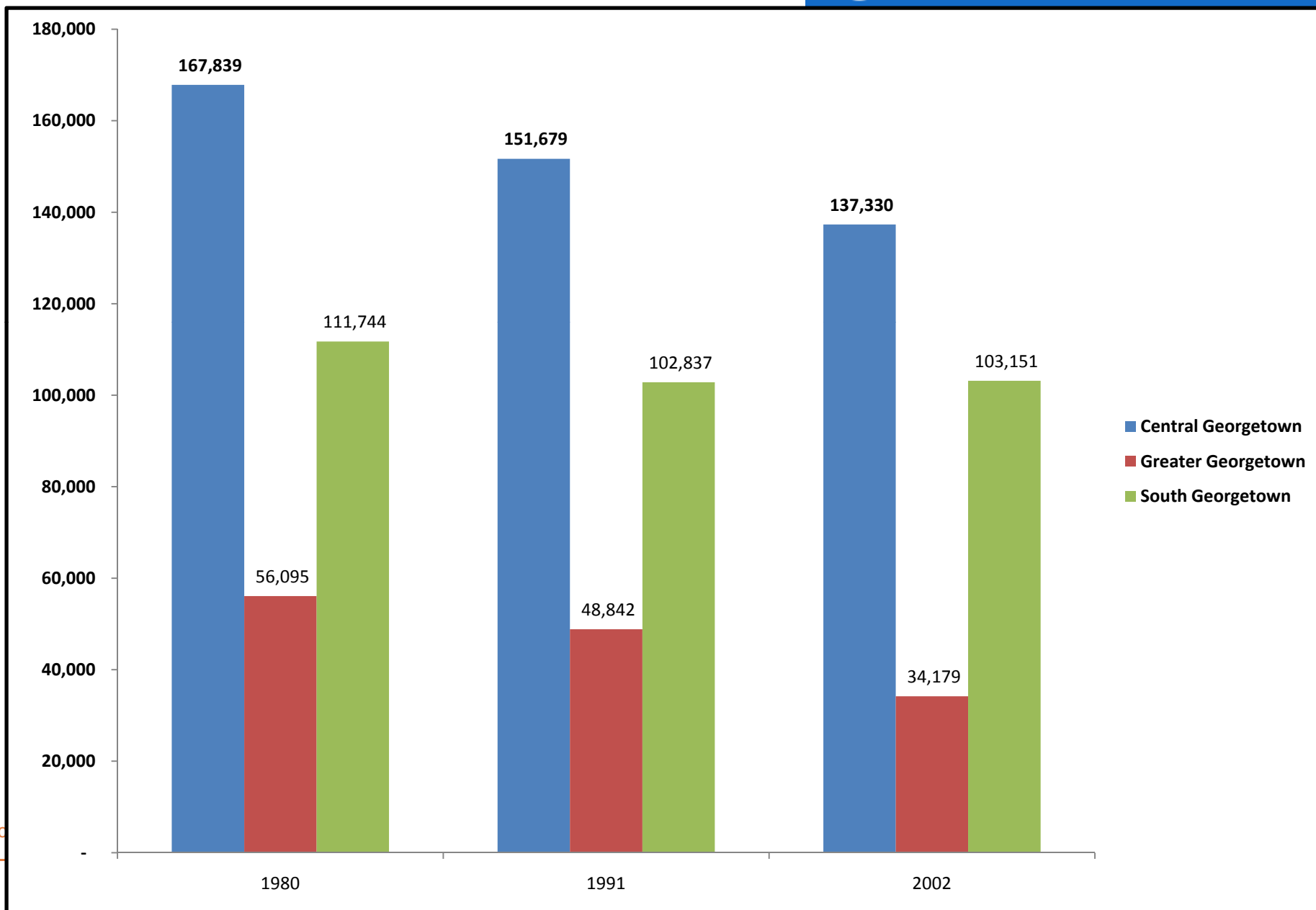


- About 90% of the Guyana's population lives on a coastal belt that is 1.4 metres below sea level
- Rising sea-levels are likely to increase the frequency and intensity of flooding in Georgetown.
- In the last decade, extreme weather conditions more frequent
- Most of the potable water provided by artesian wells whose water tables are susceptible to saltwater intrusion
- Specific areas suffer from saltwater intrusion mainly due to the many drainage canals and water outlets, overtopping, and flooding resulting from heavy rainfall
- Since the coast is critical to the economic development of the entire economy, the ripple effects are expected to be felt further than the coastal regions of Guyana.

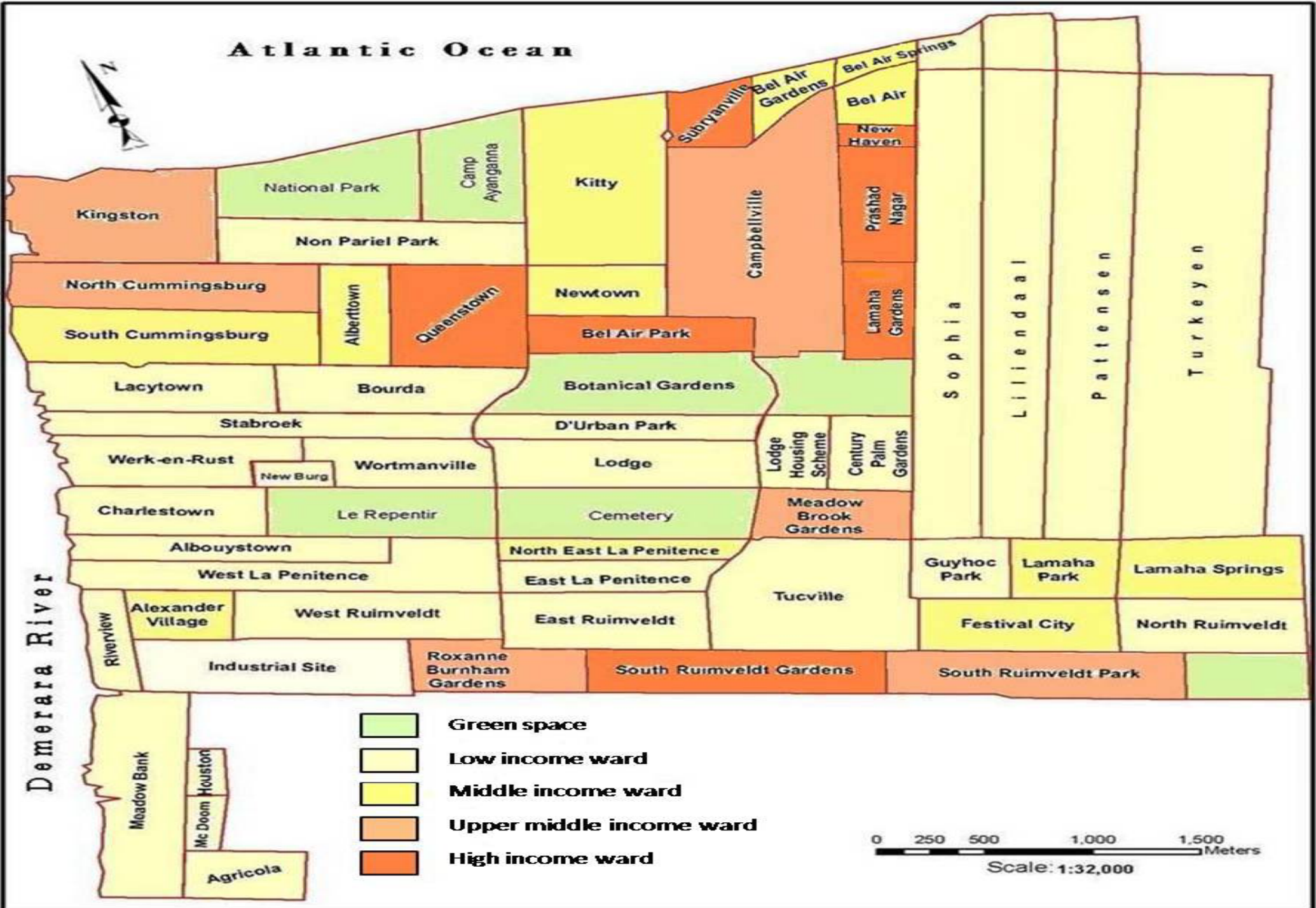
Georgetown, Population Trends



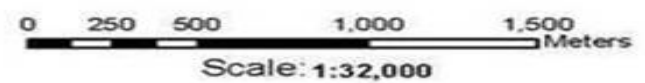
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Atlantic Ocean



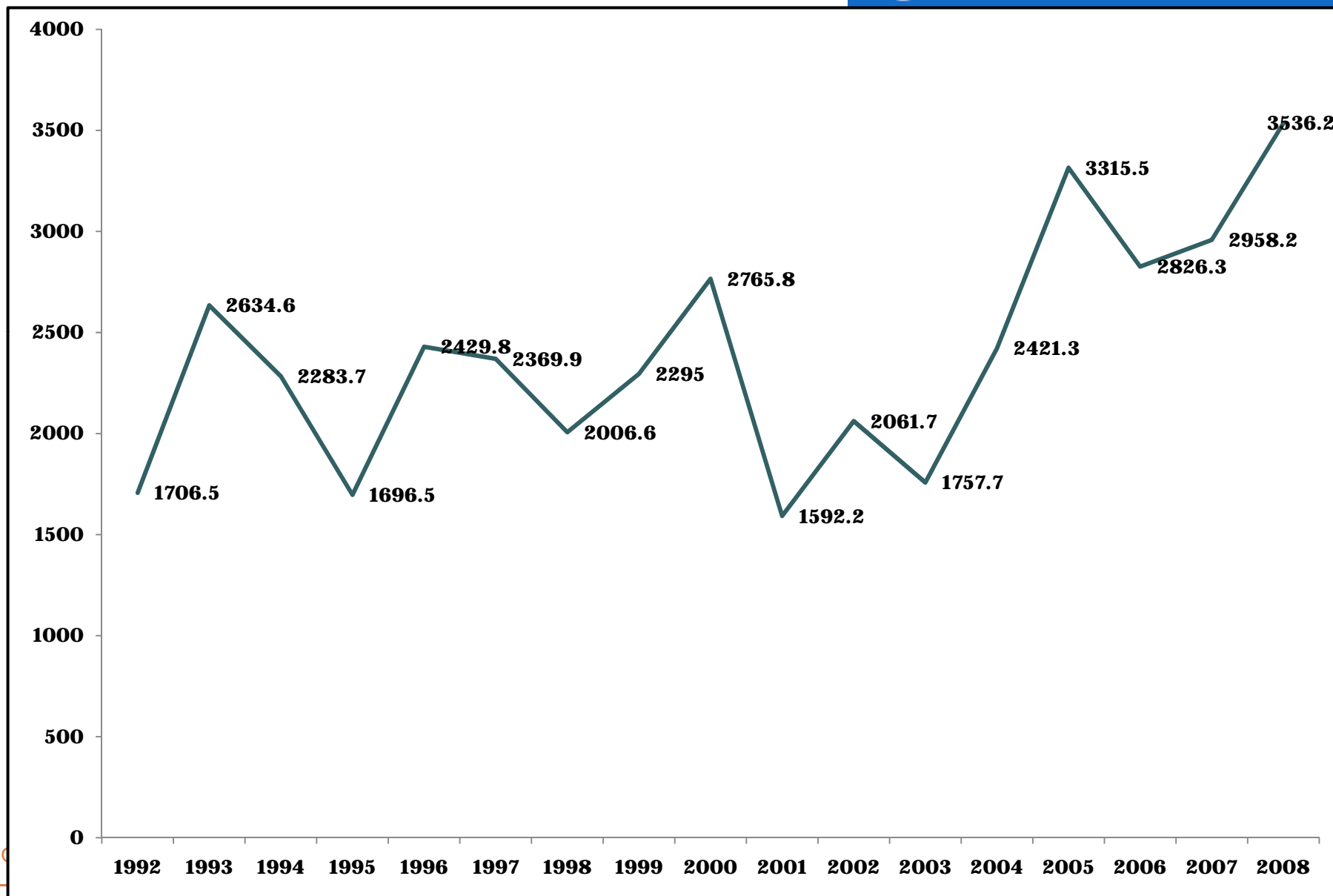
- Green space
- Low income ward
- Middle income ward
- Upper middle income ward
- High income ward



Georgetown, Yearly Rainfall (ml)



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Implications of Sea Level Rise for Guyana



Georgetown Survey Instrument



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- Adaptation and administration of Community Survey

- To assess the attitudes and opinions of the community on:
 - A. their interactions with nature
 - B. climatic issues

- 4 sections consisting of:
 1. General
 2. Demographic
 3. Ecosystem Services
 4. Climate Change

Georgetown, Data Collection



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- A random sample of households drawn based on the method of Probability Proportion to Size (PPS)
- Enumeration Districts (EDs) drawn based on the size of the Community selected in Georgetown
- A combined total of 100 households from all of the 10 selected communities. A total of 1000 questionnaires administered over July-August 2010

Georgetown, Sampled Communities



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Sampled Community	Income Category
Bel Air Park Subryanville	High Income
Roxanne Burnham Gardens Kingston	Upper Middle Income
South Cummingsburg Kitty	Middle Income
Werk-en-rust Tucville	Lower Middle Income
Sophia Riverview	Low Income

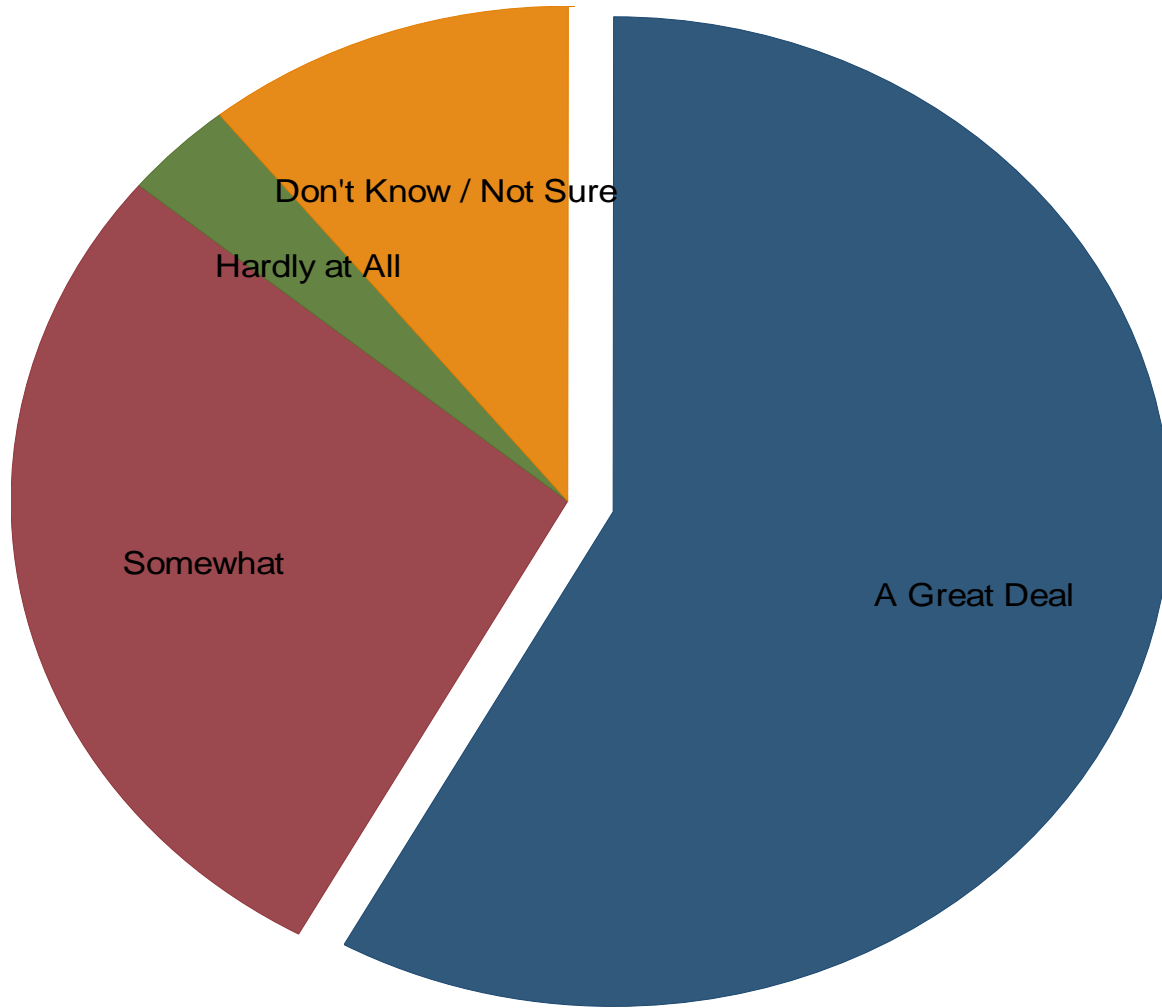
Georgetown, Descriptive Statistics



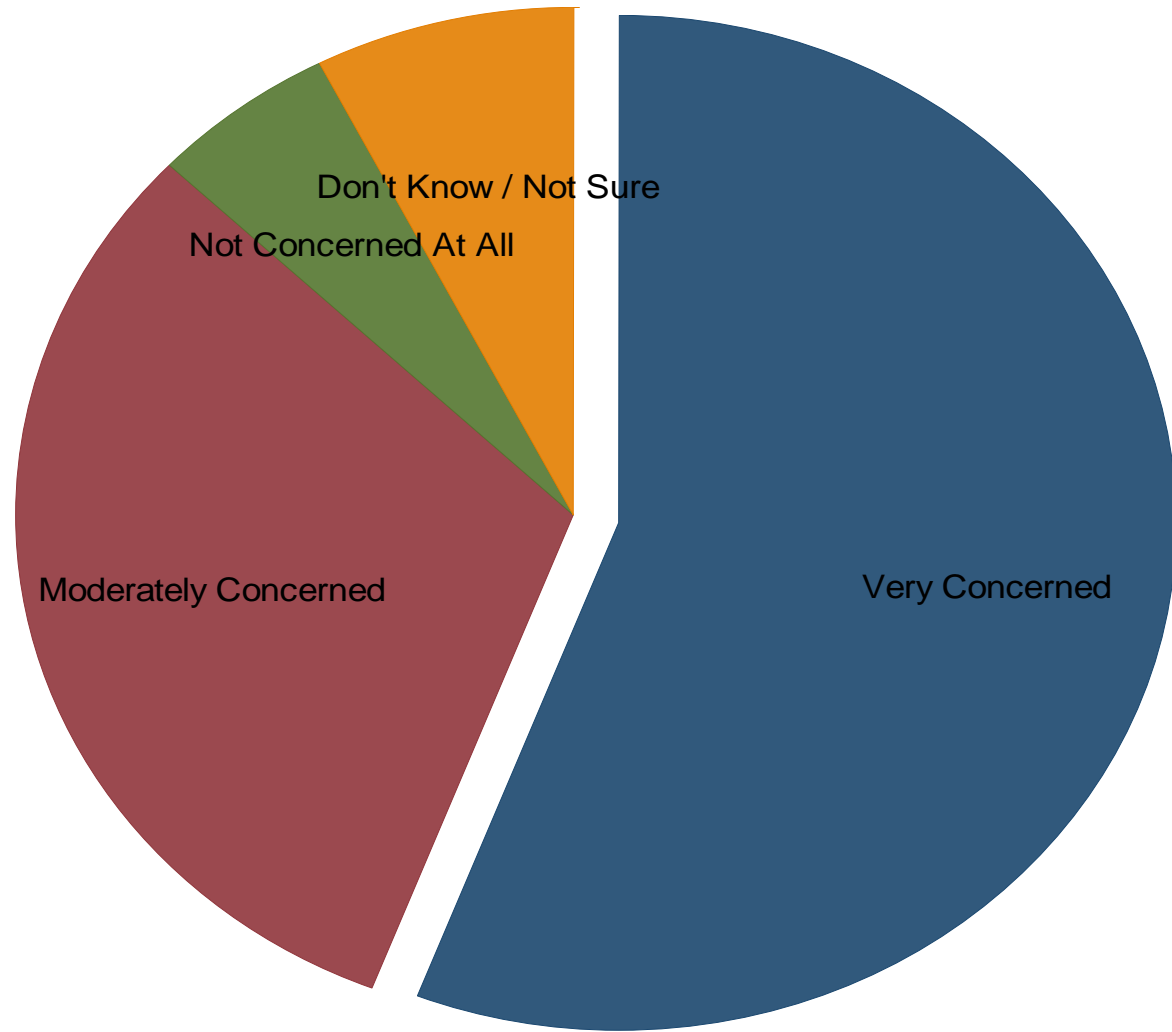
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Variable	Descriptive Measure
Age	Mean = 43.8
Income	Modal Category = 199 – 299 CAD
Gender	46% Female 53% Male
Employer	36% “Private Enterprise”
Education	55% “Secondary School”
Ethnicity	47% “African/Black” 30% “Mixed”

Is Georgetown at Risk from Climate Change?



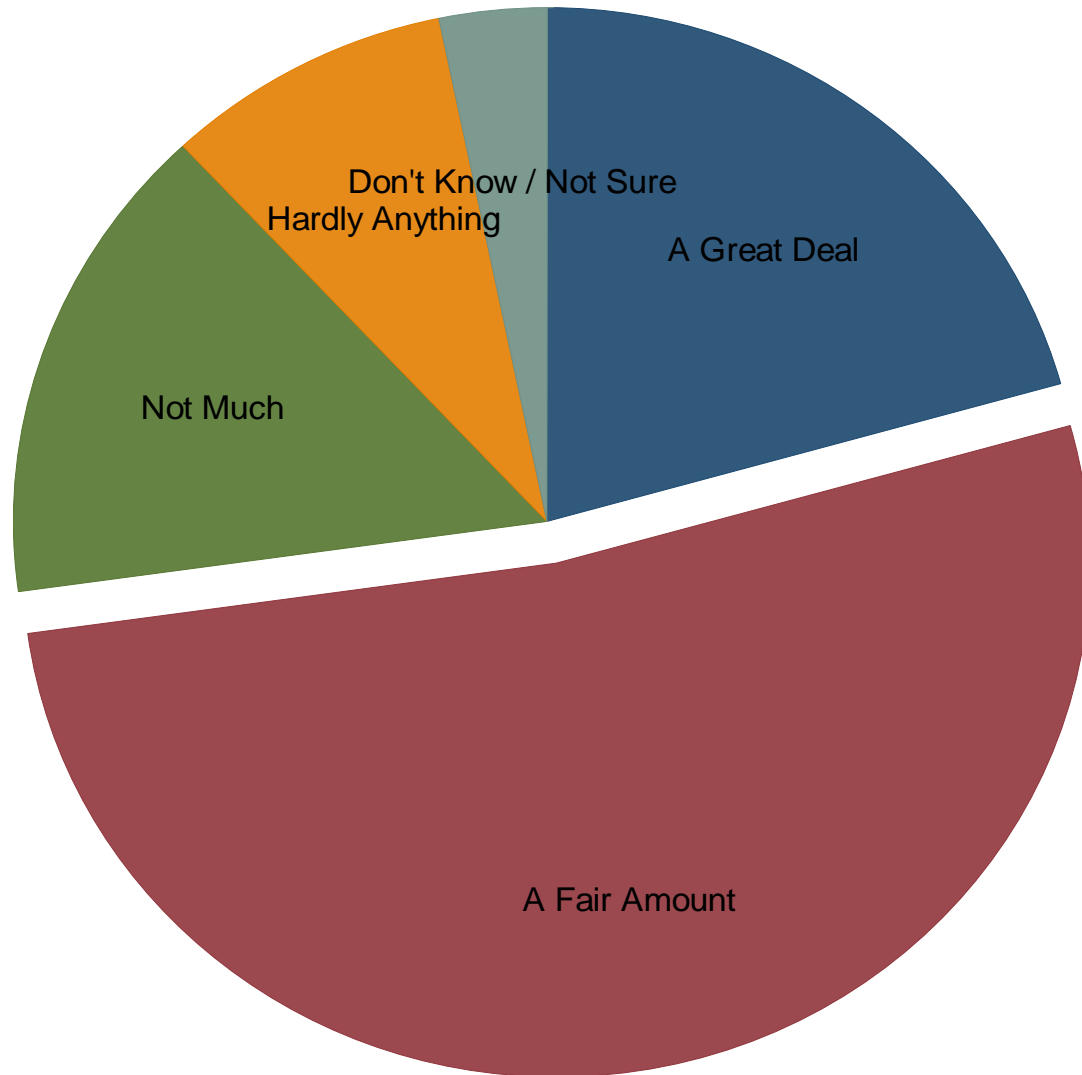
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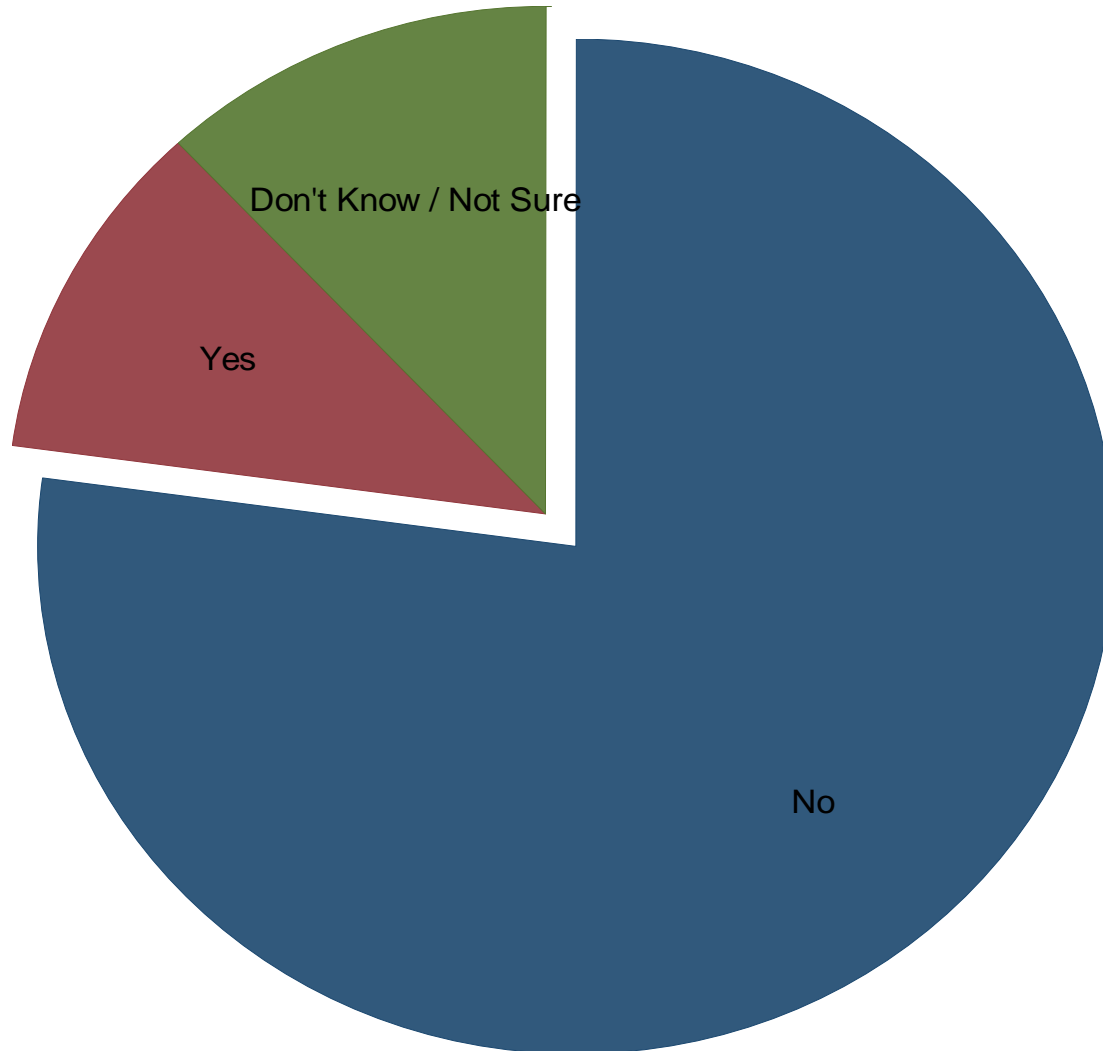
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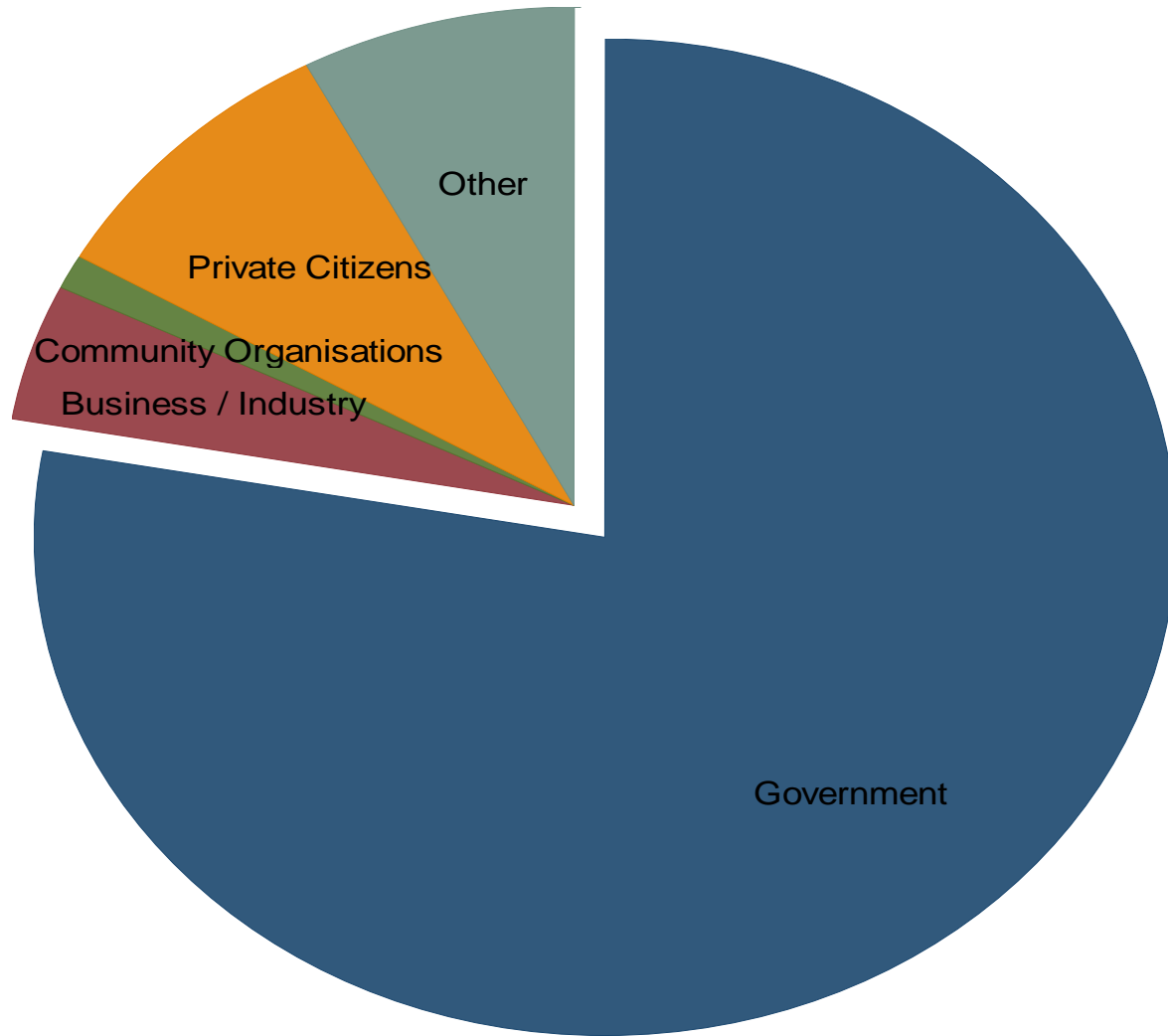
How Much do You Know about Climate Change?



Is Guyana Prepared to Handle Extreme Weather Events?



Who is Mainly Responsible for dealing with Climate Change?



A Community Vulnerability Index (1)



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- **CSVI = 0.20 [FC+HC+SC+NC+PC]**

- **Financial Capital (20%)**
 - Dwelling Type (33.33%)
 - Dwelling Ownership (33.33%)
 - Land Ownership (33.33%)

- **Human Capital (20%)**
 - Current Economic Activity (33.33%)
 - Main Occupation (33.33%)
 - Major Industry (33.3%)

A Community Vulnerability Index (2)



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■ **Social Capital (20%)**

- Highest Education of All Members of a Household (25%)
- Highest Education of the Head of the Household (25%)
- Transport to School (25%)
- Transport to Work (25%)

■ **Natural/Environmental Capital (20%)**

- Fuel for Cooking (16.67%)
- Lighting (16.67%)
- Main Source of Drinking Water (16.67%)
- Main Source of Water Supply (16.67%)
- Garbage Disposal Method (16.67%)
- Type of Toilet Facility (16.67%)

■ **Physical Capital (20%)**

- Outer Wall Construction Material (50%)
- Roofing Material (50%)

Preliminary Calculations



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Community Social Vulnerability Index

<i>Village Name</i>	<i>Index Score</i>	<i>Rank</i>
Roxanne Burnham Gardens	0.460489	1
Subryanville	0.440653	2
Kitty	0.434436	3
Bel Air Park	0.433649	4
Tucville	0.425778	5
Werk En Rust	0.422715	6
Kingston	0.411214	7
South Cummingsburg	0.402893	8
River View Ruimveldt	0.397373	9
Sophia	0.390951	10

Once Again, Thank You!



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