SEA LEVEL RISE MODELLING IN SUPPORT OF SOCIOECONOMIC IMPACT ANALYSIS: GRANDE RIVIERE, TRINIDAD AND TOBAGO

Presentation Outline:

• Sea Level Rise Projections (Potential Threat)
• Grande Riviere (Study Site)
• ICURA Project (Multidisciplinary Methodology)
• Socioeconomic Survey of Grande Riviere (Results)
• Sea Level Rise Model (Methodology and Results)
• Acknowledgements
### SEA LEVEL RISE PROJECTIONS

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

<table>
<thead>
<tr>
<th>IPCC Category</th>
<th>Projection Stated</th>
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<tbody>
<tr>
<td>1</td>
<td>0.4m - 1.4m 2000 - 2015</td>
</tr>
<tr>
<td>2</td>
<td>0.5m - 1.7m 2000 - 2020</td>
</tr>
<tr>
<td>3</td>
<td>0.6m - 1.9m 2010 - 2030</td>
</tr>
<tr>
<td>4</td>
<td>0.6m - 2.4m 2010 - 2060</td>
</tr>
<tr>
<td>5</td>
<td>0.8m - 2.9m 2050 - 2080</td>
</tr>
<tr>
<td>6</td>
<td>1.0m - 3.7m 2060 - 2090</td>
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</tbody>
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ICURA PROJECT: GRANDE RIVIERE, TRINIDAD AND TOBAGO

- Leatherback Turtle Nesting Site
- Bird Watching
- Tourism
- Commercial
- Residential
- Agriculture
ICURA PROJECT: MULTIDISCIPLINARY METHODOLOGY

ICURA PROJECT: SOCIOECONOMIC SURVEYS

- 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
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: Demographic and Socioeconomic Information

Sector Employed and Employment Status
Preliminary Results: SLR

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

- Agree
- Disagree
- Don’t Know

Preliminary Results:

Awareness/Knowledge of Climate Change

Knowledge of Climate Change

- A Great Deal
- A Fair Amount
- Not Much
- Hardly Anything
- Don't Know/Not Sure
SEA LEVEL RISE MODEL: DATA

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

SEA LEVEL RISE MODEL: GEOMATICS METHODOLOGY

- Obtain Existing Secondary Data
- Establish XYZ Control and Conduct Field Work (MSL Datum Transfer; Beach Profiles; Spot Heights …)
- Process Data in ArcGIS and ArcScene
- Develop 2D and 3D Models
Michael SUTHERLAND, Trinidad and Tobago

Simulated MSL at Grande Riviere Beach

Simulated 0.4m above MSL at Grande Riviere Beach
Simulated 0.6m above MSL at Grande Riviere Beach

Simulated 0.8m above MSL at Grande Riviere Beach
SEA LEVEL RISE MODEL: VISUALIZATION

Simulated 0.4m to 3.7m above MSL at Grande Riviere Beach

SEA LEVEL RISE MODEL: RECENT WORK
TEMPORAL BEACH PROFILES FOR BEACH DYNAMICS
**SEA LEVEL RISE MODEL: RECENT WORK**

**INCREASE IN CERTAINTY OF IMPACT**

Even at 0.4m above MSL there is significant impact upon turtle nesting sites

Secondary impact upon Grande Riviere's socioeconomic wellbeing

Support for mitigation/adaptation strategies
ACKNOWLEDGEMENTS

The authors acknowledge the assistance of the Department of Geomatics Engineering and Land Management, University of the West Indies for the use of their equipment used in field surveys. Dr. David Neale is also acknowledged for his assistance in obtaining tide gauge data and provision of the tide gauge used at Grande Riviere. Ms. Safiya Alexander, Ms. Sade Grant, Ms. Rachel Rampersadsingh, Ms. Anushka Singh, Ms. Farah Hosein, Mr. Michael Wilson and Mr. Akelo Moore (all undergraduate students at the time of the surveys) are hereby acknowledged for their assistance in completing the field surveys. Finally, financial support from the International Community-University Research Alliance (ICURA) program, sponsored jointly by Canada’s Social Sciences and Humanities Research Council (SSHRC) and International Development Research Centre (IDRC), is hereby gratefully acknowledged.

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THANK YOU