Assessing the Costs of Disasters on Jamaica’s Infrastructure: Evidence from the Damage and Loss Assessment by the Planning Institute of Jamaica
Jamaica’s Vulnerability to Natural Hazards
Methodology

- ECLAC Damage and Loss (DALA) Methodology
- Damage (replacement cost)
- Loss
- Damage + Loss = Total Cost
- Secondary effects also considered
Some Definitions:

- **Damage**: monetary value of partial or total damage to fixed assets, capital and inventories of finished and semi-finished goods, raw materials and spare parts that occur concurrently as a direct consequence of the natural phenomenon causing a disaster.

- **Losses**: The effect on flows of goods that will not be produced and services that will not be provided after a disaster.

- **Secondary effects**: The impact on the overall performance of the economy, as measured through the most significant macro-economic variables.
Disasters - Some Recent Trends
## Selected natural disasters in Jamaica and their impact

<table>
<thead>
<tr>
<th>EVENT</th>
<th>Year</th>
<th>Category</th>
<th>Cost ($JB)</th>
<th>Impact (% GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Michelle</td>
<td>2001</td>
<td>4</td>
<td>2.52</td>
<td>0.8</td>
</tr>
<tr>
<td>May/June Flood Rains</td>
<td>2002</td>
<td>-</td>
<td>2.47</td>
<td>0.7</td>
</tr>
<tr>
<td>Hurricane Charley</td>
<td>2004</td>
<td>4</td>
<td>0.44</td>
<td>0.02</td>
</tr>
<tr>
<td>Hurricane Ivan</td>
<td>2004</td>
<td>3</td>
<td>36.9</td>
<td>8.0</td>
</tr>
<tr>
<td>Hurricanes Dennis &amp; Emily</td>
<td>2005</td>
<td>4</td>
<td>5.98</td>
<td>1.2</td>
</tr>
<tr>
<td>Hurricane Wilma</td>
<td>2005</td>
<td>5</td>
<td>3.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Hurricane Dean</td>
<td>2007</td>
<td>4</td>
<td>23.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Tropical Storm Gustav</td>
<td>2008</td>
<td></td>
<td>15.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Tropical Storm Nicole</td>
<td>2010</td>
<td></td>
<td>20.6</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>111.81</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled by the PIOJ with data from various agencies
The frequency of disaster has been increasing.
Intensity of Storm events has been increasing

- Hurricane Gilbert
- Hurricane Michelle
- Hurricane Charley
- Hurricane Ivan
- Hurricanes Dennis/Emily
- Hurricane Wilma
- Hurricane Dean
Cost of Disasters (2001-2010)
Costs relative to Gross Domestic Product (GDP)
IMPACT ON THE INFRASTRUCTURE SECTOR
Infrastructure - definition

- Systems and assets, whether physical or virtual the destruction of which would have debilitating impact on national economic security, national public health or safety, or a combination of both (Paromak 2005)
Based on the Damage and Loss (DALA) methodology developed by ECLAC Infrastructure includes:

- **Transport and Communications** – road network and ground transport, water and air transport infrastructure, telecommunications, coastal infrastructure

- **Drinking Water and Sanitation** – drinking water supply systems, waste water disposal systems, solid waste disposal systems

- **Energy** – electricity, petroleum sub-sectors
## Characteristics of key Infrastructure

<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>Some Characteristics</th>
</tr>
</thead>
</table>
| **Transport**            | • Jamaica has 21000 kilometres of roads. This includes freeways, primary roads (a), secondary roads (b), parochial roads and unclassified road.  
                          | • The National Works Agency has a total of 736 bridges in its database of various types including: steel beams; arch; concrete girders; and truss.                                                                                   |
| **Energy**               | The energy infrastructure comprises:  
                          | • Four main power lines located at St. Andrew – Rockfort; Kingston -- Hunts Bay; St. Catherine – Old Harbour Bay; St. James – Bogue, all are coastal locations.  
                          | • Eight hydro-electric plants located at St. Elizabeth – Maggoty; St. Ann -- Upper White River; St. Ann -- Lower White River; St. Ann -- Roaring River; Trelawny -- Rio Beuno A;  
                          | Trelawny -- Rio Bueno B; St. Andrew -- Rams Horn; St. Andrew -- Constant Spring;  
                          | • One wind farm; St. Elizabeth -- Munro Wind Farm                                                                                                       |
| **Water Supply Facilities** | • Water Supply infrastructure water storage plants e.g. Mona Reservoir, Water treatment plants e.g. Mona Treatment Plant, Water supply facilities e.g.Yallahs Pipeline Scheme; pumping stations, and sewerage treatment plants |

Some Factors Contributing to Infrastructure Damage

- Age of infrastructure
- Design Standards
- Location
- State of Repairs/Maintenance
- Environmental Conditions
## Costs to the Infrastructure Sector

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>H. Michelle 01</th>
<th>May/June Rains 02</th>
<th>H Ivan 04</th>
<th>H. Dennis/Emily 05</th>
<th>H Wilma 05</th>
<th>H Dean 07</th>
<th>TC Gustav 08</th>
<th>TC Niole 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water &amp; Sewerage</td>
<td>96</td>
<td>78.7</td>
<td>687.7</td>
<td>400</td>
<td>47.4</td>
<td>202</td>
<td>725</td>
<td>270</td>
</tr>
<tr>
<td>Telecom</td>
<td>6.9</td>
<td>4.46</td>
<td>1535.3</td>
<td>42</td>
<td>30</td>
<td>197.68</td>
<td>136.9</td>
<td>1953.24</td>
</tr>
<tr>
<td>Transport</td>
<td>1577.5</td>
<td>1491.8</td>
<td>3225.9</td>
<td>4271.89</td>
<td>3199</td>
<td>2047.3</td>
<td>11530</td>
<td>17041.8</td>
</tr>
<tr>
<td>Energy &amp; Electricity</td>
<td>6.4</td>
<td>1.2</td>
<td>1397.9</td>
<td>70</td>
<td>1073.25</td>
<td>108</td>
<td>92.4</td>
<td>2749.15</td>
</tr>
<tr>
<td>Ports</td>
<td>120.1</td>
<td>11.56</td>
<td>1.8</td>
<td>133.46</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**TOTAL** 51727.84
Total costs based on analysis of 9 events was estimated at $111.37 b.

Of this, the infrastructure sector accounted for $51.7 b or 46% of the overall costs. At $44.4 b, the transport sub-sector (roads and bridges) bore the brunt (86%) of these costs.
Costs to the Infrastructure Sector

- Water & Sewerage: 5%
- Telecommunication: 0%
- Transport: 5%
- Energy & Electricity: 4%
- Airports: 86%
- Ports: 0%
Secondary Effects

- Impact of GDP
- Inflation
- Debt Stock
- Budget
- Revenue
- Employment
- BOP
Case Studies
Hurricanes Dennis/Emily, 2005

- Hurricanes Dennis and Emily occurred within two weeks of each other.
- Total damage was estimated at $5,976.91 million or US$96.87 million. This is equivalent to 1.2 per cent of the previous year’s GDP.
- Infrastructure was the most affected area with damage and losses of $4,826.05 million.
- Damage to Transport – roads and bridges accounted for $4,271.89 million, or 71.5 per cent of the total cost.
Tropical Storm Nicole

- Total damage was estimated at $18 089.0 million of which Infrastructure accounted for 88.0 per cent of the total cost. Damage to main roads and bridges was estimated at $14 billion of which $1.42 billion represented the preliminary cost to reopen blocked roads.
- A total of 543 main roads were impacted with St. Thomas accounting for $1,542.2 million or 11 per cent of the total cost of the damage.
- Another $1.9 billion was allocated to river training Cleaning and reconstruction of retaining walls of the Sandy Gully bridge accounted for 32.7 per cent (J$4.6 billion) of the total cost of damage to the road infrastructure.
Figure 1: Sectoral Cost of Damage and Losses - Tropical Storm Nicole

- Environment: 0.01%
- Emergency Operations: 0.24%
- Social: 7.98%
- Productive: 3.71%
- Infrastructure: 88.06%