Rainwater Harvesting as a Resilient Approach to Mitigate Water Crisis

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IWRA XVII World Water Congress (Daegu, Korea, November 29 to December 03 2021)

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Presentation Outline

- Introduction
- Conceptual Understanding
- Methodology
- Results
- Conclusion
Heavy rains to cause flash floods again

Met forecasts for northern districts
Rainwater harvesting is the process of collecting, storing, and utilizing runoff from roofs or ground surfaces for productive use in domestic water supply, agricultural use, and environmental management (Falkenmark et al. 2001; Liniger et al. 2011; Worm and Hatum, 2006).
Conceptual Understanding

➢ To find a reliable and resilient water supply system for the community is one of the major challenges at the local, regional, national, and international levels (Daniel and Tan, 2019).

➢ Reliable water management intervention is important in managing resilience (Lebel et al. 2006).

➢ Resilient approach (Gunderson and Holling, 2002) can contribute to natural resource management (e.g., rainwater).

➢ Walker et al. (2004) provided four important attributes of resilience such as latitude, resistance, precariousness, and panarchy.

✔ In this study, resilience is the ability of RHS to mitigate water crisis, sustainability against stresses, and system’s stability.
Methodology

- **Main Research Question**: How we can measure the resiliency of RHS as a water supplier?

- **Sub research questions are**:  
  - **Q1** What proportion of the year it can resist the water crisis?  
  - **Q2** How much infrastructure of rainwater harvesting can recover after extreme events (e.g., flood, cyclone)? How long households need to wait to use it after uncertainties?  
  - **Q3** Is it a stable water supply system?  
  - **Q4** How we can measure the overall resilient level of this water supply infrastructure?

- **Study site**: Mongla, Bagerhat, Bangladesh

- **Data collection tools**: FGD, household survey, field observations

- **Methods**: Mixed methods, descriptive statistics
Methodology

- **Sustainability Measurement Indicator:**

<table>
<thead>
<tr>
<th>Wait</th>
<th>Description</th>
<th>US$</th>
<th>Expenditure</th>
<th>Recovery Level</th>
<th>Assigned Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30+</td>
<td>Too Long</td>
<td>28+</td>
<td>High Exp.</td>
<td>0.0 - 0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>21-30</td>
<td>Moderate Long</td>
<td>21 - 28</td>
<td>Moderate Exp.</td>
<td>0.26 - 0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>11-20</td>
<td>Average Long</td>
<td>12 - 20</td>
<td>Average Exp.</td>
<td>0.51 - 0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>0-10</td>
<td>Below Average</td>
<td>0 - 12</td>
<td>Below Av. Exp.</td>
<td>0.76 - 1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

- **Resilient Measurement Indicator:**

<table>
<thead>
<tr>
<th>Combine value (Res. Sus., and Sta.,)</th>
<th>Resilient Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5+</td>
<td>Highly Resilient</td>
</tr>
<tr>
<td>2.0 – 2.5</td>
<td>Moderate Resilient</td>
</tr>
<tr>
<td>1.5 – 2.0</td>
<td>Average Resilient</td>
</tr>
<tr>
<td>Less than 1.5</td>
<td>Below Average Resilient</td>
</tr>
</tbody>
</table>
Result (Resistance to Water Crisis)
**Result (Sustainability Against Extremes)**

**Expenditure level**

- High Expenditure
- Moderate Expenditure
- Average Expenditure
- Below Average Expenditure

**Wait level**

- Too Long
- Moderate Long
- Average Long
- Below Average Long

**Recovery level**

- High Recovery
- Moderate Recovery
- Average Recovery
- Below Average Recovery

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### Result (Stability)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>S.D</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>0.976</td>
<td>1.0</td>
<td>0.153</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Local Community</td>
<td>0.558</td>
<td>1.00</td>
<td>0.497</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Organization</td>
<td>0.36</td>
<td>0.00</td>
<td>0.480</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### Overall Resilient Level

- **High Resilient**
- **Moderate Resilient**
- **Average Resilient**
- **Below Average Resilient**
Conclusion

➢ The extension and diversified use of rainwater through rainwater harvesting is the major foundation for the resilient approach of water crisis mitigation.

➢ Current top-down water management practice is not suitable for maintaining this system.

✓ Community freshwater pond initiative is a good example.

☐ RHS is a resilient approach to mitigate the water crisis problem in terms of resistance, recovery, and stability of the system.

➢ It can mitigate the water scarcity by 79.5%, recover 72.66% of infrastructure material, wait 9.43 days, and spend $ 6.84 after calamities.

✓ Overall, 79.42% of households belong to high and moderate resilient levels.
Thank you for your kind attention

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