Urban Flood Risk Management in the Pacific

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# Existing risk

<table>
<thead>
<tr>
<th>Flood</th>
<th>Damage and Loss</th>
<th>% GDP</th>
<th>Death toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Fiji, Jan 2003</td>
<td>F$105M*</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Central Fiji, Apr 2004</td>
<td>F$13M (Navua only)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Western Fiji, Jan 2009</td>
<td>F$440M (Gov’t and private losses)</td>
<td>~10%</td>
<td>7</td>
</tr>
<tr>
<td>Western Fiji, Jan 2012</td>
<td>F$41M (Gov’t only)</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Western Fiji, Mar 2012</td>
<td>F$90M (Gov’t only)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Apia, Samoa, Dec 2012</td>
<td>SAT 465M*</td>
<td>~25%*</td>
<td>5*</td>
</tr>
<tr>
<td>Honiara and Guadalcanal, Solomon Islands, Apr 2014</td>
<td>SI$787M</td>
<td>9.2%</td>
<td>24</td>
</tr>
</tbody>
</table>

* Includes wind damage
Future risk

Increased flood magnitude-frequency

Projected rainfall changes
Australian Bureau of Meteorology and CSIRO (2014)

Observed flood changes
Ba River at Rarawai, 1892-2015
Yeo (2015)
Future risk

Increased exposure and vulnerability

Population growth & rural-urban migration

e.g. Tamavua R., Suva
Benchmarking current urban flood risk management practice
1. Hazard assessment (mapping)

<table>
<thead>
<tr>
<th>Best Practice</th>
<th>Nil</th>
<th>Based on soils or terrain</th>
<th>Historic floods only</th>
<th>Single design flood</th>
<th>Multiple design floods</th>
<th>Hazard</th>
<th>Evacuation zones</th>
</tr>
</thead>
</table>

- April 2014 Mataniko R. extent
- Nadi R. 100y depths
- Vaisigano R. 100y hazard

Honiara Local Planning Scheme 2015
NIWA (2014)
Water Technology (2014)
2. Risk assessment

Benchmarking current FRM practice

<table>
<thead>
<tr>
<th>Best Practice</th>
<th>Consequence for historic flood</th>
<th>Probability-consequence for one event</th>
<th>Probability-consequence for all events</th>
<th>Full acceptance of residual risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Damage-probability curve to calculate AAD
Vaisigano R.
Woodruff (2008)

Koa Hill, 2014
NGIC (2014)

Nadi R., risk to life
NIWA (2014)
3. Floodplain management measures

<table>
<thead>
<tr>
<th>None</th>
<th>Largely informal measures</th>
<th>Structural only</th>
<th>Non-structural and structural</th>
<th>Integrated FRM Plan for all events</th>
</tr>
</thead>
</table>

Benchmarking current FRM practice

"River dredge is the answer"

February 10, 2012

Prime Minister Banimarama said the only solution to solving the flooding issues were that all rivers located close to villages to be dredged.
4. Planning

Benchmarking current FRM practice

Challenges:
- Customary land ownership
- Informal settlement growth
- Limited controls in existing plans
- Limited linkages b/n engineering and planning
- Lack of capacity to implement controls
- Lack of integration between national/local levels
- Conflicts of interest
5. Warning and Emergency Management

<table>
<thead>
<tr>
<th>None</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy rain</td>
<td>Direct dissemination to end</td>
</tr>
<tr>
<td>warnings only</td>
<td>users (e.g. siren, SMS)</td>
</tr>
<tr>
<td>General</td>
<td>Specific height-time</td>
</tr>
<tr>
<td>flood</td>
<td>predictions</td>
</tr>
<tr>
<td>warnings only</td>
<td>Full warning and EM system</td>
</tr>
<tr>
<td>Near real-time</td>
<td></td>
</tr>
<tr>
<td>water levels</td>
<td></td>
</tr>
<tr>
<td>reported</td>
<td></td>
</tr>
</tbody>
</table>

[Image: Navua Flood Warning System poster]
### 6. Strategic management

<table>
<thead>
<tr>
<th>None</th>
<th>Anecdotal historic flood info for ind’l catchments</th>
<th>Some Flood Studies</th>
<th>Some FRM Plans</th>
<th>Decision making across catchments</th>
<th>Strategic FRM across entire country</th>
</tr>
</thead>
</table>

Benchmarking current FRM practice
Priorities for improving urban flood risk management practice
Improving governance

- Narrow → Holistic
- Fragmented → Integrated
- Centralized → Decentralized
- Externalized → Mainstreamed
Priorities for improving FRM practice

Applying a risk management process

1. Collect Data
   - Hydrological data
   - Knowledge hubs

2. Assess Risk
   - Flood Study
   - Community Study

3. Evaluate Options
   - Flood Risk Management Study
   - Flood Risk Management Plan

4. Implement Plan
   - Modify flood
   - Modify exposure and vulnerability
   - Modify response
Managing land use

- Working with communities to find alternative land uses for land with extreme hazard
- Design and service new subdivisions on low risk land

‘April Ridge’, Honiara

World Bank
Conclusion

- PICs moving towards best practice in urban FRM but needs to be rolled out
- Priorities include improved governance, integrated RM process and risk-informed urban planning
- There’s no ‘silver bullet’ – a sustained, multi-sectoral effort is required
- Please complete survey: [https://www.surveymonkey.com/r/ZN7936K](https://www.surveymonkey.com/r/ZN7936K)

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