Towards a safer built environment

Mark Edwards – Session Chair
Geoscience Australia, Canberra, ACT
CLUS T ER PROJ E CT S

1) Natural Hazards Exposure Information Framework (GA)
2) Enhancing Resilience Of Critical Road Infrastructures (RMIT)
3) Improving the Resilience of Existing Housing to Severe Wind Events (JCU)
4) Cost-effective Mitigation Strategy Development For Building Related Flood Risk (GA)
5) Cost-effective Mitigation Strategy Development For Building Related Earthquake Risk (University of Adelaide)
ELLIOTT SIMMONS, NSW STATE EMERGENCY SERVICE, END-USER
Table 6: Possible Vulnerable Population in NSW (2011 census) within 1km of coast and below the 10m contour height (AHD).

<table>
<thead>
<tr>
<th></th>
<th>Total Population</th>
<th>Dwellings</th>
<th>No Vehicle at Dwelling</th>
<th>Schools / Childcare Centres</th>
<th>School Age Children (Pre to High School)</th>
<th>Public / Private Hospitals</th>
<th>Aged Care / Nursing Homes</th>
<th>Age &gt;= 85</th>
<th>Caravan Park / Camping Grounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Rivers</td>
<td>23649</td>
<td>9526</td>
<td>675</td>
<td>24</td>
<td>3565</td>
<td>2</td>
<td>6</td>
<td>570</td>
<td>33</td>
</tr>
<tr>
<td>Mid North Coast</td>
<td>29395</td>
<td>12436</td>
<td>1215</td>
<td>17</td>
<td>4225</td>
<td>0</td>
<td>0</td>
<td>814</td>
<td>60</td>
</tr>
<tr>
<td>Hunter</td>
<td>46818</td>
<td>19112</td>
<td>2165</td>
<td>25</td>
<td>6257</td>
<td>3</td>
<td>6</td>
<td>1541</td>
<td>48</td>
</tr>
<tr>
<td>Lord Howe Island</td>
<td>360</td>
<td>129</td>
<td>22</td>
<td>0</td>
<td>36</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Metropolitan</td>
<td>104616</td>
<td>42796</td>
<td>8570</td>
<td>84</td>
<td>10434</td>
<td>1</td>
<td>4</td>
<td>2284</td>
<td>9</td>
</tr>
<tr>
<td>Illawarra</td>
<td>38588</td>
<td>15649</td>
<td>2132</td>
<td>26</td>
<td>5402</td>
<td>0</td>
<td>6</td>
<td>1119</td>
<td>48</td>
</tr>
<tr>
<td>South Coast</td>
<td>10767</td>
<td>4436</td>
<td>358</td>
<td>10</td>
<td>1505</td>
<td>0</td>
<td>1</td>
<td>489</td>
<td>47</td>
</tr>
<tr>
<td>NSW Total</td>
<td>254193</td>
<td>104084</td>
<td>15137</td>
<td>186</td>
<td>31424</td>
<td>7</td>
<td>23</td>
<td>6825</td>
<td>245</td>
</tr>
</tbody>
</table>

Note: Figures quoted are approximate. There may be areas impacted that are adjacent to tidal rivers or estuaries further than 1km from the coast.
Flood Evacuation Order

North West SES Region Headquarters

418 Frome St
Moree NSW 2400

Telephone: (02) 6787 9280
Fax: (02) 67872980

Issued Thursday 2 February 2012 at 11:30pm  Email:nwr.ops@ses.nsw.gov.au

Radio stations are asked to immediately broadcast this message and repeat it.
Use of the Standard Emergency Warning Signal (SEWS) with this message is authorized.

Flood Evacuation Order North Moree, Yarraman, Gwydirville and Bendyglet

Authorised By: James McTavish Incident Controller

As a result of ongoing heavy rainfall the predicted flood level by the Bureau of Meteorology on the Meroo River at Moree will exceed 9.5 metres around 3pm Thursday afternoon with major flooding, and peak near 10.3 metres around 9am Friday morning. Business should also prepare for inundation of the main street.

The State Emergency Service is directing residents within the nominated areas to evacuate to South Moree within the next 6 hours. The Geoffrey Hunter Bridge on Frome Street in Moree is expected to be cut this afternoon (Thursday 2 February).

Do not delay your evacuation. Roads will be congested or closed. You could become trapped and need rescue. Remaining in flooded areas is dangerous and may place your life at risk.

In the event you need assistance, an accompanying centre will be established at the Moree Town Hall. Bala Street from where you will be directed to evacuation centre will be established at the PCYC in South Moree, where temporary accommodation and other help will be provided.

If you don’t have a car, buses may operate where possible on normal routes. Special transport may also be provided on request if necessary at the registration point.

As you evacuate you should:
- Take your important documents, mementos and photos
- Take your spare clothing and medicines
- If possible, check to see if your neighbours need help
- Turn off the electricity and gas
- Don’t walk, ride or drive through floodwater
- Continue to listen to a local radio station for updates
Warnings Current

New South Wales
- Minor to Major Flood Warning for the Darling River
- Minor to Major Flood Warning for the Lachlan River
- Moderate Flood Warning for the Murrumbidgee River
- Minor to Moderate Flood Warning for the Murray and Edward Rivers
- Marine Wind Warning Summary for New South Wales

Western Australia
- Fire Weather Warning for Gascoyne inland and South Interior fire weather districts
- Severe Thunderstorm Warning 1 - AMOC/CAP (WA)

Tasmania
- 3

bnhcrc.com.au
National Damage Assessment Data Set and Dictionary for Phase 2 Assessments

GUIDELINE
Version 1.0
Date: 26 October, 2016
Procedure
Publication ID: 3045
LISMORE
Impact Assessment
(09/04/2017)

March 2017
Event: 210/1617

Estimated Residential Property Damage ($)
(Excludes commercial and industrial)

Damage values derived from the national NEXIS data set.
PAUL MARTIN, CEO YORK SHIRE COUNCIL, WA
YORK, WA’S FIRST INLAND TOWN
Cyclone Resilience through Academic and Industry Partnership

Jon Harwood, Suncorp

TC Marcia, 2015
PHASE I: CLAIMS ANALYSIS (CTS + SUNCORP)

CYCLONE YASI (2011)

Mainland: Cat. 4 (BOM)
240 km/h peak gust

CTS Claims analysis
- 14,000 claims
- $63m in damage
- 179 assessor reports
- Insurance losses, building characteristics, lat long
- Wind speed information
Structural Failures (Older housing)
Water Ingress Failures (Age independent)
Auxiliary Items and Maintenance (Age independent)
Key Findings and Recommendations

» Pre-code housing at relatively > risk of structural damage

» Modern housing still vulnerable

» Minor damages independent of housing age (high frequency)

Recommendations for Mitigation (Existing housing)

1. Structural roof upgrading

2. Opening (i.e. windows, doors, etc.) protection upgrading

3. Community education/outreach
Phase II - Cost Benefit Analysis

» Partnered with CTS and Urbis Consulting

» Simple low cost mitigation can pay for itself after just one cyclone

» This work vital for providing evidence base for policy makers

<table>
<thead>
<tr>
<th>MITIGATION OPTION</th>
<th>COST PER HOUSEHOLD</th>
<th>TOTAL BENEFIT PER HOUSEHOLD**</th>
<th>BCR</th>
<th>PAYBACK PERIOD***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community awareness campaign*</td>
<td>$55 - $136</td>
<td>$440-$820</td>
<td>3.2 – 14.8</td>
<td>&lt;1- 6 years</td>
</tr>
<tr>
<td>Opening protection – self installed (Low cost scenario)</td>
<td>$1,660</td>
<td>$1,990-$6,400</td>
<td>1.2 – 3.9</td>
<td>4 – 21 years</td>
</tr>
<tr>
<td>Roofing option – strapping only (Low cost scenario)</td>
<td>$3,000</td>
<td>$12,900-$38,800</td>
<td>4.3 – 12.9</td>
<td>2 - 4 years</td>
</tr>
<tr>
<td>Roofing option – over-batten system (Medium cost scenario)</td>
<td>$12,000</td>
<td>$13,500-$39,400</td>
<td>1.1 – 3.3</td>
<td>5 – 37 years</td>
</tr>
</tbody>
</table>
CYCLONE RESILIENCE BENEFIT

Key points of vulnerability as basis for question structure

<table>
<thead>
<tr>
<th>Roofs</th>
<th>Window and door openings</th>
<th>Preparedness</th>
<th>Sheds</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Roof" /></td>
<td><img src="image2.png" alt="Window" /></td>
<td><img src="image3.png" alt="Preparedness" /></td>
<td><img src="image4.png" alt="Sheds" /></td>
</tr>
</tbody>
</table>

Size of the benefit depends on:

- Roof upgrades – largest driver of benefit as largest structural vulnerability addressed
- Location of home – largest potential benefits go to mitigation in the most cyclone prone areas
- Age of home – work done to pre 1980s properties will see largest benefits
How do we get homeowners to invest in mitigation?

New Roof?

New Kitchen!
UNDERSTANDING BEHAVIOR CHANGE

- Mitigation capacity?
- Prior experience with events?
- Understanding of risk?
- Financial incentive?
- What is my neighbor doing?
- The “hassle factor”
MARK EDWARDS, GEOSCIENCE AUSTRALIA
Pushover results
Mitigation

Earthquake
Mitigation
Flood
BRIDGE PRIORITISATION

Damage Probability | ARI ?? | Probability | ARI ?? | Probability | ARI ?? |
--- | --- | --- | --- | --- | --- |
D1 | 0.01% | ~ | ~ | ~ | ~
D2 | 5.6% | ~ | ~ | ~ | ~
D3 | 67.2% | ~ | ~ | ~ | ~
D4 | 23.2% | ~ | ~ | ~ | ~
D5 | 4% | ~ | ~ | ~ | ~

BRIDGE PRIORITISATION

Technical flood risk management guideline:
Flood hazard

Supporting document for the implementation of Australian Emergency Management Handbook 1, managing the flood risk: best practice in flood risk management in Australia

1H1: generally safe for people, vehicles and buildings
1H2: unsafe for small vehicles
1H3: unsafe for vehicles, children and the elderly
1H4: unsafe for people and vehicles
Mitigation
Severe Wind
GIS INTEGRATION FOR CRITICAL BRIDGE VULNERABILITY

1% AEP Flood
Mitigation
Earthquake