Cyclone Resilience through Academic and Industry Partnership

TC Marcia, 2015

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Why housing? Common but complex

» They are where we shelter – so have to be secure
» Traditional process – evolved from holding roof up not down
» Many elements, closely spaced
» There is load sharing, so no easily defined load path
Local Wind Field Parameters

- Approach terrain category
- Shielding
- Topography
- Height of building
- Orientation of building
Claims Analysis (CTS + Suncorp)

Cyclone Yasi (2011)

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

CTS Damage Survey
Pre 80s (older housing)
• >12% major roof damage

Post 80s (current construction)
• <3% major roof damage
• ~30% roller door damage
• water ingress issues
Data Overview

Claims Data

» 14,282 claims (aggregate)

» Loss, ins. value, lat/long, home age, damage description

» Wind speeds: num. models, street signs, few anemom.

» 179 assessors reports, random subset (photos, etc.)

Methodology

» Loss ratio proxy for damage intensity (claim/ins. value)

<table>
<thead>
<tr>
<th>Damage Intensity</th>
<th>Loss Ratio Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Damage</td>
<td>0 (i.e. no claim)</td>
</tr>
<tr>
<td>Minor</td>
<td>0-10%</td>
</tr>
<tr>
<td>Moderate</td>
<td>10-50%</td>
</tr>
<tr>
<td>Severe</td>
<td>50-100%</td>
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</tbody>
</table>
Loss Ratio
- 0-10%
- 10-50%
- 50-100%
- >100%

Claims Analysis Region

- 70% $V_{des}$ (180 km/h)
- 85% $V_{des}$ (210 km/h)
- 95% $V_{des}$ (240 km/h)
- 70% $V_{des}$, (180 km/h)

- Tully/Mission Beach claims 2,699, claim rate 67%

- Townsville claims 7,273, claim rate 30%

- claims 14,282, policies 54,078, claim rate 26%
Structural Failures (Older housing)
Water Ingress Failures (Age independent)
Auxiliary Items and Maintenance (Age independent)
Townsville Region (55% $V_{des}$)

**Construction Age**

- **Age Range**
  - 1982-2011
  - 1976-1981
  - 1960-1975
  - 1925-1959
  - <1925

→ Low damage levels BUT high frequency
→ Assume similar wind speed and rainfall intensity
Townsville Region (55%\(V_{\text{des}}\))

Loss Ratio

- 0-10%
- 10-50%
- 50-100%
- >100%

→ Minor damages independent of age
→ Moderate/severe damages still occur in newer regions
## Insured Loss – Townsville (55% Vdesign)

<table>
<thead>
<tr>
<th>Proportion of Claims</th>
<th>Proportion of Cost</th>
<th>Loss Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>94%</td>
<td>60%</td>
<td>0-10%</td>
</tr>
<tr>
<td>5%</td>
<td>32%</td>
<td>10-50%</td>
</tr>
<tr>
<td>&lt;1%</td>
<td>6%</td>
<td>50-100%</td>
</tr>
<tr>
<td>&lt;1%</td>
<td>2%</td>
<td>&gt;=100%</td>
</tr>
</tbody>
</table>

**Net Loss**

$63,575,021

> Primarily damage from auxiliary items (i.e. minor debris, shade sails, water ingress, fences)
> Severe damages still occur in both old (structural) and new (water ingress) housing
Key Findings and Recommendations

» Roofing, window, water ingress → dominate loss

» 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

How do we get homeowners to invest in mitigation?
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?
- The “hassle factor”
- What is my neighbor doing?
Understanding Behaviour Change

Customer survey

- Tropical Cyclones: 62% High risk, 29% Medium risk, 8% Low risk, 2% No risk in my area
- Extreme Winds: 29% High risk, 46% Medium risk, 21% Low risk, 5% No risk in my area
- Summer Storms: 11% High risk, 43% Medium risk, 38% Low risk, 8% No risk in my area
- Flooding: 5% High risk, 19% Medium risk, 52% Low risk, 24% No risk in my area
- Hail: 3% High risk, 6% Medium risk, 56% Low risk, 35% No risk in my area
- Tsunami: 2% High risk, 8% Medium risk, 57% Low risk, 33% No risk in my area
Natural Hazard Insurance Pricing

How does it work?
Natural hazard Insurance Pricing

Premium Breakdown

estimated claims cost by peril

- cyclone
- other natural peril
- non-natural peril

NQ | Brisbane | Syd,Mel

Natural Hazard Insurance Pricing

Risk pricing vs risk pooling

- Evolution of insurance pricing has removed cross subsidies across customers
- Strong price signal has led to affordability issues for high risk areas
- Address the underlying risk and price reduces

Pooled risk poor price signal

Address level risk Strong price signal

Rate comparisons

- Non-Actuarial
  - 1 foot above BFE: $2,235/yr
  - 1 foot below BFE: $819/yr
- Actuarial
  - 10 feet below BFE: $25,000+/yr
  - Building: $200,000 Contents: $80,000 (2012 Rates)

www.jcu.edu.au/cts
Cyclone Resilience Benefit

Introduction
Cyclone Resilience Benefit

Introduction
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>
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</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
Cyclone Resilience Benefit

Findings
Cyclone Resilience Benefit

Findings

» 14,400 customers have received the CRB since launch (end of June)
» Average saving around $100
» Reductions ranging from $20 to $400+
Cyclone Resilience Benefit

Findings

Pre 1980s roof improvements

- Full roof replacement: 23%
- Upgrades to elements of roof system: 36%
- No additional work: 41%

Cyclone protection for windows (all ages)

- No: 84%
- Plywood covering for all external windows: 11%
- Cyclone Shutters installed on all external windows: 4%
- Unknown: 1%

Building community cyclone resilience through academic and industry partnership
Building Community Cyclone Resilience

Next steps
As the next stage of research, CTS, Suncorp, and Qld Gov’t are working to develop tools (e.g. mobile app) to help the community better understand housing vulnerability in cyclones.