Adapting Infrastructure to Climate Change Impacts
Michael Nolan, Principal Consultant - Sustainability and Climate Change
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Overview

Climate Change and Infrastructure
Garnaut Climate Change Review
Adapting Infrastructure
What You Can Do
The challenges of climate change pose a significant risk to infrastructure, and its owners (investors), managers and long-term operators.

The recognition of these risks is a first step towards better planning of new infrastructure investments and mitigating potential damage to existing infrastructure.
Climate Change and Infrastructure

Climate Change Impacts

Extreme Events
Extreme storms, rainfall, wind and bushfires

Degradation of Materials
Reduce asset life from change in ground movement, corrosion rates, structural fatigue and chemistry

Resource Demand
Water (drought), energy (heatwaves) and viable agricultural (climate)

Longer Term Loss
Sea level rise
## Impact of Climate Change on Degradation of Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>CO₂</th>
<th>Cyclones, Storms</th>
<th>Sea Level Rise</th>
<th>Extreme Rainfall, Floods</th>
<th>Increased Temp.</th>
<th>Extreme Temp.</th>
<th>UV</th>
<th>Bushfire</th>
<th>Drought</th>
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</table>
Garnaut Climate Change Review

Impacts of climate change on the Australian economy
Recommends medium to long-term policies
Aims to address key climate change issues
Strives to achieve sustainable prosperity

Focuses on:
• Greenhouse Gas Emissions and Mitigation
• Climate Change Impacts and Adaptation

Seven Climate Scenarios
• Dry, Wet and Mid Dry
• Business As Usual and Mitigation Scenarios
Maunsell identified and assessed the impacts of climate change on infrastructure in Australia, focussing in detail on:

- **Buildings in coastal settlements**
- **Electricity distribution and transmission networks**
- **Water supply infrastructure in major cities**
- **Port infrastructure and operations**

Maunsell also qualitatively assessed:

- **Roads and Bridges**
- **Communications**
- **Alpine Regions**
Climate Change Impacts to Coastal Buildings

Impacts:
- Increased coastal property damage and service infrastructure from extreme rainfall, wind and storm events combined with sea level rise, increased maximum temperatures and ground movement.

Implications:
- Increased cost for buildings (new and existing)
- Reduced life of assets by 2%-15%
- Increased maintenance, repair and replacement of utility infrastructure and commercial and industrial facilities
Climate Change Impacts to Coastal Buildings

Scale of impact under:
- Business as Usual
- Mid Dry Climate Scenario

<table>
<thead>
<tr>
<th>State</th>
<th>2008-30</th>
<th>2031-70</th>
<th>2071-00</th>
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<tbody>
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<td>VIC</td>
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</table>
## Climate Change Impacts to Coastal Buildings
### Sea Level Rise and Storm Surge

<table>
<thead>
<tr>
<th>State / Territory</th>
<th>Approximate number of properties under threat</th>
<th>Approximate percentage of properties in each state under threat</th>
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<tbody>
<tr>
<td>New South Wales</td>
<td>208,320</td>
<td>6%</td>
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<tr>
<td>Victoria</td>
<td>83,520</td>
<td>4%</td>
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<tr>
<td>Queensland</td>
<td>246,720</td>
<td>13%</td>
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<td>South Australia</td>
<td>61,440</td>
<td>8%</td>
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<tr>
<td>Western Australia</td>
<td>94,080</td>
<td>10%</td>
</tr>
<tr>
<td>Tasmania</td>
<td>17,280</td>
<td>7%</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>17,280</td>
<td>18%</td>
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<tr>
<td>Australian Capital Territory</td>
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</tbody>
</table>

Source: Adapted from McAneney et al (2007) and ABS (2007)
Water Supply in Major Cities

Impacts:
• Reduction in clean, available water for consumption and use

Implications:
• Increased water prices
• Reduced reliability and security of water, interrupting supply
• Encouragement of efficiency and conservation
## Water Supply in Major Cities

Scale of impact under:
- Business as Usual
- Mid Dry Climate Scenario

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Port Infrastructure

Impacts:
• Increased damage to port infrastructure from cyclones, hot days, rainfall and extreme wind

Implications:
• Increased trade costs and storage of imports/exports due to ship delays
• Increased frequency and length of port closures
• Supply chain backlog
Port Infrastructure

Scale of impact under:
• Business as Usual
• Mid Dry Climate Scenario

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Adapting to Sea Level

Which Assets will be inundated?

- Sea wall protection and wharf levels
- Build in options for responding to sea level rise
- Understand transport access issues
- Appreciate scale of response globally for step change in sea level
Adapting to Climate Change

Which of your Assets are vulnerable?

- **Integrity of Assets at Risk**
- Understand Impacts to supply chain?
- Understand the Costs to OpX & CapX?
- When to Respond (to Adapt)?
Adapting to Climate Change

Investment, Insurance & Adaptation

‘Climate Ready’ Investment
• Adaptive Capacity?
• Loss Control and Insurance Cover?
• Future Compliance?

Climate Change Assessment
Barwon Heads Bridge
Client: Phillips Fox and Vic Roads

Floodplain Risk Management Guidelines, DECC 2007

Levee protection to reduce frequency of inundation

Climate change
100yr High CC + 0.5m
100yr High CC

Original floor level

Evacuation issues
More frequent inundation

House Raising Allows for High CC

Original House to be Raised

House Raised for Existing Conditions Needs to be Raised further for High CC

Ground level

Evacuation issues
More frequent inundation

House Raising Allows for High CC

Original House to be Raised

House Raised for Existing Conditions Needs to be Raised further for High CC

Current
100yr + 0.5m
100yr CC

Ground level
Climate Change Risks to Organisations

- **Capability**
  - operational (service delivery, infrastructure, organisational)
  - insurance

- **Safety**
  - environmental and safety

- **Environment & Heritage**
  - reputational

- **Reputation**
  - financial

- **Liabilities**
  - regulatory
  - stakeholder
  - political
  - litigation

- **Legislation**
  - financial
Adapting to Climate Change

What You Can Do

Use Tools for Assessing Vulnerability

*Climate Change Risk Assessments*

*Sustainability & Asset Management*

*Feasibility Studies*

Climate Change Assessment
Barwon Heads Bridge
Client: Phillips Fox and Vic Roads
Adapting to Climate Change

**What You Can Do**

Climate Change in Design and Planning
Climate Change in Operation and Maintenance

Carbon Management
Climate Change in Emergency Response

Facilitate Innovation and New Opportunities
Re-position for the Future
Adapting to Climate Change