ENGINEERING BEST PRACTICE

Where are we at?
“Climate Change in Context”
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Intervention + Adaptation + Innovation \( \geq \) Standard of Living & Existing Infrastructure “Security”

- Cultural
  - Climate
  - Change
  - Policies
- Environmental
- Economic
- Social

Combination of Actions or Activities
- Safety net at top of cliff or
- Ambulance at bottom of cliff
  (Proactive or Reactive)

- Standards
- Values
- Attitudes

Incorporating climate change

Planning Horizons Important
  10, 20, 50, 100, 500 years

Introduction
Best Practice : Definition

“A best practice is a technique or methodology that, through experience and research, has been proven to reliably lead to a desired result.”

Source: whatis.com
## Indicative Impacts on Design Parameters from Climate Predictions (Planning horizon 100 years)

<table>
<thead>
<tr>
<th>Design Parameter</th>
<th>Infrastructure Impact</th>
<th>Indicative Scale of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Sea Level</td>
<td>• Land Use • Stormwater</td>
<td>• 0.8m sea level rise • Significant loss of LOS</td>
</tr>
<tr>
<td></td>
<td>• River &amp; Drainage Systems</td>
<td></td>
</tr>
<tr>
<td>Storm Surge</td>
<td>• Landuse • Coastal protection</td>
<td>• All land &amp; infrastructure below RL 5m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runoff Volume</td>
<td>• Hydroelectric storage • Resource/Storage capacities • Wastewater systems</td>
<td>• Effectiveness reduced by 100% • Overflow doubled or trebled • LOS reduced by 50%</td>
</tr>
<tr>
<td>Annual Excellence Probability</td>
<td>• Levels of service</td>
<td>• Typically halved</td>
</tr>
<tr>
<td>Rainfall Intensity</td>
<td>• Stormwater • Drainage &amp; flood protection</td>
<td>• Increased by 16%</td>
</tr>
</tbody>
</table>
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Intervention

- IPCC
- Central government Policies
- Regional Council Strategies (RPSs)
- Regional Council Planning Documents
- TLA District Plans
- Insurance
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Example City Planning:

Climate Risk Reduction Program: (Part of outcome of the process from Chicago City Case Study)

<table>
<thead>
<tr>
<th>ASSESS</th>
<th>PLAN</th>
<th>IMPLEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess &amp; Benchmark Existing Conditions</td>
<td>Gather &amp; Downscale Climate Data</td>
<td>Develop Risk Reduction Program</td>
</tr>
<tr>
<td></td>
<td>Quantify Potential Impacts</td>
<td>Monitoring &amp; Continuous Improvement</td>
</tr>
<tr>
<td></td>
<td>Evaluation Mitigation &amp; Adaptation Measures</td>
<td></td>
</tr>
</tbody>
</table>

Intervention
Climate Change Proofed Housing
14 Jul 07, hits:168
Adaptation

Implementation driven by:

- Policies and strategies (National, Regional & Local)
- By adoption of Standards (National & Local)
- Guidance Manuals
- By a risk based approach
- Combination of all four
Government Guidelines

- MfE Preparing for Climate Change (2nd Edition)
- MfE Climate Effects & Impacts Assessment – a guidance manual for LG in NZ (2nd Edition)
- MfE Coastal Hazards & Climate Change (Guidance Manual) (2nd Edition)
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UK Standards Based Approach

- DEFRA - Planning Policy Statement 25
- Annex B

Table B.1 Recommended contingency allowances for net sea level rise

<table>
<thead>
<tr>
<th>Administrative Region</th>
<th>Net Sea Level rise (mm/yr) Relative to 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1990 to 2025</td>
</tr>
<tr>
<td>East of England</td>
<td>4.0</td>
</tr>
<tr>
<td>South West</td>
<td>3.5</td>
</tr>
<tr>
<td>NW England</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table B.2 Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights

<table>
<thead>
<tr>
<th>Parameter</th>
<th>1990 to 2025</th>
<th>2025 to 2055</th>
<th>2055 to 2085</th>
<th>2085 to 2115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak rainfall intensity</td>
<td>+5%</td>
<td>+10%</td>
<td>+20%</td>
<td>+30%</td>
</tr>
<tr>
<td>Peak river flow</td>
<td>+10%</td>
<td></td>
<td>+20%</td>
<td></td>
</tr>
<tr>
<td>Offshore wind speed</td>
<td>+5%</td>
<td>+10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme wave height</td>
<td>+5%</td>
<td>+10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Innovative Actions to Integrate Climate Change Impacts

“Proceed with Caution”

• Many options available
• Need to be integrated into overall planning process
• Need to be supported by good science and backstopped with robust national engineering standards, codes of practice and guidelines
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Approaches

- Reduction in Levels of Service
- Innovative Planning Rules
- Indemnity Provisions
- Civil Defence and Emergency Planning
- Business as usual
- Shorten planning horizons
- Flexible design
- Essential services
- Location review

Tests:  Are they sustainable?

Are they socially acceptable?

Economic & lifecycle analyses essential
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Funny to recall just a few years ago no one was driving these.
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Summing Up

Intervention + Adaptation + Innovation ≠ ? ≠ Standard of Living
Existing Infrastructure Security”
Social expectations
Social adaptation
Conclusions

• Climate change is happening and needs positive action
• National leadership from Central Government is required
• The risk based approach is currently not yet standardised
• Traditional Engineering Standards and COP are no longer valid
• There is a demand for a standards base approach
• The traditional concepts of levels of service and KPI’s are seriously under challenge
• Innovation provides some interesting non traditional solutions which have not yet had the sustainability test.
The "KEY" Challenge

Are we ready to:

• Be involved in the decision making process to prioritise and adapt to Climate Change?
• Include Climate Change adaptation in our planning and design processes?
• Include Climate Change mitigation & innovation in our design solutions?
• Establish Best "National" Practice?