Financial Risks of Climate Change
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Role of Insurance in Weather Protection
- Spreading risk
- Protection for occasional, unexpected weather
- Risk needs to be managed
- Costs borne by society
  - Insured
  - Tax-payer
  - Individual

Changing costs of extreme weather
- Costs doubling each decade
- Since 1990, $16 bn each year on average
- 2004 was costliest year on record: $40 bn
- UK Floods: Boscastle, Carlisle, North Yorkshire
- 2005 Scandinavia Storm
Changing patterns of hurricanes

UK Weather Damage Claims

- Claims have doubled to over £6 bn over the past six years, compared to previous period
- Weather risks could increase at a rate of 2 – 4 % each year

What is driving these changes?

Source: IPCC
IPCC Global Temperature Scenarios

TEMPERATURE RISE by 2080s

Climate change and extreme storms

<table>
<thead>
<tr>
<th>Weather/Tornado</th>
<th>Region</th>
<th>Stress test</th>
<th>Key references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhoon</td>
<td>Japan</td>
<td>Increased average windspeed by 8%, with sensitivity tests for +4 to +9%</td>
<td>Heston and Pidgeon (2001), Journal of Climate, 14(4), 1267-1285.</td>
</tr>
<tr>
<td>Windstorm</td>
<td>France</td>
<td>Increased frequency of storms that occur once every 20 years (or less) by 20%</td>
<td>Lackenbach and Uccellin (2004) submitted to Global and Planetary Change, Kumme and others (2005) submitted to Geophysical Research letters</td>
</tr>
</tbody>
</table>
### AIR Catastrophe Model

![Diagram of event generation, loss intensity calculation, building vulnerability, and loss estimation with exposure data and policy conditions. Source: AIR Worldwide.]

### Changes in annual storm losses

- Doubling CO₂ could lead to increase in losses by two-thirds.
- Insured: $16 bn each year on average.
- Total: $27 bn each year on average.

### Changes in extreme storm losses (1-in-250 yr)

- Hurricanes could rise by three-quarters to $100 – 150 bn.
- Typhoons could rise by two-thirds to $25 – 34 bn.
Implications for global capital markets
Capital required could rise by two-thirds to $200 bn, increasing costs of capital

Limitations of simulations:
1. Socio-economic factors

Limitations of simulations:
2. Storm characteristics
European Flood Risk

Annual costs could rise to €100 – 120 bn

Tackling Climate Change

Mitigation – avoiding worst impacts
Adaptation – some climate change inevitable

Start to diverge from mid-century

Managing climate risks:
1. Emissions

<table>
<thead>
<tr>
<th>Emission Scenario</th>
<th>Annual average uninsured loss</th>
<th>Annual average total loss</th>
<th>Insured loss with chance of occurring once every 100 years</th>
<th>Insured loss with chance of occurring once every 200 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>$3.0 bn</td>
<td>$1.5 bn</td>
<td>$14 bn</td>
<td>$16 bn</td>
</tr>
<tr>
<td>Medium-High</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>21%</td>
</tr>
<tr>
<td>Medium-Low</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Low</td>
<td>85%</td>
<td>85%</td>
<td>80%</td>
<td>85%</td>
</tr>
</tbody>
</table>

(b) Japanese typhoons
Managing climate risks:
2. Vulnerability

Source: Munich Re

Insurance as a messenger of change

Source: Munich Re