CSIS Risk Management Roundtable

Scientific Uncertainty and Climate Change Risk Management

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Climate Change: A National Security Issue

- DOD (2010) Quadrennial Defense Review
- Joint Forces Command (2010) Joint Operating Environment
- Joint Chiefs of Staff (2011) National Military Strategy of the U.S.
Climate Change: A National Security Issue

- Competition in and governance of the Arctic
- Intrastate conflict over natural resources
- Increased frequency of weather disasters
- Water supply volatility in glacier-fed regions
- Rising and volatile food prices
- Storm/tsunami damage on deltas/small islands
- More permanently displaced persons
- Heightened resentment toward West/USA
Responding to climate change involves an iterative risk management process that includes both adaptation and mitigation…”

IPCC 2007

Risk: Severity of outcome x probability

Risk management:
- Actions to reduce probability (mitigation)
- Actions to reduce potential severity (adaptation)
Uncertainty and Risk

- Uncertainty tempts people to disregard risk
- Risk = Probability X Severity
- Risk can be significant when uncertainty is large
- Risk can be high when probability is low (house fire)
Uncertainty and Risk

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Scientific uncertainty is Information.

Uncertainty informs risk management.
Uncertainty and Risk: Climate Sensitivity

Equilibrium Climate Sensitivity (°C)

IPCC 2007

- Forster/Gregory 06
- Frame 05
- Knutti 02
- Andronova 01
- Forest 06 (02 dashed)
- Gregory 02
- Hegerl palaeo 06
- Schneider LGM 06
- Annan LGM 05
Impacts Risk for Doubled CO₂ (560 ppm)

<table>
<thead>
<tr>
<th>Warming</th>
<th>0 °C</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
<td>Falling crop yields in developing regions first, then developed regions later</td>
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<td><strong>Water</strong></td>
<td>Mountain glaciers disappear; Decreased water in some areas</td>
<td>Many more areas suffer from low water availability</td>
<td>Sea level rise threatens major cities</td>
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<td><strong>Ecosystems</strong></td>
<td>Extensive damage to coral reefs</td>
<td>Rising numbers of species extinctions</td>
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<td><strong>Extreme Weather</strong></td>
<td>Rising intensity of storms, wildfires, droughts, floods, heatwaves</td>
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<tr>
<td><strong>Risk of Irreversible or Abrupt Changes</strong></td>
<td>Rising risk of dangerous positive feedbacks, Rapid SLR and collapse of Atlantic conveyor</td>
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Adapted from IPCC 2007

- Best estimate ~40% Chance
- ~10% Chance
- ~5% Chance
Reduce Uncertainty & Risk: Mitigate Emissions

![Graph showing change in global mean surface temperature (°C) and probability (%).](image)

**Temperature Change**

- **Reduced "expected" change**
- **Most severe outcome is off the table**

**Climate Sensitivity**

<table>
<thead>
<tr>
<th>Climate Sensitivity</th>
<th>2030</th>
<th>2050</th>
<th>2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>2.5</td>
<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>3.0</td>
<td>1.4</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td>4.5</td>
<td>1.7</td>
<td>1.8</td>
<td>2.1</td>
</tr>
<tr>
<td>6.0</td>
<td>1.8</td>
<td>2.0</td>
<td>2.4</td>
</tr>
</tbody>
</table>

*Rose, 2010*