From Risks to Opportunities:
Insurer Exposures and Responses to Climate Change
Governor Corzine’s Summit Confronting Climate Change in New Jersey
Trenton - September 25, 2006

Evan Mills, Ph.D.
Staff Scientist
U.S. Department of Energy
Lawrence Berkeley National Laboratory
“Everybody talks about the weather, but nobody does anything about it.”

- Hartford Courant (1897)

“After years of silence, the U.S. insurance industry is waking up to climate change.”

- Hartford Courant (2006)
Disasters Look Different Through an Insurance “Lens”

- Insurance is a form of adaptive capacity
- Insurers are themselves vulnerable
- Insurance is world’s largest industry; can play major role in solutions
- Challenge is in the sharing of risk across the public/private spheres

**Aggregate Global Impacts: 1980-2004**

- N=14,216
- N=1,049,006
- $1,825 billion
- $374 billion

Source: Munich Re
"We'd be out of our minds if we wrote weather insurance on the opinion global warming would have no effect at all."

- Warren Buffett
2006 annual shareholder mtg.

Non-climate factors play a role, but…

• Trends consistent w/ clim. Changes
• Why are non-weather losses level?
• Higher losses without prevention
• Excludes “small” loss events
  - offshore; aviation
  - health/life losses
  - small-scale events

Global Insured Weather-Related Losses
Increasing Faster than Premiums, Population, or GDP

INDEX: 1980 = 1.00

Notes: All economic values inflation-adjusted to 2004 levels. Losses from Munich Re NatCat Service; premiums from Swiss Re, Sigma. Values for 2005 are LBNL estimates.

2004: $44.7 billion
2005: $75 billion (est.)
Risk is OK; Uncertainty is Not

The ratio of losses to premium revenues is increasing; So is the volatility
Insurance Regulators (via NAIC Taskforce) Recognize the Problem

“Global warming is upon us, and it poses unprecedented new threats to the insurance industry and vast segments of society that rely on insurance for peace of mind and financial security.”

Michael Kreidler
Washington Insurance Commissioner

Tim Wagner
Nebraska Insurance Commissioner
CATs Play a Key Role in Profitability

P&C Combined Ratios: 1982-2004

Excludes effect of small weather-related events

Source: AM Best, Aggregates & Averages
Small-scale and Indirect Events & Consequences Often Overlooked

Events
- Drought
- Hail
- Heat waves
- Ice Storms
- Lightning
- Sea-level rise
- Thunderstorms
- Tornados
- Torrential rains
- Wildfire
- Winterstorms

Consequences
- Blackouts
- Coastal erosion
- Crop/fishery damages
- Equipment breakdown
- Eroded air quality
- Eroded water quality
- Flooding
- Health impacts
- Mudslides
- Property loss
- Sinkholes/Subsidence
- Weather-related vehicle accidents

Greater combined impacts than CATs in an average year
Importance of “Small-Scale” Events

Cumulative insured losses 1980-2004 (Source: American Re)
Inflation-Corrected U.S. Loss Trends: Examples of Small-scale Events

Annual losses are, in aggregate, like a large hurricane

Cumulative insured losses 1980-2004 (Source: American Re)
Swiss Re Outlook for Winter Storms under Climate Change

Increase in annual expected loss for Europe (EUR), Denmark (DNK), Germany (DEU), Sweden (SWE), Belgium (BEL), France (FRA) and the UK (GBR) over the period 1975 to 2085 (in %). The broad bars represent the mean value of the climatic models, and the error bars show the spread of the results from all models.
Temperature-Related Insurance Loss Experience

Lightning-related claims *accelerate* with temperature

Each symbol represents a lightning storm event

Source: Hartford Steam Boiler Inspection and Insurance Co.
Effected Insurance Business Segments

• Most direct lines + Reinsurance [P/C & L/H]
  – Homeowners
  – Commercial
  – Business interruption
  – Auto (personal/commercial)
  – Marine/inland marine
  – Aviation
  – Crop
  – Offshore energy
  – Equipment breakdown
  – Liability (D&O, environmental, product, political risk…)
  – Life/health

• Surplus lines; Guaranty Funds; Residual Markets; Risk Retention Groups; ART; and… public-sector insurance programs (flood, crop)

Emerging Markets are a major “hotspot”; insurers domiciled in New Jersey are impacted by catastrophes almost anywhere in the world
Why Worry? - Underwriting

• Climate change compounds existing insurance problems
  – Mold
  – Respiratory disease
  – Corporate governance/liability

• Complicates underwriting
  – Shorter return periods
  – Increasing variability
  – New types of (unanticipated) losses; shifting locations
  – “CAT-following-CAT” (e.g., windstorm > flood > pollution > mold)
  – Unexpected correlation (e.g., power outage + flood)
  – Increases not necessarily linear, predictable, or gradual

• Incomplete Data: Flying (partly) blind
  – Seriously incomplete, and increasingly proprietary loss data
  – CAT models capture only a subset of the impacts of concern

*The future will not mirror the past*
Why Worry? - Beyond Underwriting

- **Asset Management**
  - Weather-sensitivity of investments
  - Real estate holdings

- **Operations**
  - Ability to function in post-disaster settings

- **Market Power**
  - Slowed or shrinking market
    - voluntary - withdrawal
    - involuntary - knock-on effects
    - shift from U.S. to Europe/Asia -- where foresight is greater?
  - Reputation risk [and rising shareholder concern]

- **Broader Economy**
  - “Dust-bowl-plus-Depression” syndrome
  - Escalating energy prices & inflation bad for insurance market
  - Impacts of climate change on insurance customers (especially homeowners and small businesses - see new AXA study)
Crisis of Availability & Affordability

- 200-500% increases in premiums; *plus* reduced coverage
  - HCA Hospitals: Prices up 167%, coverage down 75%, leaving $750 million “hole”
- Making homeownership unaffordable for some
- Loss of insurance makes properties un-bankable
- Even unregulated surplus lines providers, commercial insurers, and reinsurers are avoiding certain areas
Structural Market Changes

- CAT models indicating higher loss outlook
  - 30% increase in category 3-5 hurricanes
  - Shift from max single event to annual aggregate loss
- Rating agencies tightening risk-based capital formulas
  --> $120 billion “capital hole”
- Federal flood insurance program insolvent (rates not actuarial; taxpayers pick up the difference)
- State government-mandated “Residual Markets” are the insurers of last resort (and, increasingly, “only” resort).
  - About 3,000,000 policyholders, and rising
    (= $3B/year foregone revenue)
  - Citizens has become the largest insurer in Florida
  - Liquidation of Poe Financial --> 350,000 policyholders into Citizens

*Not cyclical changes; Eroding insurability*
From Risk \(\rightarrow\) … to Opportunity

The insurance sector has a key role to play in helping to mitigate the effects of climate change … and by developing new products and solutions that can support emerging greenhouse-gas and renewable energy markets.

- Marsh & McLennan Companies

New Report:
~200 examples; ~100 insurers

Published by Ceres
# Proactive Insurer Responses

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Insurance Industry Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Promoting Loss Prevention</strong></td>
<td></td>
</tr>
<tr>
<td>Traditional risk management</td>
<td>Institute for Business and Home Safety</td>
</tr>
<tr>
<td>Integrating energy management and risk management</td>
<td>FM Global</td>
</tr>
<tr>
<td>Forestry, agriculture, and wetlands</td>
<td>Tokio Marine</td>
</tr>
<tr>
<td>&quot;Rebuilding Right&quot; following losses</td>
<td>Fireman's Fund</td>
</tr>
<tr>
<td><strong>Crafting Innovative Insurance Products and Services</strong></td>
<td></td>
</tr>
<tr>
<td>New products for energy service providers</td>
<td>Locton Risk Services</td>
</tr>
<tr>
<td>Energy savings insurance</td>
<td>Lloyds of London</td>
</tr>
<tr>
<td>Renewable energy project insurance</td>
<td>Munich Re</td>
</tr>
<tr>
<td>Green-buildings insurance</td>
<td>Fireman's Fund</td>
</tr>
<tr>
<td>Pay-as-You-Drive insurance</td>
<td>GMAC</td>
</tr>
<tr>
<td>Climate risk management services</td>
<td>AIG/Solomon Associates</td>
</tr>
<tr>
<td><strong>Participating in Carbon Markets</strong></td>
<td></td>
</tr>
<tr>
<td>Facilitating carbon trading</td>
<td>Aon</td>
</tr>
<tr>
<td>Managing risk for Clean-Development Mechanism (CDM) projects</td>
<td>Swiss Re</td>
</tr>
<tr>
<td>Enabling customers to purchase carbon offsets</td>
<td>Insurance Australia Group</td>
</tr>
<tr>
<td><strong>Aligning Terms and Conditions with Risk-Reducing Behavior and Capitalizing on the “Halo Effect”</strong></td>
<td></td>
</tr>
<tr>
<td>Assigning Directors &amp; Officers liability</td>
<td>Swiss Re</td>
</tr>
<tr>
<td>The &quot;Halo Effect&quot;</td>
<td>Travelers</td>
</tr>
<tr>
<td><strong>R&amp;D and Direct investment in Climate Change Solutions</strong></td>
<td></td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>Allstate</td>
</tr>
<tr>
<td>Investments</td>
<td>Swiss Re</td>
</tr>
<tr>
<td>Climate-responsive funds</td>
<td>Gerling</td>
</tr>
<tr>
<td><strong>Building Awareness and Participating in the Formulation of Public Policy</strong></td>
<td></td>
</tr>
<tr>
<td>Consumer information and education</td>
<td>USAA Insurance Company</td>
</tr>
<tr>
<td>Having a voice in public policy discussions on climate change</td>
<td>UNEP Finance Initiative</td>
</tr>
<tr>
<td>Endorsing voluntary energy-saving policies</td>
<td>American Insurance Association</td>
</tr>
<tr>
<td>Energy-efficiency codes and standards</td>
<td>Insurance Institute for Highway Safety</td>
</tr>
<tr>
<td><strong>Leading by Example</strong></td>
<td></td>
</tr>
<tr>
<td>In-house energy management</td>
<td>AIG/Hartford Steam Boiler</td>
</tr>
<tr>
<td>Reducing insurers's carbon footprint through improved operations</td>
<td>American Modern Insurance Group</td>
</tr>
<tr>
<td>Disclosing climate vulnerabilities and liabilities</td>
<td>Saint Paul Travelers</td>
</tr>
</tbody>
</table>
Examples

- **FM Global** - Promoting hurricane-resistant construction among its customers
- **Fireman’s Fund** - green-buildings insurance
- **Tokio Marine** - replanting 7500 acres of mangroves
- **American Insurance Association** - Endorsing public transportation; reduced speed limits
- **IBHS** - “Fortified….for safer living” program
BASF Home - Patterson NJ

• Meets Institute for Business and Home Safety’s “Fortified…for safer living” standards [going beyond code]
  – Wind-resistant rigid foam panel walls and multi-glazed windows
  – Ice-dam resistant
  – Mold resistant
  – Insulation not damaged by flood

Some insurers giving premium credits....
Synergisms between Disaster Resilience & Reduced GHG Emissions

Source: http://www.betterhomebetterplanet.com/
Policy Recommendations

Assessment

• Fill data holes!
• Tap insurers’ knowledge of risk assessment/management
• Incorporate climate risks in assessing insurer solvency and consumer-impacts - climate change not priced into market
• Improve catastrophe modeling to capture climate change
• Assess exposures of insurer investments; capital adequacy
• Understand State’s own vulnerability as self-insurer

Application

• Upgrade building codes for resiliency and energy efficiency; couple with incentives to go beyond code
• Foster public-private partnerships with insurers: e.g. flood protection can make uninsurable risks insurable
• Identify and remedy undue regulatory barriers to constructive insurer responses (risk-based pricing, premium differentiation/incentives)
• Prioritize solutions that have win-win combinations of enhanced disaster resilience and climate protection
http://eetd.lbl.gov/insurance

Evan Mills, Ph.D.
MS 90-4000
Lawrence Berkeley National Laboratory
Berkeley, CA 94720 USA
510-486-6784
EMills@lbl.gov