Risk principles for the Insurance Industry

Risk function and data requirements for the insurance industry to assess the risk

- **Hazard**
  - Based on meteorological, geophysical and hydrological data
  - Hazard maps, deterministic / probabilistic models

- **Vulnerability**
  - Based on historical loss experience
  - Parameters influencing the damage, e.g. wind speed, building codes

- **Insured Values**
  - Based on scope of coverage
Risk modeling of natural catastrophes

From hazard to risk

Historical and / or simulated events
Munich Re vulnerability function / damage sensitivity
Exposure data

Risk curve

Losses

Return period

Natural catastrophes 1980 – 2010
Number of events

Worldwide

Geophysical events (Earthquake, tsunami, volcanic eruption)
Meteorological events (Storm)
Hydrological events (Flood, mass movement)
Climatological events (Extreme temperature, drought, forest fire)

In Europe

© 2011 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE – As at January 2011
### Significant natural catastrophes 1980 – 2010

#### 5 costliest natural catastrophes ordered by insured losses

##### Worldwide

<table>
<thead>
<tr>
<th>Period</th>
<th>Event</th>
<th>Affected Area</th>
<th>Overall losses</th>
<th>Insured losses</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.–30.8.2005</td>
<td>Hurrican Katrina, storm surge</td>
<td>USA: LA, New Orleans, Slidell, MS, Biloxi, Pascagoula, Waveland, Gulfport</td>
<td>125,000</td>
<td>62,200</td>
<td>1,322</td>
</tr>
<tr>
<td>6.–14.9.2005</td>
<td>Hurrican Ike</td>
<td>USA, Cuba, Haiti, Dominican Republic, Turks and Caicos Islands, Bahamas</td>
<td>38,300</td>
<td>18,500</td>
<td>170</td>
</tr>
<tr>
<td>23.–27.8.1992</td>
<td>Hurrican Andrew</td>
<td>USA, Cuba, Haiti, Dominican Republic, Turks and Caicos Islands, Bahamas</td>
<td>26,500</td>
<td>17,000</td>
<td>62</td>
</tr>
<tr>
<td>17.01.1994</td>
<td>Earthquake</td>
<td>USA: CA, Northridge, Los Angeles, San Fernando Valley, Ventura, Orange</td>
<td>44,000</td>
<td>15,300</td>
<td>61</td>
</tr>
<tr>
<td>7.–21.9.2004</td>
<td>Hurrican Ivan</td>
<td>USA, Trinidad and Tobago, Venezuela, Colombia, Mexico</td>
<td>23,000</td>
<td>13,800</td>
<td>125</td>
</tr>
</tbody>
</table>

##### Europe

<table>
<thead>
<tr>
<th>Period</th>
<th>Event</th>
<th>Affected Area</th>
<th>Overall losses</th>
<th>Insured losses</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.12.1999</td>
<td>Winter Storm Lothar</td>
<td>France, Germany, Switzerland, Belgium, Austria</td>
<td>11,500</td>
<td>5,900</td>
<td>110</td>
</tr>
<tr>
<td>18.–20.1.2007</td>
<td>Winter Storm Kyrill</td>
<td>United Kingdom, Germany, France, Netherlands, Austria, Switzerland, Poland</td>
<td>7,800</td>
<td>4,500</td>
<td>49</td>
</tr>
<tr>
<td>25.–26.1.1990</td>
<td>Winter Storm Daria</td>
<td>Belgium, Denmark, France, Germany, Ireland, Netherlands, Sweden, United Kingdom</td>
<td>5,900</td>
<td>4,400</td>
<td>94</td>
</tr>
<tr>
<td>12.–20.08.2002</td>
<td>Floods, severe storms</td>
<td>Germany, Austria, Czech Republic, Hungary, Moldova, Switzerland, Slovakia</td>
<td>16,800</td>
<td>3,500</td>
<td>39</td>
</tr>
<tr>
<td>15.–16.10.1987</td>
<td>Winter Storm</td>
<td>France, Norway, Spain, United Kingdom</td>
<td>3,500</td>
<td>2,800</td>
<td>18</td>
</tr>
</tbody>
</table>

© 2011 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE – As at January 2011

---

**Munich Re NatCatSERVICE**

The world’s most comprehensive database of natural catastrophes

- From 1980 until today all loss events
- For USA and selected countries in Europe all loss events since 1970
- Retrospectively all Great Natural Catastrophes since 1950
- In addition all major historical events starting from 79 AD (eruption of Mt. Vesuvio)
- Currently more than 28,000 events documented

NatCatSERVICE database uses a uniform worldwide standard for recording events due to natural hazards.

Subdivision into event groups (e.g. storms) and event types (e.g. tropical storms).
Indemnification schemes

Types of loss compensation

- **Loss based indemnification:**
  - Compensatory damages up to the sum insured of the insurance policy
  - *Advantage:* individual loss-based pay-out, core competence of insurance
  - *Disadvantage:* high administration costs; large loss events: demand surge, claims inflation and repair-cost-delay inflation

- **Parametric trigger based indemnification:**
  - Event definition trigger-based pay-out (e.g. weather trigger)
  - *Advantage:* low administration cost; quick pay-out based on objective scientific data
  - *Disadvantage:* high basis risk, potential mismatch between event definition and loss

- **Model based indemnification:**
  - Pay-out based on model-simulated loss
  - *Advantage:* quick pay-out, low administration cost
  - *Disadvantage:* high basis risk

Conclusions

Key takeaways

- The insurance industry offers risk transfer solutions for basically all types of natural catastrophes.
- Depending on the availability of scientific data and claims data/loss experience different risk transfer mechanisms can be used.
- Market/client decide on most appropriate risk transfer solution based on their specific needs.
THANK YOU FOR YOUR INTEREST

Ernst Rauch
Head Corporate Climate Centre
Climate & Renewables
Contact: erauch@munichre.com
Homepage: www.munichre.com