The changing risk landscape – a challenge for the reinsurer

Christian Schauer
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Agenda

- Introduction
- Changes in the global risk landscape
- Emerging Risks - definition
- Sonar – risk perception network
- Examples of Emerging risks
Swiss Re Group at a glance - 2006

- Net income of CHF 4.6 billion
- Premiums earned of CHF 29.5 billion
- Investment portfolio of CHF 162.7 billion
- We enable the risk-taking that is essential to enterprise and progress
- World’s leading and most diversified reinsurer
- Pioneer and leader in insurance-linked securitisation solutions
- Proven expertise in risk and capital management
- More than 90 offices in over 25 countries
- Strong corporate culture based on 143 years of experience

Geographical diversification

Swiss Re’s premiums earned by region in 2006 (CHF 29.5 billion)

<table>
<thead>
<tr>
<th>Region</th>
<th>Premiums Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>47%</td>
</tr>
<tr>
<td>Europe</td>
<td>44%</td>
</tr>
<tr>
<td>Asia</td>
<td>9%</td>
</tr>
<tr>
<td>(including Middle East and Africa)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Swiss Re 2006 Annual Report
Global presence

Offices in over 25 countries

Source: Swiss Re 2006 Annual Report

Global Risk landscape
Overview

Economical Risks
- Oil price/energy supply
- US Current Account deficit
- Chinese economic hard landing
- ...

Geopolitical Risks
- Proliferation of weapons of mass destruction
- Internat. Terrorism
- Interstate and civil wars
- .......

Environmental Risks
- Natural catastrophies (Tropical storms, Earthquakes)
- Loss of freshwater services
- Climate change

Technological Risks
- Breakdown of critical information infrastructure
- Emergence of risks associated with nano-technology

Societal Risks
- Pandemics / epidemics
- Infectious diseases in the developing world
- Chronic diseases in the developed world
- Liability regimes

Risk landscape of a reinsurer like Swiss Re

**Insurance exposure**
- NatCat
- Property „man-made“
- Casualty

**Property & Casualty**
- Earthquake California
- Winterstorm Europe
- Earthquake Japan
- Terrorism
- Fire / Explosion

**Life & Health**
- Mortality
- Pandemia

**Swiss Re - Top Topics**
- Climate change
- Insurance-linked securities
- Liability regimes
- Nanotechnology
- Natural catastrophes
- Pandemics
- US Reinsurance Regulatory Reform
- Solvency II
- Terrorism
Insured catastrophe losses 1970-2006

Source: Swiss Re sigma 2007

Increasing value concentration makes peak risks a growing challenge

Count of observed hurricanes in the US in the last 110 years

Projected population change 1994-2015

Source: Swiss Re’s Nat Cat team

Source: National Oceanic and Atmospheric Administration (NOAA)
General observations:
Growing population in coastal areas

- The 1926 Florida hurricane caused economic loss in present day USD of 100 m. The similar powerful Andrew in 1992 caused 39 bn.

Population Growth Rates

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>All US</td>
<td>57%</td>
<td>24%</td>
<td>13%</td>
</tr>
<tr>
<td>Florida</td>
<td>223%</td>
<td>64%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Populations increasingly concentrate in urban areas

Source: United Nations
Change in the risk landscape - “Fewer accidents, more catastrophes?”

Urbanisation

1950  1 Mega city (>10 million inhabitants; New York)
1975  6 Mega cities
2000  19 Mega cities
2015  23 Mega cities (estimated: 375 million inhabitants)

- Populations on the increase → cities are growing upwards and downwards.
- More and more thoroughfares and shopping centres are being moved underground
  - dramatic consequences in the event of fire
  - emergency escape routes are getting longer

- There are already 37 residential buildings around the world taller than 200 metres – 36 of these were constructed in the last three years.

The number of internet hosts

Source: Internet System Consortium
### Viruses - development

<table>
<thead>
<tr>
<th>Virus</th>
<th>Year</th>
<th>Time required to become most prevalent</th>
<th>Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jerusalem, Cascade</td>
<td>1990</td>
<td>3 years</td>
<td>$ 50 Million for all viruses over a period of 5 years</td>
</tr>
<tr>
<td>Concept</td>
<td>1995</td>
<td>4 months</td>
<td>$ 50 Millionen</td>
</tr>
<tr>
<td>Melissa</td>
<td>1999</td>
<td>4 days</td>
<td>$ 1 Billion</td>
</tr>
<tr>
<td>Love Bug</td>
<td>2000</td>
<td>5 hours</td>
<td>$ 700 Mio. - 6.75 Billion</td>
</tr>
<tr>
<td>Nimda</td>
<td>2001</td>
<td>22 minutes</td>
<td>600 Mio $</td>
</tr>
</tbody>
</table>

### The classification of risks

**Risks relating to the past**

- **Traditional**: identifiable and assessable in monetary terms

**Risk impacting the future**

- **New**: only to a limited extent identifiable and assessable in monetary terms (if at all)

**Traditional risks**

- **Phantom risks**

- **Emerging Risks**
## The insurance landscape

### Emerging risks

#### The grey area: Emerging risks
- Limited identification and assessment
- Unclear cause/effect relationship
- Differing perceptions of threat involved
- Often long-tail, multiline effects
- Average loss difficult to quantify
- Worst-case potential large and not quantifiable
- Insurance principles cannot (yet) be applied

#### Real risk
- Real threat, limited liability

#### Phantom risk
- Perceived threat, potentially real liability

### Selection criteria for emerging risks

- Novelty/change
- Uncertainty
- Insurance relevance
  - Cumulative loss potential
  - Long-tail
  - Multi-line
  - Frequency and severity difficult or impossible to assess
- “Headline articles”
  - Increasing public awareness
Emerging risks – Threats of today, losses of tomorrow?

- Ageing infrastructure
- Acrylamide
- BSE/vCJD
- Climate change: global warming
- Contingent Business Interruption
- Endocrine disruptors
- EMF
- Indoor pollution
- Lifestyle drugs
- Toxic mould
- Alloy
- Antibiotic resistance
- Drinking water quality
- Functional food
- GMO, Gene technology
- Indoor pollution
- Lifestyle drugs
- Nano technology
- EMF
- Obesity
- Pervasive computing
- Contingent Business Interruption
- Cyber Risks
- Spread of diseases
- Drinking water quality
- Lifestyle drugs
- EMF
- Obesity
- Pervasive computing
- Swiss Re

Asbestos - Ensuring room for action requires early recognition

1895
- Risks become apparent
1900
- First recognized asbestos fatality in London
1939
- Asbestos recognised as occupational disease
1975-1985
- US liability tightened
- Sweden bans asbestos (1975)
1985-2005
- Rising media interest
- Abandoning asbestos
- New bans, norms, orders
- EU bans all forms of asbestos

How much evidence needed for action?
Example Asbestos: 40 – 100 years delay

Risk indicators
- Options to act
- Signals

Swiss Re
**Group ER management framework**

**Rationale (Illustration 100 years of asbestos premonition)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>French factory report of 50 deaths in female asbestos textile workers and recommendation of controls.</td>
</tr>
<tr>
<td>1918</td>
<td>US insurers refuse cover to asbestos workers due to assumptions about injurious conditions in the industry.</td>
</tr>
<tr>
<td>1930</td>
<td>UK Merewether Report cites 66% of long-term workers in Rochdale factory with asbestosis.</td>
</tr>
<tr>
<td>1931</td>
<td>UK Asbestos Regulations specify dust control in manufacturing only and compensation for asbestosis, but this is poorly implemented.</td>
</tr>
<tr>
<td>1950s</td>
<td>First worker’s comp asbestos claims filed</td>
</tr>
<tr>
<td>1960s</td>
<td>First GL cases filed and first payments made</td>
</tr>
</tbody>
</table>
| **2006** | US Insurance loss as of 2004: USD 55 bn *  
Total estimated future losses: USD 275 bn ** |

**Conclusion**

Asbestos exclusions were introduced in the US in 1918 – but somehow they got “lost” in the following years.

Data on harmful health effects of asbestos were reported as early as 1898, but the insurance industry did not integrate this knowledge into its risk management.

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**SONAR**

- Systematic
- Observations of
- Notions
- Associated with
- Risk
SONAR perceives early indicators

<table>
<thead>
<tr>
<th>Early indicators</th>
<th>Events</th>
<th>Claims, losses</th>
</tr>
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</table>

- **time to adapt**
- **time to react**

SONAR’s history

- Systematic Risk Perception started in 1995
- SONAR Patent filed

- **1995**
- **2000**
- **2002**

- Risk perception network established to promptly detect faint signals
- **Purpose:**
  - Systematic screening of the risk landscape
  - Identification and evaluation of emerging and future risks
  - Centralising observations associated with risk from different countries, cultures and enterprises
The SONAR process

Perception/Observations/Comments by internal and external sources
Swiss Re Group, External networks
SONAR team
Swiss Re experts

Input
Triage
Analysis
SONAR Watch list
Risk assessment
Risk management
Product management eg EC EMRI

Issue management
Opportunity modelling
Product development
Risk communication / dialogue
Markets

Interactive process

Categorization of Emerging Risks

No immediate or mid term measures necessary

Permanent observation required; Watch list, regular updates necessary.
No immediate measures

Immediate measures necessary.
In-depth analysis necessary (topic team);
Estimate impact (probability & severity). Stipulate recommendations, guidelines and execution thereof.
Nanotechnology
The insurance perspective

Why nanotechnology is a challenge – also for insurance

- **Novel**: Technology to visualize, characterize and engineer tailored materials, devices and systems in the approximate size range of 1 – 100 nm
- Nanomaterials with entirely novel properties and functions, as well as hazards: Highly reactive and mobile in the human body and the environment
- **Big**: Most industry segments affected (surface materials and paints, pharmaceuticals, cosmetics, electronics, energy, food processing, etc.)
- Rapid development: Worldwide revenues expected to exceed USD 1 trillion by 2015
- **Gaps**: No long-term experience; size-related hazards not systematically examined; adapted regulatory framework missing
Knowledge gaps not considered yet

| Insurance status today | Swiss Re...
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>• The portion of nanotechnology in existing acceptances is unknown</td>
<td>• monitors the scientific evolution for the purpose of reducing uncertainty about liability loss potential</td>
</tr>
<tr>
<td>• No extra premium for possible future liabilities due to nanomaterials</td>
<td>• supports efforts to assess and manage nanotech risks: Definition problem and unique distinction criteria</td>
</tr>
<tr>
<td>• &quot;Nano inside&quot;: maybe yes, maybe no, maybe too</td>
<td>• has not been seeking for general exclusion or specific nanotechnology cover</td>
</tr>
</tbody>
</table>

| As a rule, existing insurance covers include risks of nanotechnology | |

Obesity - Too big to ignore
Obesity

- Center for Disease Control and Prevention (CDC) has declared obesity an epidemic
- 1 out of 3 people in the US is obese
- 400,000 obesity-related deaths annually in the US

Build and overall mortality

Relative risk of death (from all causes) by BMI
Calle E et al, NEJM 341(15) 1999

<table>
<thead>
<tr>
<th>BMI</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>0.8</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>18.5-20.4</td>
<td>0.9</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>20.5-21.9</td>
<td>1.0</td>
<td>1.4</td>
<td>1.8</td>
</tr>
<tr>
<td>22.0-23.4</td>
<td>1.1</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>23.5-24.9</td>
<td>1.2</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td>25.0-26.4</td>
<td>1.3</td>
<td>2.0</td>
<td>2.4</td>
</tr>
<tr>
<td>26.5-27.9</td>
<td>1.4</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>28.0-29.4</td>
<td>1.5</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>30.0-31.9</td>
<td>1.6</td>
<td>2.6</td>
<td>3.0</td>
</tr>
<tr>
<td>32.0-34.9</td>
<td>1.7</td>
<td>2.8</td>
<td>3.2</td>
</tr>
<tr>
<td>35.0-38.9</td>
<td>1.8</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>&gt;40.0</td>
<td>1.9</td>
<td>3.2</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Relative risk

- Females
- Males
Swiss Re’s new epidemiological model helps understand the range of potential outcomes

- Swiss Re has significant exposure to mortality risk and therefore needs an in-depth understanding of pandemic risk

- Swiss Re has developed a sophisticated epidemiological model to
  - understand the risk
  - gain insight into the impact of various intervention strategies
  - understand the sensitivities to various assumptions

- The model uses a stochastic process to produce a distribution of outcomes, rather than relying on a small number of subjectively chosen scenarios
Key outputs from the model

- Using the model, Swiss Re has estimated:

  In most developed countries, a 1-in-200-year severity pandemic would give rise to excess mortality of between 1 and 1.5 deaths per 1,000 lives within an insurance portfolio.

- This result is particularly relevant for insurers in setting mortality shock assumptions in their internal models.

- The model also shows that the influenza pandemic of 1918, a unique event in 420 years, would have a much lower impact on mortality today than it did in 1918.

Global Warming

Swiss Re
Global Warming
A Changing Risk Landscape

- consumer preferences
- carbon market
  - alternative energy
  - investment opportunities
- business environment
  - reputation risk
  - NGO activism
  - emission limits
  - regulation
- physical environment
  - extreme events
  - tropical cyclones
  - extra-tropical cyclones
  - wildfires
  - heat waves
  - volatile weather
  - rising sea level

Changes in extreme events:
Heatwave 2003

**Economic impacts: downsides**
- Agricultural losses: USD 12.3bn
- Serious problems with:
  - freshwater resources (Italy)
  - forest fires (Portugal)
  - freshwater fish (Switzerland)
- Shortage of electricity, peak prices on spot market (EEX)
- Estimated 22,000 to 35,000 heat deaths (excess mortality)

**Economic impacts: upsides**
- Beverage industry and air conditioning systems, tourism in alpine regions

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August 2003 temperatures relative to 2000-2002, 2004

Source: Reto Stöckli, ETH/NASA, MODIS / Prof. Christoph Schär
Changes in extreme events:
Winterstorm Europe - Goal and methodology

Compare wind storm losses on a Europe-wide property insurance portfolio in current and future climate conditions. Co-operation with Federal Institute of Technology Zurich (ETH):

Global climate model — Regional climate model — Swiss Re loss model

Changes in extreme events:
Flood losses in Europe - Joint project with EC

Tackle the problem in co-operation with EC Research Center in Ispra

- Break down climate change forecast for Europe:
- Calculate river discharge under changing climatic condition
- Quantify the impact of climate change on river flood losses in Europe

Preliminary results
- Annual precipitation (over all) will increase slightly
- Less summer- but increased winter-discharge
- Enhanced flood risk during winter and spring
- Return periods of heavy precipitation events could be halved
Swiss Re’s response

Jacques Aigrain, CEO of Swiss Re:
“... Climate change has become an important element of our long-term risk management strategy.”

Four strategic priorities:
- Understand the risk & adapt pricing and risk models accordingly
- Influence the business environment by raising awareness at industry & governmental level
- Leverage the opportunities by developing products & services for mitigation and adaptation
- Address own environmental footprint