Risk management for climate change and catastrophes in Asia

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1. Overview of Climate Change

Global temperatures have been rising rapidly due to increased greenhouse gas emissions.

Source: Stephen Stoft
1. Overview of Climate Change

The impact of climate change is significant for insurers.

Insured losses, 1970-2020, in USD billion at 2020 prices

1. Overview of Climate Change

In Japan, the number of extreme precipitation has been rising.

1. Overview of Climate Change

Climate change may have a wide range of impacts on insurance processes.

- Physical risks: The first-order risks arising from weather-related events.
- Transition risks: The financial risks arising from a transition to a low-carbon economy.

Source: Actuaries Institute Australia.
2. Mosquito-borne Infectious Diseases

Global warming can affect infectious diseases.

Global Warming

- Changes in precipitation amounts and patterns
- Increased rainfall at specific times of the year
- Increase in the number of mosquitoes and natural hosts
- Rise in temperature
  - Increase in minimum winter temperatures
  - More mosquitoes overwinter
  - Increase in maximum summer temperatures
  - Expansion of the mosquito survival zone
  - Changes in people's clothing and living environment

Changes in conditions affecting infectious diseases

- Entry of pathogens into the body
- Presence of vectors and natural hosts
- Social environment conducive for pathogens to live
- People's Health

## 2. Mosquito-borne Infectious Diseases

### Characteristics of Major Mosquito-borne Infections:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Symptoms</th>
<th>Vaccine available</th>
<th>Reported in Japan</th>
<th>Number of infected people worldwide</th>
<th>Probability of epidemic in Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dengue Fever</td>
<td>Fever, headache, myalgia, rash</td>
<td>No</td>
<td>Yes (200 per year)</td>
<td>400 millions per year</td>
<td>Not very low</td>
</tr>
<tr>
<td>Zika virus infection</td>
<td>Asymptomatic or mild disease</td>
<td>No</td>
<td>Yes</td>
<td>1.5 millions per year (in Brazil)</td>
<td>Not very low</td>
</tr>
<tr>
<td>Chikungunya fever</td>
<td>Fever, arthralgia, rash</td>
<td>No</td>
<td>Yes (20 per year)</td>
<td>Over 1 million per year</td>
<td>Not very low</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>Fever, chills, high mortality</td>
<td>Yes</td>
<td>No</td>
<td>100 thousands per year</td>
<td>Not very low</td>
</tr>
<tr>
<td>Malaria</td>
<td>Fever, chills</td>
<td>Yes</td>
<td>Yes</td>
<td>200 millions per year</td>
<td>Very low (Under the current housing structure)</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>High fever for several days</td>
<td>Yes</td>
<td>Yes</td>
<td>70 thousands per year</td>
<td>Very low (By Routine Vaccination)</td>
</tr>
<tr>
<td>West Nile Fever</td>
<td>Flu-like symptoms, relatively slight</td>
<td>No</td>
<td>No</td>
<td>2 thousands per year (in North America)</td>
<td>Not very low</td>
</tr>
</tbody>
</table>
2. Mosquito-borne Infectious Diseases

Aedes aegypti and Aedes albopictus have been known vectors of dengue fever.

**Aedes aegypti**

- Distributed throughout the world in tropical and subtropical regions.
- Currently not distributed in Japan.
- Mainly found in urban areas.

2. Mosquito-borne Infectious Diseases

Aedes aegypti and Aedes albopictus have been known vectors of dengue fever.

- **Aedes albopictus**
  - Distributed in tropical, subtropical and temperate regions.
  - Also widely distributed in Japan.
  - Mainly found in suburban and exurban areas.

Moritz UG Kraemer et al. (2015) https://elifesciences.org/articles/08347*
2. Mosquito-borne Infectious Diseases

Global warming has caused the habitat of the Aedes Albopictus to move northward.

- The Aedes Albopictus is widely distributed in Japan and is found in high densities in urban areas, urban towns, and densely populated residential areas.
- These mosquitoes are vectors of dengue fever and Zika fever.
- These mosquitoes are thought to survive in environments with an average annual temperature of 11°C or higher, and their habitat is moving northward due to global warming.
  → As a result, areas at risk of dengue fever epidemics are expanding.

2. Mosquito-borne Infectious Diseases

Fukoku Life estimated the impact of a dengue fever epidemic under the 2°C rise scenario.

- If global warming causes a 2°C increase in temperature, the average January temperature in the five prefectures of Fukuoka, Nagasaki, Miyazaki, Kagoshima, and Okinawa will exceed 10°C, and the Aedes aegypti could become established.
- Using data on the number of infections and mortality rates in the Philippines in 2019, we estimated the amount of insurance we would pay. → Confirmed that the impact on the surplus is limited.

<table>
<thead>
<tr>
<th>Population (A)</th>
<th>Infected (B)</th>
<th>Death (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(B/A)</td>
<td>0.42%</td>
<td>(C/B) 0.37%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Population</th>
<th>Infected</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 prefectures of Japan*</td>
<td>10,559,000</td>
<td>44,165</td>
</tr>
</tbody>
</table>

* Fukuoka, Nagasaki, Miyazaki, Kagoshima, and Okinawa. Filled in red on the map of Japan.
3. Climate Change and Natural Disasters

Large-scale torrential rains and typhoons have hit Japan in recent years.

- Typhoon Hagibis, which occurred in October 2019, caused flooding and landslides over a wide area of Japan, resulting in 90 deaths, nine people missing, and 4,008 houses totally or partially destroyed, 70,341 homes flooded. The total damage amounted to 1.86 trillion yen.
- The total amount of rainfall in the Kanto Koshin region associated with Typhoon Hagibis was increased by 10.9% due to increases in air and sea surface temperatures since 1980 and by 13.6% due to increases in air and sea surface temperatures since 1850 (industrialization).

Source: Ministry of Land, Infrastructure, Transport and Tourism. 
https://www.mlit.go.jp/river/shinngikai_blog/kasen_hyouka/dai08kai/dai08kai_ref1.pdf
3. Climate Change and Natural Disasters

Ministry of the Environment simulated the characteristics of Typhoon Hagibis under the conditions of future global warming.

Image: Temporal precipitation distribution by simulated typhoon
Left: Reproduction calculation of current typhoon, Right: 4°C rise scenario

3. Climate Change and Natural Disasters

Simulations showed an increase in peak flows and tidal anomalies.

- Peak flows in major water systems increased on average 15% under the 2°C increase scenario and 29% under the 4°C increase scenario compared to the present climate. → May increase the risk of river flooding and landslides.

- The tidal anomaly in Tokyo Bay increased by 12% under the 2°C rise scenario and by 26% under the 4°C rise scenario compared to the present climate. (Varies by model.) → May increase the risk of flooding.

3. Climate Change and Natural Disasters

Real estate transactions need to present hazard maps.

- In recent years, Japan has experienced frequent large-scale water-related disasters that have caused extensive damage. Information related to flood risk has become an essential factor in making decisions regarding the conclusion of contracts during real estate transactions.
- Therefore, in Japan, it has become mandatory from 2020 for building lot and building traders to present hazard maps and provide information on the subject property's location at the time of a real estate transaction.
- Property prices may be affected as real estate buyers become aware of flood risks.


3. Climate Change and Natural Disasters

Natural disasters increase the risk of various infectious diseases.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Situation</th>
<th>Risk</th>
<th>Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVID-19</td>
<td>Spread in refuges</td>
<td>High Shared living space, close quarters</td>
<td>Disinfection of facilities, ventilation, health observation, isolation of symptomatic patients and early medical examination system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bringing in volunteers</td>
<td>High Risk of being brought in from endemic areas</td>
<td>Health observation and vaccination checks of volunteers</td>
</tr>
<tr>
<td>Respiratory infection</td>
<td>Spread in refuges</td>
<td>Middle RS virus infections are prevalent, especially in infants</td>
<td>Thorough measures against droplet infection</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>Spread in refuges</td>
<td>Middle Risk of foodborne illness from soup kitchens and rations</td>
<td>Proper food and sanitation management</td>
</tr>
<tr>
<td>disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spread in refuges</td>
<td>Middle Risks when circulating bathtubs and stored water are shared.</td>
<td>Not in the mouth, disinfection practices</td>
</tr>
<tr>
<td></td>
<td>Infection during volunteer work</td>
<td>Middle Risk of exposure during volunteer work</td>
<td>Avoidance of skin exposure and bare-handed work</td>
</tr>
</tbody>
</table>

Source: Natural Institute of Infectious Diseases. https://www.niid.go.jp/niid/ja/disaster/r2-7/10512-r3-7-1.html
4. Risk Management for Climate Change

The following elements should be considered in scenario testing;

• **RCPs:** The IPCC has envisioned four patterns of temperature rise scenarios, depending on future greenhouse gas emissions. In the RCP8.5 scenario, where temperatures rise significantly, physical risks are more apparent. Conversely, transition risks will be evident in the RPC2.6 scenario, where the temperature rise is suppressed.

• **Time horizons:** Physical and transition risks will emerge over time (and at different times depending on mitigation actions taken), so future time frames should be specified when specific risks are evaluated.

• **Specific localized impacts:** Physical risks arise when climate change results in extreme weather patterns at the local level or changes to land cover, crops, and other environmental parameters. In Japan, wind and flood damage is one of the most alarming risks, and the risk of infectious diseases is also likely to increase during wind and flood damage.

• **Specific local economic and technological changes:** Governments around the world will enact and enforce changes in policy differently using various technologies to achieve national objectives. In April 2021, Japan announced its goal of a 46% reduction in greenhouse gas emissions in FY2030 (compared to FY13 levels) and its ongoing challenge to achieve a further 50% reduction.

*Climate-Related Scenarios Applied to Insurers and Other Financial Institutions*
4. Risk Management for Climate Change

The following elements should be considered in scenario testing:

• **A view of the prospective political situation:** The ability to implement and sustain the potentially disruptive economic transformations required to achieve a reduction in GHG emissions is a function of the country’s political system and policies. Scenario construction should consider such factors as the likelihood of policy reversals, etc.

• **Technological assessment:** Possible new technologies, such as hydrogen-powered transport or smart electric grids, should be studied with appropriate cost–benefit analysis.

• **Nature of economic changes:** A transition to a low-emissions economy can be either gradual or abrupt. Scenarios should consider the nature of change, particularly regarding transition risk, and the underlying uncertainty of future assumptions.

• **Level of resilience:** Resilience of the local population, consumer behavior, the building stock, the agricultural system, etc., and the strategic or other importance of that place or people to other countries should be considered. The level of resilience affects the type and severity of impacts.

*Source: International Actuarial Association. Climate-Related Scenarios Applied to Insurers and Other Financial Institutions*
4. Risk Management for Climate Change

Some companies offer premiums based on water damage risk.

- In 2020, Rakuten General Insurance launched Japan's first product that changes premiums for flood risk linked to hazard maps.
- The risk classification can be determined by simply entering the address and house structure on the company's website.
- The risk classified pricing can increase fairness between policyholders. The company will decrease the premium rate for 70% of policyholders.

*Image*: Lower premiums in areas with low risk of water damage.

*Source*: WEDGE Infinity. https://wedge.ismedia.jp/articles/-/20852
4. Risk Management for Climate Change

Insurance Companies provide education on disaster preparedness.

• As part of its community and social contribution activities, Tokio Marine & Nichido conducts "disaster prevention classes," a disaster awareness program for children, with Tokio Marine Group employees and agents serving as volunteer instructors throughout Japan.

• It is socially meaningful for insurance companies to pass on the expertise they have gained through their risk consulting services, and raising awareness of disaster prevention can help reduce risk.

Source: https://www.tokiomarine-nichido.co.jp/world/egao/torikumi/try/lesson.html
4. Risk Management for Climate Change

Nudge theory has led to research on what kind of pro-evacuation messages are effective.

Message (A): Most of those evacuated said they did so because the people around them evacuated. Your evacuation will save lives.

Message (B): Most of those evacuated said they did so because the people around them evacuated. Unless you evacuate, you are putting other people's lives at risk.

Message (F): Protect yourself from disasters by learning about the damage that heavy rains can cause, making correct judgments and taking action.

- An experiment was conducted in Hiroshima Prefecture, where landslide damage is frequent, to examine messages that promote evacuation using the nudge theory.

- Message A and Message B, which conveyed that one's actions would benefit others, resulted in a higher percentage of people evacuating to shelters than the conventional Message F.

- Currently, news organizations use Message A to advise people to evacuate during disasters.

5. Climate Change and Sustainable Management

Insurance companies are also required to manage their operations sustainably.

- In March 2016, Fukoku Mutual Life Insurance Company endorsed the UN’s PRI, and is currently taking into account ESG issues when making investment decisions while ensuring that these considerations do not interfere with our fiduciary duty.
- In February 2021, the Company invested in sustainable development bonds issued by the Inter-American Development Bank. Funds procured through investment in these bonds are partly used to support proper forest management in Honduras.

Source: Fukoku Mutual Life Insurance company.
5. Climate Change and Sustainable Management

Insurance companies are also required to manage their operations sustainably.

- Fukoku Mutual Life Insurance Company is building Environment-friendly real estate.
- Opened in 2010, the Osaka Fukoku Seimei Building received a commendation during the Fifth Award Ceremony for Buildings in Osaka, receiving the year’s highest Comprehensive Assessment System for Built Environment Efficiency evaluation.

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Emissions (t-CO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2017</td>
<td>51,225</td>
</tr>
<tr>
<td>FY2018</td>
<td>47,859</td>
</tr>
<tr>
<td>FY2019</td>
<td>42,057</td>
</tr>
</tbody>
</table>

- Fukoku Life is engaged in ongoing steps to conserve energy and reduce CO₂ emissions associated with its buildings. In fiscal 2019, the efforts lowered its CO₂ emissions 12.1% year on year.
- Working to reduce greenhouse gas emissions will help mitigate reputational risk, one of the risks associated with climate change.

Source: Fukoku Mutual Life Insurance company.
6. Conclusion

- Climate change is expected to cause cataclysmic natural disasters and pandemics. Therefore, insurance companies need to formulate risk management policies considering their risk profiles, referring to scenarios envisioned by specialized organizations.
- The role of insurance companies is not only to prepare for losses but also to encourage risk-averse behavior among policyholders to mitigate damage. For example, awareness campaigns on water-related disasters can save many lives.
- Risk and opportunity are two sides of the same coin. The emergence of risks associated with climate change is an opportunity for insurance companies to provide further coverage and increase revenues.
Thank you very much for your attention!

If you have any questions, please email me at wataru.hirose.os@fm.fukoku-life.co.jp.