

3-2-9 Initiatives in the Insurance Sector:

Climate Change Adaptation and Mitigation Efforts by Sompo Japan

Hajime Sano, Hiromichi Tsumori
Sompo Japan Nipponkoa Risk Management

1. Climate Change and the Insurance Sector

Besides its other impacts, climate change can result in enormous risks to the business of insurance companies and their corporate customers. For example, the climate change-induced increase in abnormal weather risk can result in direct damage to corporate facilities, equipment, and logistics, and lead to an increase in payouts by insurance companies. To illustrate, during the mild winter of 2008–09, the sales of heating products by consumer electronics retailers dropped by half, and one ski hill after another could only operate for half of the normal ski season due to the lack of snow. These kinds of changes in weather due to climate change—while they have a substantial impact on the sales of corporate clients—can also lead to increases in the need for products and services to cover weather risk, such as weather derivatives.

In addition, in order to hold back the impacts of climate change, there are efforts under way to strengthen regulations in order to significantly reduce greenhouse gas emissions and to transition toward a low-carbon society. While these regulations increase the compliance costs of insurance companies themselves, they are also creating business opportunities in the areas of renewable energy and energy conservation, carbon capture and storage (CCS), emission trading, and so on.¹ Insurance companies outside Japan have already started to aggressively invest in the renewable energy sector and provide insurance for CCS. The transition to a low-carbon society could create major business opportunities for insurance companies as well.

2. About Sompo Japan

Built upon a foundation of property and casualty insurance, Sompo Japan has developed a wide range of business activities. It all began with the Tokyo Fire Insurance Company, founded in 1888 as Japan's first fire insurance company. Tokyo Fire has its roots in fire fighting during the Edo Period (1603–1868) in Japan as the Tokyo Fire firefighters, an in-house fire brigade, that would sprinkle water on their uniforms and rush over to customers' homes to prevent the spread of fire using a fire hook.

The basic concepts of the insurance business are "public help" from the national and local

¹ CCS is an approach to separate and recover carbon dioxide from the emissions of large emitters such as thermal power plants, and then store and isolate it underground or in the ocean for a long time, as an effort to suppress carbon dioxide emissions to the atmosphere.

government, "self-help" by the people themselves, and in the middle, "mutual help"—and realizing a society where everyone helps each other is exactly what Sompo Japan aims for.

Yasuda Fire and Marine Insurance, the predecessor of Sompo Japan, was one of Japan's first financial institutions to establish a dedicated office for global environmental risk management when it was set up in 1990, and it acquired ISO 14001 certification for environmental management systems—the first Japanese financial institution to do so—in 1997. Later, the emphasis expanded from environment to corporate social responsibility (CSR), and today, Sompo Japan lists "adaptation and mitigation to climate change" as CSR priority issues.

3. Sompo Japan's Approach to Climate Change

In recent years, societies and economies have been seriously affected by frequent and large-scale disasters resulting from natural hazards² around the world. According to statistics compiled by Munich Re, a major reinsurance company that underwrites risk for insurance companies, large-scale disasters due to extreme weather events have been increasing worldwide since 1990, and there has been an associated increase in economic and insured losses. A large number of enormous natural hazards occurred in 2011, in particular, such as the Great East Japan Earthquake and major flooding in Thailand, with a large increase in economic losses and insurance payouts.

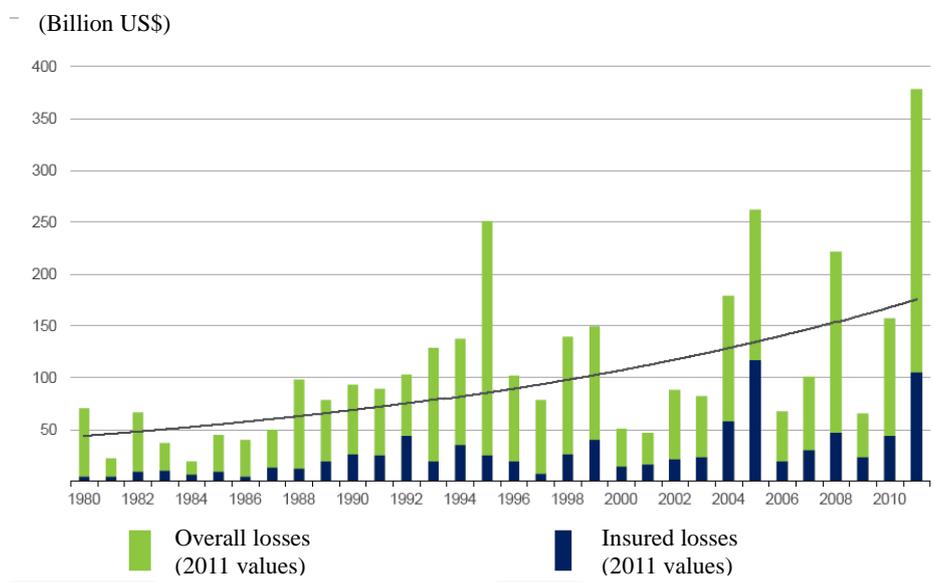


Figure 1. Overall losses and insurance losses due to disasters³

² Throughout the book, "disasters" refer to those resulting from natural hazards, unless otherwise stated.

³ Munich Re "NatCatSERVICE"

A variety of sectors are being affected by the increase in disasters that appears to be arising from climate change, including agriculture and other primary industries, infrastructure industries such as electricity and railways, manufacturing industries such as automotive and electrical equipment, and service industries such as retail and logistics. Insurance companies undertake the risk by providing insurance to these sectors, and for insurance companies, climate change is seen as both a significant risk and a business opportunity.

Two approaches are generally taken to respond to climate change: "mitigation" and "adaptation."

Specific examples of "mitigation"—to reduce greenhouse gas emissions—include promoting and expanding the use of renewable energy, using carbon offsets, and having businesses transition to "low-carbon" (e.g., energy efficient) operations. For its part, Sompo Japan has been working to reduce environmental impacts associated with its own activities based on ISO 14001 environmental management systems. In 2008, the company obtained "Eco First" certification from Japan's Minister of the Environment and declared its intent to reduce CO2 emissions by more than 56% by 2050 compared to 2002. Sompo Japan is intensifying a variety of efforts, such as investment in energy conservation, including more efficient air conditioning and inverters for lighting, promotion of resource and energy conservation among all employees, and development of a green purchasing system for its value chain.

Sompo Japan is also making an effort to promote "mitigation" to climate change in society as a whole, through its provision of insurance and financial products and services. Examples include developing "Sompo Japan Green Open" (nicknamed "Buna no Mori," meaning beech forest) as an eco-fund to support companies that are proactive in environmental management, reducing paper use by handling insurance policy documentation online, using recycled parts to repair automobiles damaged in accidents, and offering services to support eco-friendly and safe driving.

Meanwhile, for "adaptation" to avoid or reduce the various impacts of climate change, Sompo Japan is making use of the know-how it has accumulated over the years to evaluate and quantify risks to society, and providing solutions in the form of a range of insurance products and services. One example is the weather index insurance product offered in Thailand, as described in the next section.

4. Development of Weather Index Insurance in Thailand

In 2007, the Japan Bank for International Cooperation (JBIC) created the study group of "Study on Market-based Adaptation -- the Potential of Index-based Insurance," to discuss whether or not private-sector risk financing approaches such as insurance could be effective in developing countries, which are vulnerable to the impacts of climate change and delayed in disaster preparation. Sompo Japan participated, and through this study group, targeted the Southeast Asia region, which has close connections with Japan. In particular, the focus was on the agricultural sector, which is most directly affected by climate change and for which responses are difficult for the private sector working alone.

The study group discussed the issues from a number of perspectives, including technical challenges for creating insurance in developing countries, and strategies to address them; the proper roles of the public and private sectors; and international frameworks to ensure the capacity to handle potential risks that may balloon in the future. As a result, the group concluded that weather derivatives (weather index insurance) could be an effective adaptation measure.

A weather derivative is a financial product that allows a policy holder to be paid a predetermined sum of money in the event that an index meets certain conditions (relating to temperature, wind, precipitation, snowfall, etc.). For example, regardless of whether or not any actual damage occurred, a predetermined amount of money would be paid out if rainfall is below a certain amount in July, a month that has a major impact on agricultural crop yields. The use of index products such as these can minimize the damage when unexpected weather conditions reduce profits or increase costs, by allowing insurance payouts for compensation to be made more quickly than regular insurance based on actual damage, and by avoiding secondary damage caused by any delay in recovery from a natural disaster.

Actually, these products—weather derivatives and weather index insurance—function almost identically. Products sold in Japan as weather derivatives are being sold in Thailand and other countries as insurance, with essentially the same contents.

Because weather derivatives (weather index insurance) are designed based on weather data, which is closely correlated to data on damage, the availability of reliable long-term data is essential. Thailand was selected for being an agricultural country in Southeast Asia that has an extensive system as well as advanced information technologies for weather observation. Within the country, northeast Thailand was selected for having an incomplete infrastructure for irrigation, for its dependence mainly on rain-fed farming methods, and for being generally a poor region. For these reasons, the final selection went to Khon Kaen Province in the central region of the northeastern part of the country, and rice, the country's primary crop.

To design a weather derivative (weather index insurance), it is first necessary to analyze past data on weather and rice yields in the target area. To analyze past data, cooperation was sought from the National Institute for Agro-Environmental Sciences, which is engaged in research in rice production in northeast Thailand. Then, based on the research outcomes, we developed a prototype of weather index insurance, and went to Thailand for feedback directly from farmers.

Insurance is not commonly used in rural areas of Thailand, and farmers were not familiar with products such as weather index insurance, so there was a possibility they would not accept it. To deal with this, we first created a trial insurance product, and organized presentations for local farmers, in cooperation with the Bank for Agriculture and Agricultural Cooperatives (BAAC), a governmental financial institution and a local sales partner.

This was Sompo Japan's first attempt to develop weather index insurance for a developing country, so we had some concerns about being able to have the local people understand the product. However, the response was very favorable from the first presentation, attended by about ten farmers. Thai farmers generally have the practice of borrowing money each year from a bank mainly to secure a work force, and repaying the principal and interest once they have turned their harvest into cash. If the harvest is negatively affected by drought or some other cause, their loan repayments are delayed, resulting in problems with farm operations the following year.



Figure 2. Interviews were conducted with local farmers



Figure 3. Presentations were made to explain the new concepts

Local people feel considerable anxiety about not being able to repay loans, so farmers said they would certainly use such a product if it was available, and the same response was elicited in presentations held in other areas.

Meanwhile, local farmers made many suggestions about the prototype. For example, with the original prototype, if the rainfall was below a certain amount during the three months from June to August, and rainfall in June was below a certain amount, an insurance payout would be made. Both conditions had to be met. However, farmers said that it would be simpler to have just one condition for payment, so the conditions were reduced to just one: the amount of rainfall during the three-month period. Also, farmers pointed out that rainfall in September affected harvests more than June, so the target period was changed to July to September.

These are examples of how Sompo Japan worked to reflect local input and improve the product. In order to have the farmers experience how the weather index insurance works, a simulation was conducted in 2009 without any actual exchange of insurance premiums or payments.

In parallel with this effort, Sompo Japan Thailand (currently Sompo Japan Nipponkoa Thailand), a local subsidiary of the Group, continued negotiations with the Thai insurance authorities. The company obtained official product approval for weather index insurance in December 2009, and launched its sales in January 2010.

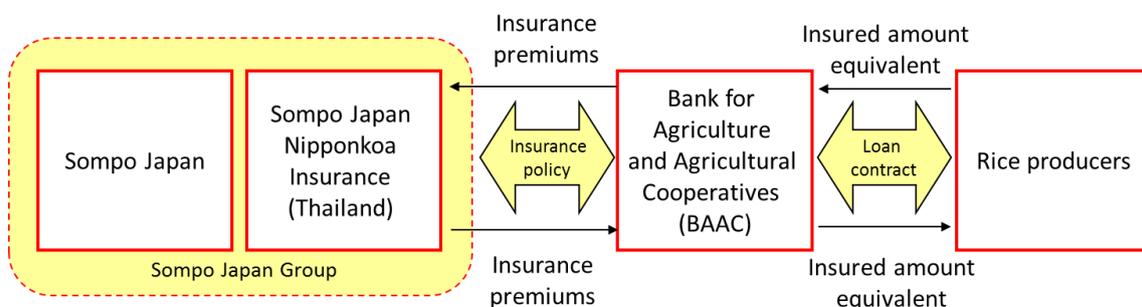


Figure 4. Weather index insurance scheme

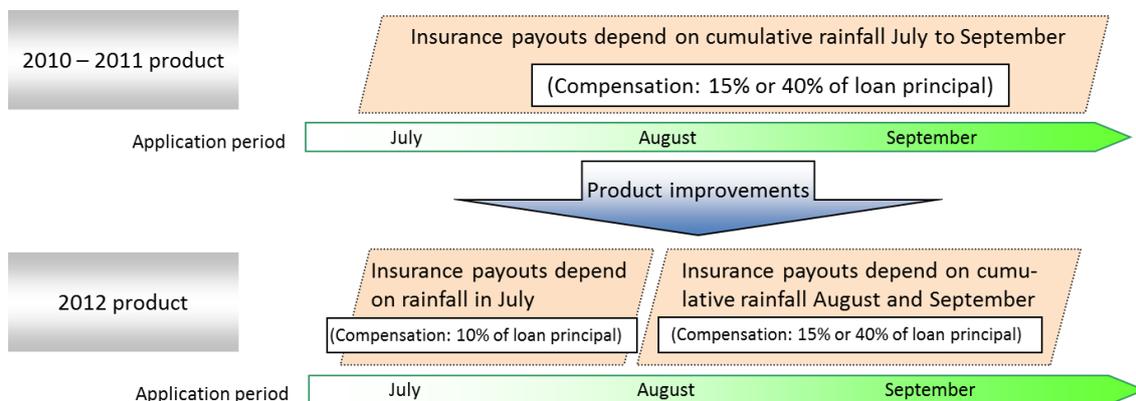


Figure 5. Product outline of Thai Weather Index Insurance

Under this arrangement, Sompo Japan Thailand underwrote the insurance contracts, while BAAC was responsible for promoting the insurance to farmers. If a drought or other circumstances arose in which an insurance payout should be made, Sompo Japan would make the insurance payment to BAAC, and BAAC would pay the equivalent amount to the farmer.

A ceremony was held in Bangkok for the product launch, attended by Thailand's Minister of Finance and the Japanese Ambassador to Thailand. The potential for weather index insurance attracted attention as an adaptation strategy to climate change.

Sompo Japan had a target of 1,000 applicants for the insurance, but was not certain what the actual response would be in northeast Thailand, where insurance was not commonly used. However, applications came in at a faster pace than expected, and the final number of contracts reached 1,158.

In fiscal 2011, the product was recognized for being easy to comprehend, and BAAC requested to expand the sales territory. As a result, the area was expanded to include four more provinces that have the confirmed and reliable meteorological data required for product development (Nakhon Ratchasima, Maha Sarakham, Kalasin, and Roi Et). With this expansion, there were over 6,000 contracts signed in fiscal 2011.

In fiscal 2012, in response to a request from BAAC and farmers, we made product improvements to enable early payouts if drought occurred in July, early in the planting season, which had a major impact on crop yields. As a result we changed the conditions, instead of counting rainfall over three months from July to September, to count the rainfall in the single month of July, or the two months of August and September. It was also decided to expand the sales territory from five provinces (Khon Kaen, Nakhon Ratchasima, Maha Sarakham, Kalasin, and Roi Et) to nine (with the addition of four—Buriram, Sisaket, Surin, and Ubon Ratchathan), all in northeast Thailand. It turned out that a drought actually did occur in some parts of northeast Thailand, so many policyholders received insurance payments, and the overall experience demonstrated the actual effectiveness and benefits of having insurance.

This process of making repeated improvements based on feedback from farmers and partners has resulted in weather index insurance becoming well established locally. It is attracting attention as one adaptation measure to reduce the risks of disasters in developing countries.

5. Development of Weather Derivatives in Japan

So far, we have looked at weather index insurance in Thailand, but know-how accumulated in the development of weather derivatives in Japan made it possible to develop these products in Thailand. Weather derivatives are traced back to their development by major energy companies in the United States in 1997. Sompo Japan was the first in Japan to start selling derivatives in December 1999, with payout criteria based on temperatures. The company has been actively selling these products since then.

It is said that weather variability affects the profits of as much as three out of four businesses to some extent. For such businesses, Sompo Japan offers order-made weather derivatives. Based on past data, we design products through discussion with customers regarding the types of indicators to use and levels of payout, etc.

Sompo Japan offers weather derivatives in a wide range of areas. For example, in the agricultural sector, we sell agricultural organizations a weather derivative to compensate for the risk of a cool summer or excessive rain. In the event of a cool summer, a certain amount of money is paid out for the total number of days the minimum temperature drops below a certain predetermined number during the period covered. With another product aiming to compensate for typhoon risk, the compensation is determined depending on the number of typhoons that go over the target area.

In the renewable energy sector, we offer a derivative to solar power generation businesses that uses sunlight hours as the indicator. This product mitigates the risk of reduced profits due to a lack of sunlight, and a predetermined amount of money will be paid if the number of sunlight hours is below a certain figure. The aim is to support the stable development of businesses in this sector. Meanwhile, for individual consumers, we have developed and offer a service that uses weather derivatives for solar power generation. This was done in cooperation with companies that install photovoltaic power generation systems on individual homes. We expect that these products will help promote the introduction of renewable energy, including solar power.

Sompo Japan aims to support the economic activities of businesses and help create a society resilient to climate change, through these products to address climate-related risks.

6. Natural Disaster Risk Assessment Model

So far this chapter has touched upon weather index insurance and weather derivatives that Sompo Japan offers in Japan and Thailand, but the design of these types of insurance and financial products requires quantitative assessments of the risks being covered.

The quantitative assessment of risks typically uses "disaster risk assessment models," which are a

sophisticated combination of numerical models, including statistical, physical, and financial models. Sompo Japan has developed its own in-house model for such risks as earthquakes, typhoons, floods, and tsunamis. The insurance loss amounts assessed by the model are useful for designing insurance products and for management decisions by insurance companies.

As an example of a natural disaster risk assessment model, below we introduce a typhoon model developed by Sompo Japan Group companies. The typhoon model is based on data from past observation. It statistically models typhoon characteristics such as where typhoons develop, what path they follow, and how strong they are. Then, based on this model, it conducts a random simulation by computer, prepares a few hundred to a few thousand years' worth of hypothetical typhoon events, and creates a typhoon event set. The event set includes large-scale typhoon events that rarely occur, making it possible to quantitatively assess risk, even for major typhoon disasters that have never been experienced in the past.

To implement climate change adaptation measures, it is necessary to quantify changes in future risk based on natural disaster risk assessment models. These models use statistical models and random simulations to model past characteristics, and quantify probabilistic risk by recreating a large number of disaster events based on those characteristics. Meanwhile, it has been pointed out that the frequency and intensity of disasters themselves may change as a result of climate change. Thus, in terms of evaluating medium and long term changes in the amount of risk, there may be limits to what can be accomplished by using only disaster risk assessment models, which come from statistical methods using historical data.

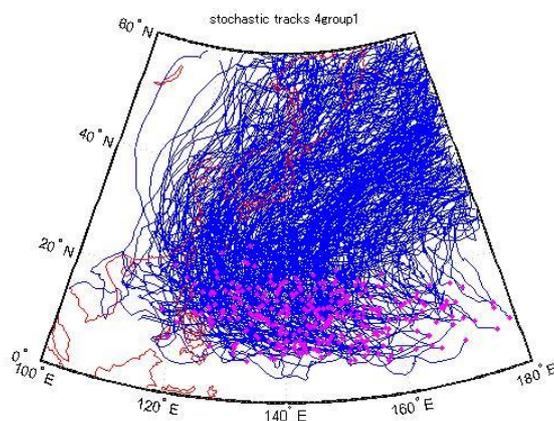


Figure 6. Hypothetical typhoon events generated by typhoon model

One approach to deal with this is to incorporate the results of climate change prediction simulations into the disaster risk assessment model. For example, in the United Kingdom, the Association of British Insurers teamed up with the Meteorological Office to implement a joint project to predict future changes in storm disaster risk. They evaluated the value of total and annual expected losses from climate change impacts generated for a period of 100 to 200 years. Insurance companies are basing their medium and long term risk management upon these assessment results.

Working with the Disaster Prevention Research Institute at Kyoto University, Sompo Japan is conducting joint research and development of a national flood model that takes into account the impacts of climate change. Combining Kyoto University's know-how, relating to analysis of changes in precipitation as well as river flow and flood calculations, with Sompo Japan's risk assessment know-how relating to insurance damage, we are aiming to quantitatively evaluate flood risk nationwide from the economic perspective.

7. Moving toward a Sustainable Society

Climate change is an unprecedented challenge that will result in extensive damage to various sectors of society. It is a major business challenge for the insurance industry in particular, as the increase in disasters is leading to an increase in insurance claims paid.

The societal mission of insurance companies is to evaluate risks in society and the economy and to provide solutions in the form of insurance and financial products and services. The sustainability of society is threatened by climate change, but we hope that Sompo Japan can contribute to the realization of a sustainable society with solutions for climate risk, and also to advance the sustainable growth of insurance companies themselves.