THE GENEVA ASSOCIATION

Lessons learned from the events of 11 March 2011

A GENEVA ASSOCIATION CONFERENCE REVIEW

The Geneva Association

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The Geneva Association identifies fundamental trends and strategic issues where insurance plays a substantial role or which influence the insurance sector. Through the development of research programmes, regular publications and the organisation of international meetings, The Geneva Association serves as a catalyst for progress in the understanding of risk and insurance matters and acts as an information creator and disseminator. It is the leading voice of the largest insurance groups worldwide in the dialogue with international institutions. In parallel, it advances—in economic and cultural terms—the development and application of risk management and the understanding of uncertainty in the modern economy.

The Geneva Association membership comprises a statutory maximum of 90 chief executive officers (CEOs) from the world's top insurance and reinsurance companies. It organises international expert networks and manages discussion platforms for senior insurance executives and specialists as well as policymakers, regulators and multilateral organisations. The Geneva Association's annual General Assembly is the most prestigious gathering of leading insurance CEOs worldwide.

Established in 1973, The Geneva Association, officially the "International Association for the Study of Insurance Economics", has offices in Geneva and Basel, Switzerland and is a non-profit organisation funded by its members.

Photo credits:

Cover: Miyako, Japan. This picture taken by a Miyako City official on 11 March 2011 and released on 18 March 2011 shows a tsunami breeching an embankment and flowing into the city of Miyako in Iwate prefecture shortly after a 9.0 magnitude earthquake hit the region of northern Japan. AFP Photo/JIJI Press

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Lessons learned from the events of 11 March 2011

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CONTENTS

WELCOME

Shuzo Sumi,

Chairman of the Board, Tokio Marine & Nichido Fire Insurance Co., Ltd. Co-Chairman of The Geneva Association's Climate Risks and Insurance working group.

It was a great pleasure to be able to welcome The Geneva Association's 5th Climate Risk and Insurance Seminar to Sendai in Japan. For a first field trip, it was a venue that represented the enormous scale and impact that natural catastrophes can inflict on people, on a society and on an economy. The meeting provided an opportunity to share some of the lessons learned from the events of 11 March 2011; not only the experience and knowledge that Japan itself has built up, but also what it has told us about the role that insurance plays in Japanese society and its economy in the wake of such catastrophes. Many aspects of the insurance business were tested that day, not least, the responsiveness of the homeowners' earthquake insurance system and the mechanisms for the sharing and transfer of risk, and a number of lessons were learned. Sendai therefore provided an appropriate location for this meeting of insurance specialists, all of whom came to share knowledge and understanding about insurance and its role in the aftermath of that terrible day, and to understand the lessons it has taught us. As such, the meeting aimed to make us better prepared for future mishaps and enabled us to share with the wider industry our existing knowledge and experience for the benefit of all.

The way that insurers handled claims and worked in the community following the Tohoku earthquake and tsunami changed perceptions of insurance in Japan. Indeed, insurance was among the first forms of financial relief to reach affected households in the region. Even though insurance has the effect of absorbing and mitigating disaster-caused financial distress, there is much more room for exploration of how insurance can be used as a useful social measure to prepare for the next major disaster.

A reliable system is easier said than done, because it relies on many more actors than just insurers. Establishing strong and trusting relationships between the major actors involved in societies is fundamentally important in designing and organising a sustainable and supportive system for this type of event. This is why the work of the United Nations Office for Disaster Risk Reduction (UNISDR) is of great importance to the development and support of more resilient societies. As many of you know, the 3rd United Nations Conference on Disaster Risk Reduction will take place in Sendai in March 2015. The insurance industry is well-positioned to take part in the international discussions on disaster risk reduction, and it has also therefore been timely and meaningful to have this conference ahead of that auspicious United Nations meeting.

THE GENEVA ASSOCIATION'S WORK ON THE CR+I PROJECT

Michael Butt,

Chairman of the Board of Axis Capital Group; Co-Chairman of The Geneva Association's Climate Risks and Insurance working group.

The Geneva Association has been working on climate risk issues since 2008, when the Climate Risk and Insurance project was established following a mandate from its Members at the 2008 General Assembly. A working group of experts was set up and embarked on a multi-year programme to study the links between climate risk and insurance. Sendai represents the working group's first field visit to the site of a disaster to draw on lessons learned from the event.

The insurance industry has a lot more to contribute at a structural level to the social and political debate on disaster risk reduction than it has currently been able to manifest or show itself able to do. It needs to be more positive about what we have learned and can continue to learn, and contribute to the debate, at the political, social and structural levels in the future. The Geneva Association's move towards advocacy and dissemination of information is a positive move in that direction. Given the advent of Sandy, the tsunami in Sendai and other climate-related events, this meeting has been timely; the United Nations has just announced its sustainable development goals, so The Geneva Association's ability to work through them is particularly important.

The insurance industry has an extensive in-built knowledge of extreme events. It needs to do more about extracting that knowledge and sharing it. An interesting item that came out of the press conference in London in June 2013 on The Geneva Reports No. 7,[1] a set of case studies on disaster risk reduction, was how the insurance industry takes a long-term view of extreme events. This is in contrast to the short-term interests of many participants, particularly in the political arena. Because of its focus on risk-based pricing, the insurance industry can contribute meaningfully to discussions on the real cost of risks without being part of the political discourse. We also have a deep knowledge about, and can advise on, risk reduction measures that reduce the impact of a disaster when it occurs.

The Geneva Association is increasing its role in helping people understand—particularly in developing countries—what can be done in disaster risk reduction, from improving infrastructure to more complex institutional issues, and this is an important step forward.

The private sector is vital if these risks are going to be properly managed. Substantial amounts of alternative capital are entering the insurance industry looking to share risk. This should be encouraged to ensure that the private sector has enough capital to take on the risks that governments cannot or should not be affording. There is great growth opportunity here to develop the appetite of spreading risks that are currently not insured.

1 Orie, M. and Stahel, W.R. (eds.) (2013) *Insurers' contributions to disaster reduction—a series of case studies*, The Geneva Reports No. 7. Geneva: The Geneva Association.

INTRODUCTION

John H. Fitzpatrick,

Secretary General, The Geneva Association (2012–2014).

In June 2009 in Kyoto, the Climate Risk and Insurance (CR+I) working group initiated the development of the Kyoto Statement, an unprecedented industry statement of comments and commitments to mitigate and adapt to climate risks, signed by 56 insurance and reinsurance CEOs. Not all of the chief executives present felt free to sign it in 2009, but, given the conclusions of the latest Intergovernmental Panel on Climate Change (IPCC) report and a re-energising of the industry by The Geneva Association, we expected to gain more signatories at our May 2014 General Assembly in Toronto. At the time of writing, some 67 CEOs have signed the revised Climate Risk Statement.

The Geneva Association is most interested in the intersection of economics, politics and the industry's capacity to manage the risks facing this planet. Our objective is to make the world more resilient to the large events that can affect us. However, the desire to impose a global capital standard on the insurance industry will undoubtedly have an effect on its capacity to take on the risks that the world has.

An event of the magnitude of the Tohoku earthquake and tsunami puts a real strain on all the systems of support that come into play after an event. These are what we really want to study and understand, because they are of a different scale than the normal windstorm or earthquake that can occur.

Through the CR+I seminar in Sendai, The Geneva Association sought to understand the behavioural aspects and incentives that individuals, companies, insurers and governments have that challenge our capacity to mitigate extreme events. In short, what steps we can take as a working group to make society more resilient to extreme events.

We do not do this in a vacuum. There are conditions out there that impact the capacity for resilience, i.e. governments are still recovering from the financial crisis of 2008, with a level of debt-to-GDP that constrains them in terms of pre-event planning and disaster risk reduction.

There is also the unprecedented monetary support of central banks that has drastically reduced interest rates for pensioners, savers and, of course, insurers, who are challenged to earn an adequate rate of return by investing premiums at these interest rates.

The trend towards greater losses from extreme events is in place due to the increased value of property in harm's way and the changes in climate that we are observing. It is also the case that the amount of loss not covered by insurance has been rising, with the burden falling on individuals and governments in post-event recovery. They simply cannot afford it and that is the challenge we face and sought to address in this meeting.

CURRENT STATE OF GLOBAL DISCUSSIONS ON DISASTER RISK RESILIENCE: THE INSURANCE INDUSTRY AND THE POST-2015 GLOBAL DISASTER RISK REDUCTION FRAMEWORK

Margareta Wahlström

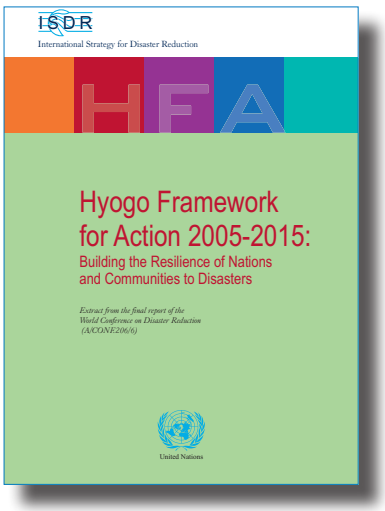
Special Representative for the United Nations Office for Disaster Risk Reduction (SRSG) and Head of the United Nations Office for Disaster Risk Reduction (UNISDR).

Insurers are the experts on risk, but there is a wider context of economics, politics, global process and the efforts that are being tried within the global framework in which insurance finds itself.

Disaster risk reduction efforts were globally started by scientists, many of whom were Japanese. They were founded on a strong conviction that the way society had built itself—the socio-economic developments, assets and infrastructure—were going to overtake our ability to deal with disasters unless we adopt a more preventive approach. To put it another way, fast economic growth generates risks, and it does so very quickly. Insurers are conscious of this. After 10–15 years, this community of scientists retreated to rethink their strategy and tactics. The United Nations General Assembly went much more into advocacy in the public space, looking for a demand-driven constituency who understood where we are, what we are doing and what they can contribute to this field. Today, the simplest version of saying this is "who pays". Governments pay a lot, private industry pays a lot, but it is the citizens who pay ultimately. The real issue we face is how we can make the global risks concept meaningful to families and citizens; not just scary scenarios, but what do you do? What are the instruments available to us today?

Stability may be threatened if we cannot manage our disaster risks. Previous efforts around the turn of the century became focused on building up resilience to events rather than tackling the aftermath, and these represent a move towards prevention and community resilience. The Hyogo Framework for Action in 2005 was the most recent instrument delivered by that process. Until now, the target has been governments and government obligations, but there has not been much about other stakeholders. Governments, however, cannot cope with these risks on their own. The opportunity that has been created over the last decade is to move these discussions into the public debate. Based on that recognition, how do we structure this process? What is the governance process? What does it signify for the financing of risk? What does it signify for the cost of risk? How do we overcome some of the traditional trust gaps between civil society and government and big business? Each operates in their own silos, which are guided by a significant lack of knowledge about each other, preconceptions and an inability to feel and shape a commonly held agenda. The Hyogo Framework for Action will be relaunched in 2015. The expected outcome is that we need to substantially reduce disaster losses in terms of lives and of social, economic and environmental assets of communities and countries. There are three strategic goals:

1. the integration of disaster risk in policies and planning,
2. the development of relevant institutions,



3. the development of competencies to deal with catastrophes and emergencies, preparedness and response, and recovery programmes.

In parallel, there are global processes going on with a global sustainability programme scheduled for launch in 2015 and what we hope will be progress on final discussions around climate talks. Can we make a convincing case that this is all part of the same agenda? One of the commitments UNISDR has made is that we have to influence these other agendas, even if we cannot integrate all of them fully. Sustainable development goals can only be fully credible if they frame their planning in risk. This was our input to the Rio de Janeiro conference in 2012.

At the national level, a lot of legislation has been passed around the world—a minimum of 75 pieces have been passed with regard to disasters. Unfortunately it doesn't usually cover disaster risk reduction but is instead focused on disaster management. The good news is that countries are beginning to work this out. Regionally and nationally, many more countries are now working with UNISDR to address this.

Identifying, assessing and monitoring risk is something the insurance industry does, but the enormous volume of risk monitoring today helps policymakers to take the right decisions. One of the issues we can investigate together is whether there is a way of offering criteria for a standard for the quality of information we get. This would help.

In terms of knowledge education and research, the scientific community walked away from disaster risk and went to climate when this became a popular subject. Slowly they are coming back and UNISDR is trying to mobilise them as well.

In March 2012, we launched the consultations on the next Hyogo Framework for Action (HFA). It is an evolved version of the previous HFA. This is our second year of formal consultation about very specific areas of competence. We need standards for resilience and sustainability and are developing a peer review system for national systems for disaster risk reduction. In terms of getting attention it is very successful.

The 2015 UNISDR conference in Sendai will be an intergovernmental session that will bind governments on certain commitments. It says that governments are not alone anymore. A broad range of communities are involved, including local and national governments, children, and the elderly and disabled. In a world where 50 per cent of the population is over 60, this will be extremely important. Since insurers look at ageing, they can also play a part in these discussions.

We hope to see private sector collaboration as the strongest driver of risk knowledge and risk transfer in their own interests, but also in the interests of consumers and wider society. The private sector has a role to play in advocacy

and the design and development of projects. Private-sector advisory groups are already taking part in preparations for Hyogo.

Insurance plays a special role in the tackling of risk but it is only one piece of the puzzle. This means committing to solutions and participating; insurers have an extraordinary knowledge base, but have not yet fully solved the question of how to use that to map other solutions. Insurers must also articulate clearly how they can help, because individuals are very ignorant about how the insurance industry works. What is the basis you need to function? How do you take decisions? Insurers have to help the outside world understand them a bit better in all the ways they work as an industry.

One area where we can immediately get traction is on the education side. What can we do to generate incentives? One of the areas UNISDR wants to facilitate is the bringing together of partners to trade ideas around particular areas of practice. I am also a great believer in simplification—unless you can speak simply and clearly, you lose the listeners early on. Insurers are extremely well-positioned to map what risk looks like in 30–40 years' time. Most scientists will say they can't predict that far into the future, that it is too complicated and too full of uncertainties, but we actually need to educate people on risk accumulations that are taking place today and will manifest themselves later.

Insurance discussions become more concrete when taking place after an event but we would like to see insurers involved in risk prevention. Reconstruction is what breaks the back of governments these days. Not enough comparison of reconstructions has taken place, but, in most cases, it comes back to the treasury. There is no consistent understanding of what a good practical-based policy is, and the tendency around reconstruction is that it is unique every time, meaning that the mistakes seem to repeat themselves. There is no benefit being accrued from the innovation that is taking place.

Overall, we need a bit of give and take between the public and the private sector. You want to know as insurers if you will have a space at the 2015 HFA conference. We would like a substantial commitment to the post-2015 discussions and for you to be part of the public discussions. We would like to ask for ideas on how insurers can keep the profile of the conversation high, through events, discussions, op-eds, etc. This is a core issue and we need to make the linkages to sustainability and resilience.

DISASTER MANAGEMENT OF JAPAN: VIEWPOINTS TOWARDS POST-2015 HYOGO FRAMEWORK FOR ACTION (HFA2)

Soichi Nakajima

Director for International Cooperation, Disaster Management Bureau, Cabinet Office, Government of Japan.

Anti-tsunami lock gate in Numazu city on Shizuoka on 12 May 2014. Numazu city is threatened by the possibility of large tsunami caused by a Tokai earthquake.

Japan faces a wide range of natural catastrophes, from earthquakes and tsunamis to typhoons. It is located in an earthquake zone where seismic activities constantly occur. In fact, Japan represents only 0.25 per cent of total land mass in the world, but has almost 20 per cent of the world's earthquakes. From 1945 to 1950 there were a series of big disasters where more than 8,000 people lost their lives. Japanese economic development started in about 1955 and was supported by the disaster management framework introduced by the enactment of the Disaster Countermeasures Basic Act in 1961. Following the 1995 Kobe earthquake and the 2011 Tohoku events, there have been substantial amendments of the Basic Act. In effect, based on lessons learned from each disaster, there has been a constant strengthening of the Japanese system.

The Basic Act clarifies the roles and responsibilities between local and national authorities, public entities and residents through all stages of a disaster, from prevention and mitigation through to disaster response and recovery and rehabilitation. This Basic Act introduced several essential mechanisms in Japan. At its core is the Central Disaster Management Council. This council decides policy on disaster management and is chaired by the prime minister. Ministers from all related ministries are included, as well as the chiefs of key public operations including the Bank of Japan, power companies, national media and academic experts, to name a few.

A second mechanism is the disaster management planning system. This mechanism is driven by a national plan drawn up by the Central Disaster Management Council. Each government ministry and each prefecture and municipality create their own operational plans that are based on the higher-level plan. Through this planning system, important policies are driven down to the lower level, whilst feedback is driven up to the higher level.

The promotion of self-help in the wake of a disaster has been a particularly effective mechanism in reducing disaster impacts. The ratio of deaths from disasters in a district has been reduced from 18.3 per cent to just 6 per cent partly due to story-telling and passing the lessons learned from disasters on to the next generation.

Bundling all these mechanisms together, the Basic Act has enhanced local disaster prevention capacity and the lessons learned.

Japan welcomes the opportunity to take part in international cooperation efforts on disaster risk reduction. It hosted the first and second United Nations' world conferences on disaster risk reduction and will host the third conference as well, which will take place here in Sendai on 14–18 March 2015.

OVERVIEW OF THE 2011 TOHOKU EARTHQUAKE AND TSUNAMI

Fumihiko Imamura

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Giant earthquakes (magnitude 8+) have taken place around the Pacific "Ring of Fire" throughout the 20th century and, although there appears to be a peak in the middle of the century, there is no sense of a regular cycle or any degree of predictability about their occurrence.

In terms of historical data, there are reliable earthquake records in Japan that go back as far as 1611, and before that, there is sporadic evidence from historical documents and literature. In the last 400 years, there have been only a few earthquakes in Fukushima.

GPS tracking of ground movement was installed by the Japanese government in 1995 after the Kobe earthquake. It shows that because of tectonic plate subduction, Japan is heading east to west at a rate of several centimetres per year. This means that, over time, energy builds up that, if released suddenly, will create an earthquake. The more recent advent of seismic monitoring in the sea provides a third dimension that enables us to understand very clearly exactly where an earthquake has taken place.

Using this lengthy data-set, the Japanese government has relied on historical data to project the potential height of tsunamis, but the Tohoku earthquake exceeded all previous records in some areas by as much as five-fold. Hazard maps also did not account for the scope of this tsunami. Therefore, a collaboration with geologists as well as historians is under way to help us better understand the historical record and tsunami risk.

The Tohoku earthquake actually contained four separate earthquakes, one of magnitude 9— the largest in Japanese history—which triggered a further three aftershocks of between magnitude 7.3 and 7.5. In some areas, the ground moved as much as six metres from west to east as a result of the slip.

Approximately half of the energy went into the Pacific Ocean, becoming a tsunami heading towards Hawaii and Chile. Nearly 20,000 lives were lost in Japan, but only two people died as a result of the tsunami that reached other countries in the Pacific up to 23 hours later. The total cost of the earthquake and tsunami to Japan was approximately US$300bn, equivalent to 30 per cent of Japan's annual budget. Approximately 200,000 cars were moved by the tsunami, including electric cars which short-circuited and created fires, highlighting the emergence of new risks as our society develops. Damage was caused not just by the water, but also by floating debris from ships, houses and trucks. The movement of the water caused a huge amount of erosion but also deposited vast amounts of sediment, both of which are damaging.

Whilst at sea, the rising water does not create much of an impact; when it reaches the coast, however, it carries an enormous amount of kinetic energy.

Four hundred years ago, it was declared that pine trees and a green belt would be planted along the coast that would serve to reduce the impact of a tsunami and, behind the trees and green belt, a canal was built to capture water. Between the coast and the canal, only farms were built, meaning that the land was not built-up. The canal was designed to reduce energy and disperse some of the tsunami waters significantly, as well as help to delay the arrival of the tsunami. The way that this system performed during the 2011 tsunami has helped us understand how to create better protection mechanisms.

Therefore, Sendai is considering refashioning its coastal area. Plans would include a raised seawall that would block an average tsunami and an elevated coastal road which would protect against the very largest water heights. Zoning restrictions on where residences can be built would also help to reduce fatalities.

The Great East Japan Earthquake in Iwate

THE STATE OF STOCHASTIC TSUNAMI HAZARD ASSESSMENT

Yo Fukutani

Research Associate, International Research Institute of Disaster Science, IRIDeS, Tohoku University.

The hazard map area and the areas actually affected by the tsunami in 2011 are fundamentally different. The hazard map shows the potential hazard area for a 40 to 100-year event. It is just a deterministic map for one earthquake scenario.

We need a stochastic tsunami hazard map including information for uncertainty based on stochastic tsunami hazard evaluations. In order to develop such a map, we have to analyse stochastic wave heights and combine them with a numerical simulation of the uncertainties of tsunamis.

In the field of engineering, there are two, generally known types of uncertainty: epistemic and aleatory. Epistemic uncertainty arises from a lack of knowledge or data and can be captured by logic trees with alternative models. Aleatory uncertainty is the unexplained difference between a model prediction and observed data—it can only be estimated by validation exercises, which in these circumstances are derived from a comparison of predicted and observed tsunami wave heights.

The International Research Institute of Disaster Science at Tohoku University studied the stochastic tsunami height based on the knowledge of the Tohoku tsunami. Valuable lessons learned from the 11 March 2011 earthquake were included in that assessment:

1. The dislocation distribution published by Ishii *et al.* (2013)[2] was used.
2. Validation exercises in which the predicted and observed tsunami wave heights were used.
3. Uncertainty due to the dynamic fault rupture effect of the huge fault was evaluated.

This was also combined with an evaluation of numerous fault models using the correlated random source parameter (CSRP) model (a kinematic fault model proposed by Liu *et al.*, 2006[3]) to provide the slip variability of the fault. The analysis showed that wave height in the Tohoku tsunami corresponded to a range of return period from 450 to 12,000 years. The results of the research provided a visualisation of the regional differences of uncertainty that are useful for risk hazard communication.

There is scope for future work in this area, not least to examine the uncertainties created by tide variations, including the effects of sea level rise caused by climate change and the development of stochastic hazard maps.

2 Ishii, Y., Dan, K., Miyakoshi, J., Takahashi, H., Mori, M. and Fukuwa, N. (2013). *Source modeling of hypothetical Nankai Trough, Japan, earthquake and strong ground motion prediction using the empirical Green's functions*. Shimizu Corporation Research Report 90:17–26 [in Japanese].

3 Liu, P., Archuleta R.J. and Hartell, S.H. (2006). Prediction of broadband ground-motion time histories: hybrid low/high-frequency method with correlated random source parameters, *Bulletin of the Seismological Society of America* 96 (6): 2118–2130.

Yoshi Abe

Research Associate, International Research Institute of Disaster Science, Tohoku University.

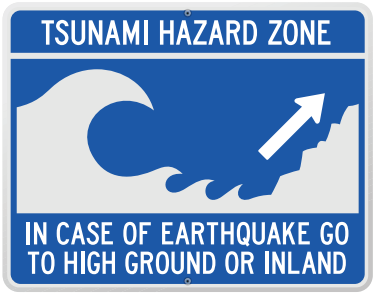
Disaster evacuation area sign board in Tokyo in residential area, 2012

The population affected by the 2011 tsunami's inundation area was approximately 600,000 people, of which around 96 per cent were able to evacuate. Over 60 per cent of the people killed or missing were over 60 years old. The reason for this is that they were not able to evacuate far from where they were. A more careful analysis of the underlying factors that led to this outcome are that, firstly, not all evacuation sites were necessarily located near residents; secondly, the tsunami was much greater than the hazard level depicted in the hazard maps that guided evacuation procedures; and, finally, some evacuation action by those affected was delayed because people did not notice the tsunami information or the tsunami itself. Furthermore, the warnings issued by the Japan Meteorological Agency initially underestimated the height of the tsunami, which gave people a false sense of security, and the estimates were only subsequently revised upward repeatedly over the next hour.

The warning process

Tsunami warnings are issued via a series of different channels, namely through signs and spoken communication including TV, radio and cell phones, and sirens. When local governments issue a tsunami warning, they issue an evacuation order to residents, but there were many residents who did not evacuate immediately, because they did not believe that a tsunami would either come or could happen. Of those who did evacuate, approximately 50 per cent took their cue from the fact that the earthquake had taken place, while only about 16 per cent took their signal to evacuate from television or radio. Of those that took their cue to evacuate from the behaviour of other people, 23 per cent were female, while only 13.9 per cent were male.

Since the disaster, local governments and residents in coastal areas have been working on evacuation training to speed up evacuation procedures and make them more efficient. During the evacuation on 11 March 2011, 43 per cent of residents evacuated on foot while 54 per cent left the area by car. The sudden increase in traffic caused significant traffic jams, and plans have now been put in place to ease traffic congestion in the event of an evacuation.



REVIEW OF THE INSURANCE INDUSTRY RESPONSES

Masaaki Nagamura

General Manager, Corporate Social Responsibility, Corporate Planning Department, Tokio Marine & Nichido Fire Insurance Co. Ltd.

There is value in analysing the role of the Japanese insurance industry in the wake of the March 2011 events in Sendai in order that lessons learned can be shared elsewhere in the world. Looking at what can be effective and what remains to be done will help design pre-funded risk-sharing and risk management systems in other high-risk areas around the globe that will make best use of public–private collaboration.

The homeowners' earthquake reinsurance system

The economic damage of the Sendai earthquake was approximately US$170bn. The insured loss is estimated at US$35.7bn, second only in world history to Hurricane Katrina. You might wonder how many insurers went bust in the wake of the disaster, but the answer is zero. This has a lot to do with the homeowners' earthquake insurance system which is in place and which played a critical role in the post-disaster recovery effort, while keeping insurers financially sound. The insured losses under the programme alone amounted to approximately US$12bn and provided benefits to more than 780,000 households. Insurance penetration at the time was 23.7 per cent in Japan and 33.6 per cent in the hardest-hit Miyagi prefecture. More than 90 per cent of reported claims were settled within 90 days of occurrence, and it is very likely that the insurance payments reached the recipients quicker than any other form of financial relief.

It was the Niigata earthquake in 1964 that prompted the government to create this public–private partnership to contain economic loss arising out of large scale earthquakes. This led to the Earthquake Insurance Act of 1966 that aimed to contribute to the stabilisation of the lives of the affected people. Instead of pursuing indemnity type coverage, it was designed to offer immediate financial relief to the victims of the disaster.

The system structure

The programme offers protection of household and home contents against earthquake, tsunami and volcanic eruption damage. It is offered as a rider to standard homeowner policies, and the distribution method reduces adverse selection and solicitation costs. It offers between 30–50 per cent of the insured property value with property capped at US$500,000 and contents limited to $100,000. The premium rates for the policies are based on a "no loss and no profit" principle, a measure governed by the General Insurance Rating Organisation of Japan (GIRO). The premiums are pooled and the pool is managed by the Japan Earthquake Reinsurance Co., Ltd (JER).

There are a number of contributing factors that have meant that the programme could make quick payments:

Firstly, the funding mechanism and the approximate payment procedure mean that cash flow can take place quickly. Each private insurer cedes 100 per cent of the written risk to JER. The risk is pooled and redistributed by way of retrocession, with JER retaining a portion of the risk and retroceding some of that risk to the primary insurer and the other portion to the government. The JER is mandated to manage the risk reserve of each primary carrier in addition to managing its own fund. This facilitates a transparent process in the case of a loss, and protects the insurer's bottom line at the same time. The government also keeps a fund under a special account which is put aside from the ordinary fiscal budget.

If a quake occurs and looks likely to affect the government reinsurance layer, GIRO is called in to estimate the loss. Based on that independent judgement, the JER requests approximate payment from the government and, with discrete funding in place, there is no fear of a liquidity crunch at the time of a large quake.

Secondly, the programme's simplicity is an advantage. The system has a unique procedure whereby losses are categorised into three different segments: total loss, half loss and partial loss, meaning the amount payable is 100 per cent, 50 per cent and 5 per cent respectively of the insured property value for each of these categories. Furthermore, the widespread and numerous claims that are all triggered at once mean that an enormous administrative and manpower strain is put on an insurer. An indemnity-type programme in this instance would be impossible.

Thirdly, industry-wide cooperation and communication have played an important role. Lessons learned from the Kobe earthquake were effective in the wake of the March 2011 disaster. The ability to designate total loss areas meant that there was no need to inspect individual properties, which speeded up the process. Furthermore, a streamlined claim assessment standard adopted by the industry led to quick and fair adjustment and settlement of claims.

Finally, insurers were able to mobilise their manpower quickly and effectively. Immediately after the quake Tokio Marine had an emergency task force meeting that decided on four key actions:

- confirm the safety of employees and agents;
- complete the claim appraisal process in two months;
- dispatch manpower and relief supplies;
- set up back-up claim offices.

Lessons learned

In total, Tokio Marine alone mobilised around 9,000 people in response to the disaster and, in retrospect, the contingency plan in place worked.

However, some areas of concern still exist with the system that was in place. The private sector reserve was significantly diminished and a second impact could have had more serious repercussions. Therefore, the private sector contribution in the homeowners' system has been reduced and the point at which the government becomes attached has been lowered to support the private sector in the event of consecutive policy triggers. To respond to the concern, there is a discussion to introduce a sliding scale mechanism that automatically adjusts the risk sharing between the two sectors based on pre-determined logic.

Also, a significant gap exists between the half-loss category of payment and the partial loss (5 per cent) level of payment, and the question stands as to whether another layer between 50 per cent and 5 per cent should exist. This may respond to customer needs, but it does require extra reserves and further administrative costs which will inflate the cost of the system and therefore increase pricing.

Overall, it is clear, therefore, that this is a good time for the insurance industry to stand up and show the public that it provides a major societal good as a provider of risk management solutions.

Disaster recovery in the aftermath of the 2011 Tohoku earthquake and tsunami

IMPLICATIONS OF 11 MARCH: ASSESSING THE EARTHQUAKE AND TSUNAMI RISK IN OTHER REGIONS OF THE WORLD

Robert Muir-Wood

Chief Research Officer, Risk Management Solutions.

The recurrence of the 2011 M_w9 Tohoku earthquake and tsunami in northeast Japan is unlikely for a very long time. Therefore, the lessons learned from the event should principally be applied elsewhere in the world.

First, it is worth looking at why the 11 March earthquake and subsequent tsunami was a surprise. There are three key reasons:

1. All the previous work on the regional earthquake hazard had tended to concentrate too much on what has happened in the last 200 years only. The return period for this magnitude of earthquake is far longer, however—it took more than 1,000 years for the extreme stresses necessary for this magnitude of energy release to build up.
2. The accepted scientific theory was that magnitude 9 earthquakes do not occur on old ocean crust subduction zones.[4] The example of the scientific theory being wrong is an important cautionary tale about the risks of setting too much store in such theories.
3. There was accumulating evidence that there had been a large earthquake and tsunami on this coastline almost 1,200 years ago. Historical records point towards a large earthquake and tsunami in the region in A.D. 869 and, in 2001, archaeological investigations had identified tsunami sand deposits up to 4km inland. Indeed, three sets of tsunami deposits were found dating back over the last 3,000 years. In 2001, the earthquake in A.D. 869 was considered to have been around magnitude 8.1 to 8.3. By 2007, after the finding of tsunami sand at a series of inlets along the coast, this was increased to as high as magnitude 9. This evidence of these previous extreme events was cited in the discussions about the relicensing of the Fukushima Daiichi nuclear power plant, but was ultimately dismissed.

Due to the sheer scale and impact of giant earthquakes (magnitude 8.7+), they tend to feature in the historical record, wherever they occur around the world, at least over the last 300 years. This permits us to understand their frequency and impact. Since 1800, there is some suggestion that earthquakes on this scale tend to be temporally clustered, but the evidence does not yet quite reach the threshold of being statistically significant. However, in the very active 18th century, there is no suggestion of clustering.

The oldest reported giant earthquake is from A.D. 365 in the Eastern Mediterranean which sent a tsunami to inundate the port city of Alexandria, now part of Egypt. People at the time thought that the earthquake and tsunami had affected "the whole world"—or at least the world of most of the Roman Empire from the Middle East to Sicily.

4 See Ruff, L. and Kanamori, H. (1980) Seismicity and Subduction. *Physics of the Earth and Planetary Interiors 23*(3): 240–252.

Looking at where the risks of similar giant earthquake disasters are possible today—Lima in Peru, Viña del Mar in Chile, Acapulco in Mexico and Kaohsiung in Taiwan—are all high-rise coastal cities that are on major subduction zones and are therefore at risk from earthquakes of this magnitude. Interestingly, the city of Tokyo cannot experience a direct hit from a magnitude 9 earthquake because the subduction zone is so crumpled and fragmented around that region that there is insufficient available fault area to generate an earthquake of this size.

As previously mentioned, giant earthquakes are rare with return periods in any one subduction of between about 300 and 1,000+ years. This means there are a series of major cities located in the vicinity of such subduction zones that have no knowledge they could be in the front line of such disasters: for example, Acapulco in Mexico, the Ryukyu Southern Japanese Islands, the west coast of Luzon and Manila in the Philippines; New Zealand; or the southern shore of Java/Bali, which would also affect the northern coast of Australia; the Himalayan front, which is 600–800km in length and could therefore be catastrophic in terms of loss of life; the Hellenic arc in southern Greece and the west coast of the lesser Antilles islands in the Caribbean.

There are two key perspectives that one can take away from this situation:

1. From a humanitarian perspective there is a huge challenge of increasing awareness in all these regions in terms of promoting safety and good practices, in particular around the threat from tsunamis. Japan has much to teach the rest of the world on the necessary public education around the response to a giant earthquake and evacuating ahead of the ensuing tsunami. For example, signage and education packages are needed in at-risk coastal areas around the world. However, many places choose to "bury their heads in the sand" preferring not to consider the risk. In the Caribbean, for example, signage might discourage the economically vital tourist industry.
2. People in Japan who work in this area are genuinely world leaders on education, and their best practices and knowledge should be shared and adopted around the world, especially in these high risk coastlines.

From a reinsurance perspective, magnitude 8.7 earthquakes and their subsequent tsunamis can create some of the largest and most regional of all losses. Beyond the regional shaking damage from the earthquake itself, tsunami impacts can extend over huge distances—potentially thousands of kilometres away from the event itself.

Overall, for all considerations of humanitarian action and economic impacts, these very high impact but low frequency events should not be ignored.

LESSONS LEARNED FROM TOHOKU: TO HELP ENHANCE NATCAT UNDERWRITING CAPABILITY

Atsuhiro Dodo

Head Property Treaty Underwriting Japan, Director Property & Specialty, Swiss Reinsurance Company Ltd.

Natural catastrophe underwriting in Japan has been developed and strengthened following each of the events that has taken place over the past five decades. Each event has provided more information on the hazards present, and helped improve the claims experience and refine the design of the products on offer. Overall, this has served to strengthen underwriting and increase model-driven understanding.

The Tohoku earthquake, the first event that has taken place since the development of stochastic catastrophe models, provided some very valuable lessons learned. The event could therefore be tested by these new tools and, interestingly, it was found that the models prove to be broadly accurate in assessing the scope of the event. Historically, there had been a great deal of reliance on one view of how earthquakes propagate in segments, which created a bias and an assumption that the maximum magnitude of an event in the region was M8.2. This fault-segment approach was proven wrong by the Tohoku event, which showed that what were previously considered to be five independent segments actually all acted together creating one huge event.

The effect of secondary events was also underestimated—the tsunami was the key driver of loss in this event—and this highlighted the need to have a clear understanding of exposure. The exposures presented by the largest accounts such as power plants and semiconductor facilities need to be well understood, as these constitute the bulk of the subsequent claims.

It is also important to build uncertainty into the model, because the same event may create different ground motions on different occasions. But proper underwriting requires more than a model; it requires a good understanding of the model's limitations, the treatment of uncertainty, and one should always challenge commonly agreed perceptions and assumptions.

This is very important as far as high-growth regions are concerned, and much of the Asian high-growth region's policies are written out of Japan. NatCat underwriting in high-growth markets is at an early stage of development in terms of scientific hazard understanding, organisational set-up and policy terms. This means that there are good opportunities as far as understanding the risks is concerned and providing products that enable more risk sharing.

Swiss Re has therefore implemented a new approach which is a reflection of the lessons learned and the advancement of science and computational power. Our focus has been on the treatment of uncertainty and unknowns.

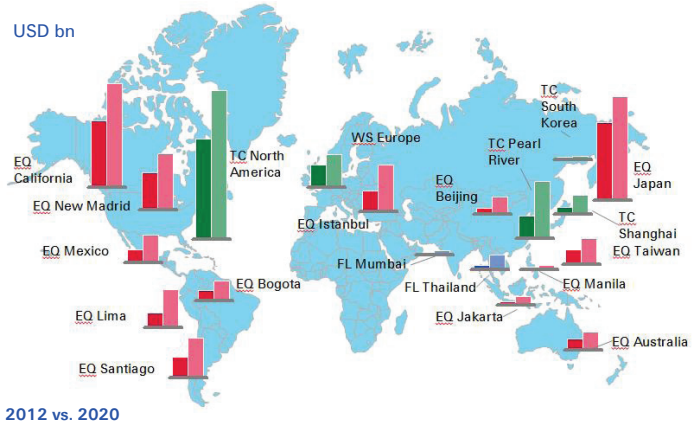
Looking to the future, there will be an increase in exposed economic values, whilst the growing middle class in high-growth markets will increase levels of insurance penetration. Governments will look to the private sector to take on more risks as the market becomes more sophisticated.

In order to enhance NatCat underwriting capability, in essence, what is needed is a robust system for the identification and evaluation of the risk and a systematic approach to the selection and transfer of risks that reduces protection gaps whilst promoting an adequate level of exposure transparency. Finally a broader and deeper dialogue with stakeholders must be developed that enables the sharing of knowledge and best practices, and helps to identify emerging risks that could impact our future.

Demand for Nat Cat Capacity Will Continue to Increase

Swiss Re

Increase in Largest Industry Loss Scenarios per Region ...



... is Driven by

- Growth in Exposed Economic Values
- Growing Middle Class in High Growth Markets, Leading to Higher Insurance Penetration
- Governments Moving Nat Cat Risks into the Private Sector
- Possible Increase in Demand through Major Nat Cat Events or New Regulation

Time Framework: Demand for Nat Cat Insurance Expected to Increase by 2020 on Average by Approx 50% in Mature Markets and 100% in HGM.

Source: Swiss Re sigma

WARMING OF THE OCEANS AND IMPLICATIONS FOR THE INSURANCE INDUSTRY

Falk Niehörster,

Senior Program Manager, RMS-Risk Management Solutions, Inc.

Falk Niehörster introduces the Geneva Association's report Warming of the Oceans and Implications for the (Re)insurance Industry[5] *for which he was the lead author.*

There is now evidence that, over recent decades, the climate has changed and we have already reached a "new normal" for a number of climate- and weather-based (extreme) indices. Even former "sceptics" of climate change have started to admit that global warming is detectable and that it is most likely attributable to human emissions of greenhouse gases.[6] In fact, this is true not only for the land surface of our planet, but also for the global ocean.

Ocean warming is a topic of growing concern, as it indicates a long-term (on the order of centuries) change of our climate, even if anthropogenic greenhouse gas emissions stopped entirely tomorrow.

The global oceans and their currents are of fundamental importance for the storage and distribution of solar energy absorbed by the climate system. Energy is exchanged between the atmosphere and ocean mainly via radiative exchange and the transport of latent heat from evaporation and condensation. By transporting vast amounts of energy and being the main source of water to the atmosphere, the oceans determine weather patterns and provide the energy needed for the development of extreme events. Understanding the changes of ocean dynamics and the complex interactions between the ocean and the atmosphere is the key to understanding current changes in the distribution, frequency and intensity of global extreme events relevant to the insurance industry, such as tropical cyclones, flash floods or extra-tropical winter storms.

Recently, improved observational records and the increased length of reliable time series provided new evidence of the degree of global ocean warming and the distribution of energy within the ocean. A positive temperature trend in the ocean is now detectable and has already changed selected but relevant metrics for extreme events away from what we have observed in the past.

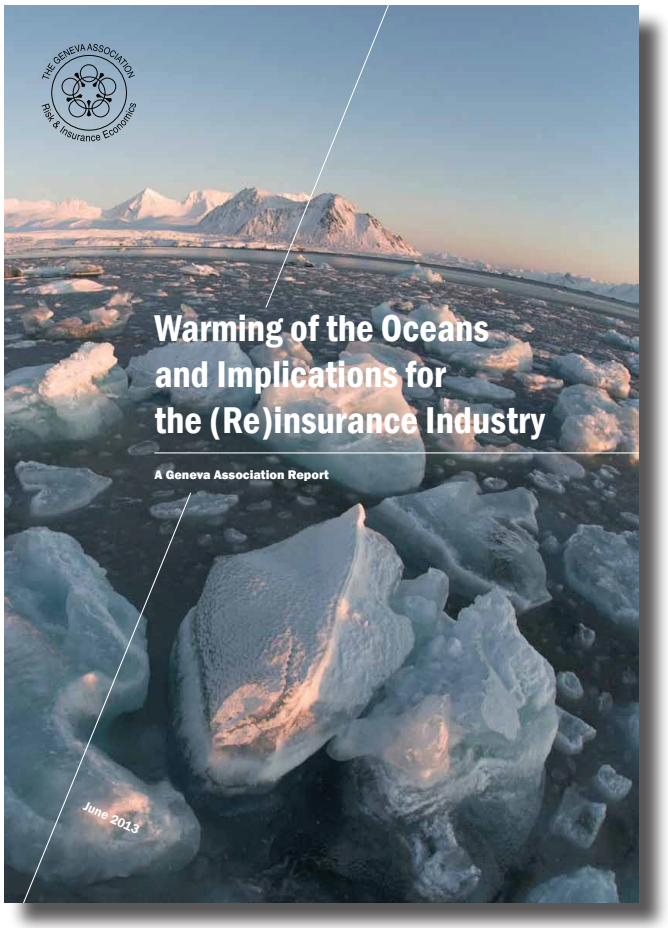
The implications of ocean warming for insurance-relevant extreme events include the need to reassess the way we quantify and manage today's catastrophe risk; specifically, after moving away from historical averages, the need to define a "new normal" which is itself highly uncertain.

Historical data-driven (or climatological) approaches to estimate the background risk of different events will fail in a non-stationary environment, as they do not adequately incorporate recent changes. Even if some of the changes might not

5 The Geneva Association (2013).

6 http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html

be significant yet, risk estimation has to include the consequences of what the current physical understanding can tell us about the implied changes of the observed ocean warming. New methods in risk estimation, such as scenario-based approaches and tail-risk modelling, are becoming an even more important and essential part of the insurance business with a variety of different applications, for example, capital requirement determination, pricing and/or risk mitigation.



To download the report, click here.

TROPICAL CYCLONE GENESIS IN THE NORTHERN PACIFIC OCEAN

Harutoshi Tagaya

Managing Director, Tokio Marine Research Institute, Tokio Marine Global, Ltd.

Global warming and future climate change

While the global mean temperature anomaly in 100 years has risen by 0.68° C, the mean temperature anomaly in Japan has risen by 1.15°C, much higher than the global average. The sea surface temperature is also rising.

In 2012, the Intergovernmental Panel on Climate Change (IPCC) published a special report stating that the frequency of an extreme event such as heavy rain, which occurs once every 20 years, may occur once every 10 years, 50 years from now, and once every 7 years, 80 years from now.

Typhoon risk in Japan

A typhoon is a tropical cyclone that develops in the Northwest Pacific basin.

Tropical cyclones are classified by maximum wind speed. Under the classification of the Japan Meteorological Agency, a storm whose maximum wind speed exceeds 17.2m/s , is called a typhoon.

Although the Great East Japan Earthquake was the worst by far, 8 out of 10 of the worst natural catastrophic insurance losses in Japan have been caused by typhoons. Therefore, predicting typhoon development is a material issue for the Japanese insurance industry. But, there is no clear pattern or trend, and it is quite difficult to predict the genesis and the landfall of a typhoon.

Prediction of future typhoon risk using climate models

Global warming may likely shift expected losses to increasing levels of loss. As the mission of the Tokio Marine Research Institute (TMRI) is to investigate future material changes of the environment and/or risk, the management has chosen to study future typhoon risk.

Three phases of research have been undertaken:

- Phase 1 (2008–2009) developed a Monte Carlo simulation model to forecast insurance loss due to future typhoons in around 2100;
- Phase 2 (2010–2011) improved the model as well as forecasting insurance loss in the near future somewhere around 2035. In this phase we added a study of seasonal forecast;
- Phase 3 (2012–2014) refined the Phase 2 project and extended the study to develop a water damage and flood risk model in the future environment.

For its investigations, the Tokio Marine Global has undertaken joint research with academia, in particular, the Atmosphere and Ocean Research Institute of the

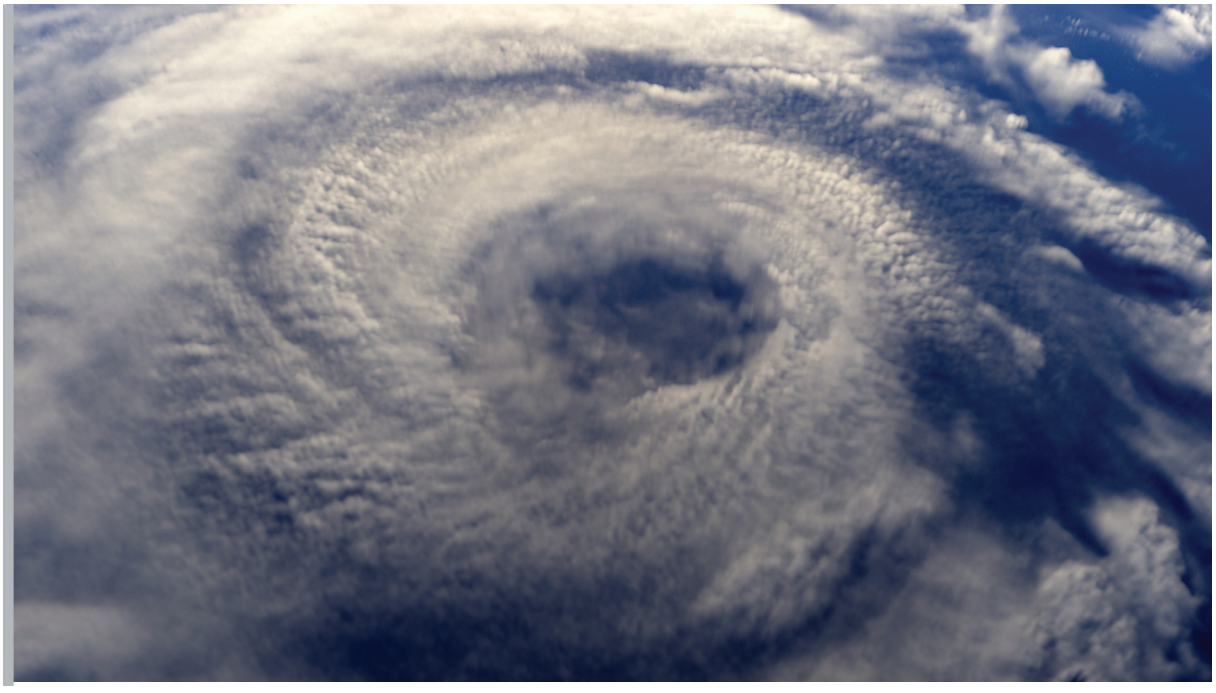
University of Tokyo, which takes a macro approach to studying the environmental factors that support typhoon genesis, and further research with the Hydrospheric Atmospheric Research Center of Nagoya University, which is taking a micro approach that will enable high resolutions to a local area.

The results of research show:

- Typhoon track frequencies in the southeast side of Japan are likely to increase, while those in China and Southeast Asia are likely to decrease due to typhoon genesis location change.
- Averaged central pressures of future typhoons are likely to drop 3 to 5hPa in the mid-Northwest Pacific.

Roles of the insurance industry

Besides providing insurance products, the insurance industry has the know-how and skills in the field of loss control and mitigation to build a more risk-resilient society against natural hazards. Tokio Marine Group provides an advice to businesses as well as education to society. As part of this community engagement, Tokio Marine Group participates in a voluntary programme visiting 36 primary schools across the nation to build awareness about disaster prevention.

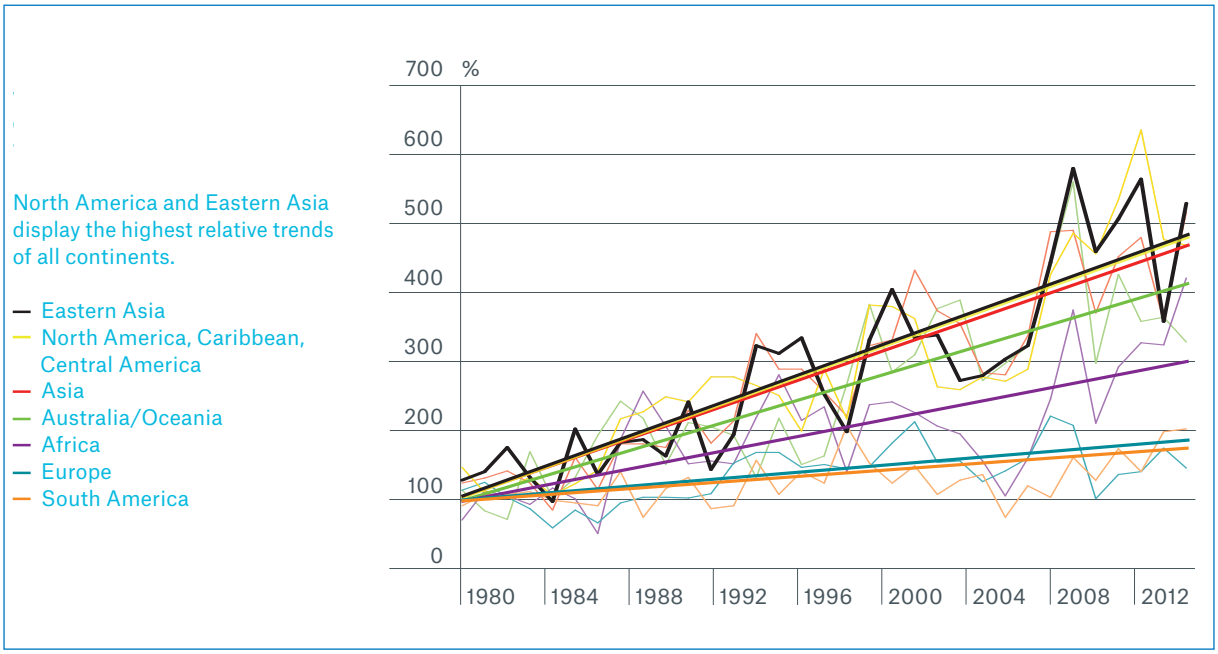


EXTREME WEATHER HAZARDS AND RISKS IN EASTERN ASIA

Peter Höppe
Head Geo Risks Research/Corporate Climate Centre, Munich Re.

Munich Re has been gathering data on extreme weather events in eastern Asia since the 1970s. East Asia is the continent with the largest increase in weather-related extreme events (Figure 1). Some 30 per cent of all global events have occurred in Asia since 1980 accounting for 41 per cent of all fatalities and 31 per cent of overall economic losses but only 9 per cent of the insured losses. Since 1980 in Asia, only 9 per cent of the losses caused by extreme events were insured, whereas in North America the ratio is 46 per cent. Overall economic losses in the region since the 1980s are US$700bn, with 64 per cent occurring in China and 16 per cent in Japan. However, if you look at the insured losses, because of the high penetration of insurance, the situation is reversed: 62 per cent of insured losses are in Japan and 11 per cent in China. At 45 per cent, nearly half of these events in these eastern Asian countries have been flood events, followed by storm events totalling 39 per cent, and 16 per cent for other weather-related events like wild fires, heatwaves or droughts.

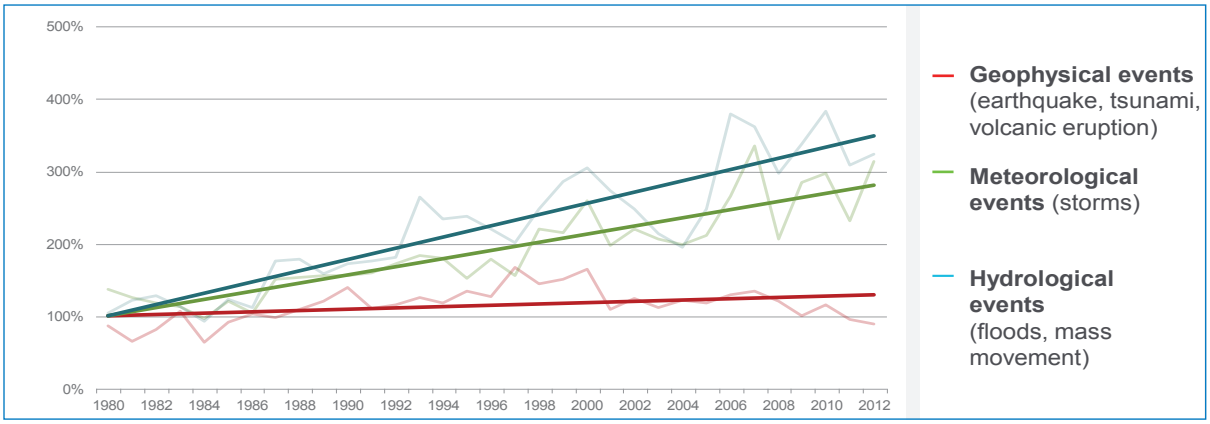
FIGURE 1: UPWARD TRENDS IN WEATHER-RELATED LOSS EVENTS PER CONTINENT AND IN EASTERN ASIA, 1980-2012



Source: Munich Re NatCat Service

Comparing the separate trends of storm and flood loss events globally to those of geophysical events, a pattern emerges: most of the trends come from atmospheric events (Figure 2). This suggests that, most probably, changes in the atmosphere are the drivers of natural catastrophe losses. In Asia, there also has been a significant increase of earthquakes, tsunami and volcanic loss events that is similar to storm (meteorological) events. An explanation for this is that the largest population growth has taken place on this continent, and people have settled more and more in risky areas. There is not as strong an increase in storm events in eastern Asia as in the rest of the world, and researchers think they have found a specific pattern there showing an inactive phase of typhoons during the last 15 years which is masking potential increases in storm events. However, there has been a drastic increase in flood-related events (more than 800 per cent), the major change in this continent.

FIGURE 2: NATURAL CATASTROPHES WORLDWIDE 1980-2012—NUMBER OF LOSS EVENTS OF DIFFERENT PERILS WITH RELATIVE TREND



Source: Munich Re NatCat Service

The increasing water content of the atmosphere due to global warming is going to drive an increase in the number of convective storms in many regions. There are also some winter hazards which can cause a lot of damage and loss. The 2008 winter in China caused one of the largest insured loss events in Chinese history, with total economic losses of US$21bn and with US$1.2bn of insured losses. This was the result of a clash of warm and humid air from the south and south-west and cold polar air from the Arctic.

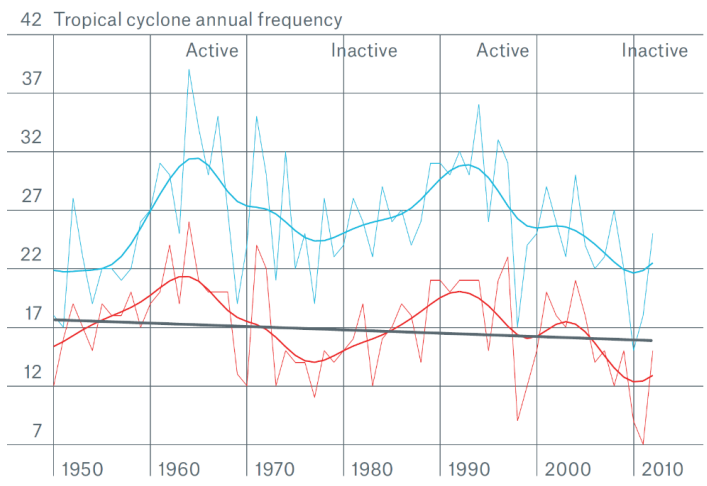
Inland floods are the most common hazard in eastern Asian countries, and they can cause major losses in large cities. Floods are the peril which can be prevented best, and a lot has been done to lower the damages and the losses, even though the hazard is increasing. That explains, at least partly, why in some countries loss trends do not show an increase.

Droughts and heatwaves are directly affected by global warming, and there is an increasing probability of seeing them in the future, which could especially affect agricultural insurance. Wildfires are only partly natural, as they have to be started somehow, and, in many cases, they are due to human activities. But preventive measures like early detection provisions can make a big difference.

In the long term, anthropogenic climate change is believed to become a significant loss driver. We must be careful to look at the different perils individually, however, because climate change is not driving every peril everywhere in the same way.

Typhoons are the most devastating events in eastern Asian countries, and the higher exposure caused by urban development on these coasts is increasing the concentration of destructible assets. It is quite likely that we will see a more active typhoon phase in the coming years, and 2013 could already have been the beginning of this new phase (Figure 3). In the long term, the steady rise of sea temperatures will intensify typhoons.

FIGURE 3: MULTI-DECADE VARIABILITY: TYPHOON ACTIVITY



Numbers of typhoons and tropical storms (TY, TS in blue) and just typhoons (TY in red) in the WNP Basin

The black line indicates the linear trend in typhoon frequency.

Source: Munich Re, 2013; data: JTWC

A recent study published in a scientific journal[7] shows that most of Asia already has seen a significant increase in specific humidity of the air. With more water vapour in the air, there is a higher potential for intense precipitation events and, due to the energy which is released once the water vapour condenses, this will increasingly fuel extreme events like thunderstorms and tropical storms. In the past 10 years, the sea level has been rising faster, and this is the best evidence that global warming has not come to a standstill. There is quite some evidence that more heat has been taken up by the oceans, which then results in a rising sea level as the warming water expands.

A U.S. study has shown that global warming already has led to more intense precipitation events in most of the northern hemisphere,[8] and another study shows that temperature records on a global level have occurred five times as often compared to what we would expect in a stable climate.

So how should the different stakeholders address these challenges? Insureds need to increase overall awareness of risks from nat cats and understand their risk management options. Prevention measures should be undertaken, supported by better building standards and more resilient buildings with, for example, valuable assets on the upper floors. Insurance cover can be provided at lower premiums when risks are well-protected.

From a government and regulatory standpoint, regulatory frameworks must be set where innovative insurance solutions can find a market and where the insurance sector can be sustainable and stable. Countries should have a risk master plan and a strategy for preventing, mitigating and financing risk. Governments should consider the development of a resilience rating that will standardise resilience levels to create specific levels of protection.

Primary insurers can meet the challenge through careful product design, creating special nat cat modules and sublimits with a dedicated pricing approach. Limitations and accumulation controls are needed and risk financing requires robust internal risk management frameworks.

For reinsurers it is increasingly necessary to drive the modelling of risks in line with the changing exposure patterns. Reinsurance capacity needs to be sustainable and reliable in the long term. Client support is certainly necessary with innovative products and tailor-made solutions and, if claims have to be paid, then, fast support and guidance should be provided.

7 Willett, K.M, Williams, C.N., Jr, Dunn, R.J.H., Thorne, P.W., Bell, S., de Podesta, M., Jones, P.D. and Parker, D.E. (2013). HadISDH: an updateable land surface specific humidity product for climate monitoring. *Climate Past 9*: 657–677.

8 Min, S.-K., Zhang, X., Zwiers, F.W. and Hegerl, G.C. (2011). Human contribution to more-intense precipitation extremes. *Nature 470*(7334): 378–381.

PACIFIC DISASTER RISK FINANCING PILOT PROGRAMME: INCREASING THE FINANCIAL RESILIENCE OF PACIFIC ISLAND STATES AGAINST NATURAL DISASTERS

Olivier Mahul
Program Manager, Disaster Risk Financing and Insurance Program, World Bank.

The World Bank's disaster risk management framework covers a range of activities: risk identification, risk reduction, financial protection, disaster preparedness and post-disaster reconstruction. When the dialogue starts on disaster risk management with developing countries, at some point there is an interest in talking about risk financing, and this is where the World Bank can help. It is a response to the needs of a developing country (from Mexico to small islands in the Pacific) rather than an agenda that is pushed.

The World Bank's Disaster Risk Financing and Insurance Program came of age with the establishment of the Turkish catastrophic insurance pool in 1999, and a second milestone in sovereign risk financing was the establishment of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). It has four pillars: sovereign disaster risk financing, property catastrophe risk insurance, agricultural insurance and disaster micro-insurance.

The World Bank provides advisory services to its clients, but it is not a broker nor a reinsurance company. To provide support, it sometimes offers World Bank products in the form of loans, but mostly it seeks to provide transparent and independent advisory services to a wide range of clients—currently about 70 countries. It also actively works on advocacy and knowledge management.

Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)

The World Bank has been working on PCRAFI for 6–7 years. The work started immediately after the establishment of the Caribbean Catastrophe Risk Insurance Facility (CCRIF) when the Pacific countries wanted to establish a similar initiative. The World Bank quickly realised that the major issue at that time in the region was a lack of information and therefore established the Pacific Risk Information System (PRIS). The major database has been used to establish disaster risk financing solutions and provided knowledge and understanding on fiscal risk exposure, the public financial management of disasters and small pilot projects.

The World Bank's four policy options for disaster risk financing in order are:

Assess risks—The assessment and quantification of disaster risks to understand potential budget impacts to support informed financial decision-making. Pacific island's economies are amongst the most affected by disasters in the world so this is very important.

Secure funding—Secure funding is needed to ensure effective financing sources are available for unavoidable disaster-related outlays.

Execute and monitor funding—Execute and monitor resources to ensure effective implementation of public funds directed to disaster response, recovery and reconstruction. Once the money is available from the Ministry of Finance, how can you secure that the funds are available to the sector or agencies? Very often, the problem is not finding the funds but executing the funds. When requests come to the Ministry of Finance, for many reasons, there are delays in responding and making these funds available to the local agencies. A very interesting counter-example is what happened in Japan where in that case the Ministry of Finance was quite responsive and infrastructures were rebuilt very quickly.

Finally, reducing financial risk—Reducing disaster losses and risks to the government budget and the wider economy. As a government, how can I make sure that my financial liability can be reduced? One way is to take care of my own public assets (floods are the most damaging for public assets). How can government quickly rebuild public assets (explicit contingent liability)? There is also a social contingent liability: if most of your population is not insured, in case of disaster, the population will expect the government to act. This *ad hoc* assistance has to be put in place and can have a major budgetary impact on governments. To promote the insurance of private assets, we reduce the contingent liability and we except high- and middle-income households to be insured; this will free some funds to genuinely help the low-income population (which was one of the main objectives of the Turkish pool).

So far there are five lessons learned:

- Lesson 1: Pacific catastrophe risk models are being accepted by international reinsurers.
- Lesson 2: International reinsurance markets are willing to underwrite (parametric) Pacific catastrophe risks at a competitive price.
- Lesson 3: Regional pooling mechanisms generate major premium savings for the participating Pacific island countries (PICs).
- Lesson 4: PICs are committed toward the sustainability of the Pacific catastrophe risk insurance programme but are dependent on donor support.
- Lesson 5: Further institutional capacity-building on disaster risk financing and insurance is essential.

STRUCTURING THE PUBLIC-PRIVATE EARTHQUAKE INSURANCE POOL IN THE PHILIPPINES

Madeleine Varkay

Principal Public Sector Development Specialist, Asian Development Bank.

Why is the Asian Developemnt Bank (ADB) proposing to structure the public–private earthquake insurance entity in the Philippines? In 2009, ADB management supported a comprehensive approach to disaster risk management focused on four areas:

- disaster loss adjustment;
- disaster risk management;
- disaster risk financing;
- the strengthening of risk governance across public and private institutions to reduce natural catastrophe vulnerability.

There has been a significant amount of data presented with respect to the vulnerability of the Philippines to a range of natural hazards, but the most significant economic threat is that resulting from earthquake. The National Capital Region (NCR) accounts for 36 per cent of the country's GDP; and this highly concentrated economic exposure requires the development of a risk offset solution that is both sustainable and commercially viable. The Philippine Institute of Volcanology and Seismology estimates that a 7.2 magnitude earthquake along the West Valley fault line, which runs through the heart of the NCR, would result in an estimated 30,000 deaths, the displacement of over 6 million people and 2.4 trillion Philippine pesos in damages (23 per cent of GDP).

The invitation for ADB to initiate the project came from the senior representatives of the Philippine Insurance and Reinsurance Association (PIRA) during the 2010 Asia Insurance Council meeting held in Manila. Subsequently, in 2011, PIRA requested ADB assistance in setting up an earthquake catastrophe insurance pool. The concept was supported by the Office of the Insurance Commissioner and the Department (Ministry) of Finance. ADB agreed to fund initial studies into the feasibility of the project and received official approval to move forward with the project concept. The first feasibility study considered three structural options:

- a public–private insurance pool with the local insurance market;
- a public–private reinsurance company to support the local insurance market;
- a public–private direct monoline insurance company to stand alongside the existing market.

These three approaches were considered to be viable commercial options to offset middle-class residential and small- and medium-sized enterprise (SME) property risk to the international reinsurance and alternative risk transfer (ART) market. The rationale to focus on the middle-income group is justified in terms of the unfunded costs of exposure: while the lower-income groups come under the protection of government emergency relief and the higher-income groups have

access to insurance cover, middle-income property is largely uninsured, thereby exposing the financial sector, specifically commercial bank mortgage portfolio, to the risk of systemic loss, and the government, to an unfunded contingent liability. The scope of the multiplier effect of middle-income property loss on the economy in terms of loss of overall productive assets, including the erosion of investment capital from remittances, requires a proactive approach to natural catastrophe risk management and financing.

Considering the scope of potential asset loss and the new guidelines by international rating agencies on the rating of insurance pools, in July 2013 the project's joint government and private sector working group unanimously approved the structuring of a public–private owned monoline direct insurance company, designated as the Earthquake Protection Insurance Company of the Philippines (EPIC). The project's international working group is chaired by the Insurance Commissioner of the Philippines, deputy chair, the Department of Finance, and is advised by the senior board members of PIRA, major international reinsurance companies, an international open-platform modelling firm and international actuaries.

International solvency rules and the new risk-based capital regulations soon to be introduced to guide the insurance sector of the Philippines adopt a holistic approach to enterprise risk management. Therefore, to ensure timely stakeholder consultation on analytical methodology, the project communicated each stage of data gathering and risk analysis supporting EPIC's business plan model.

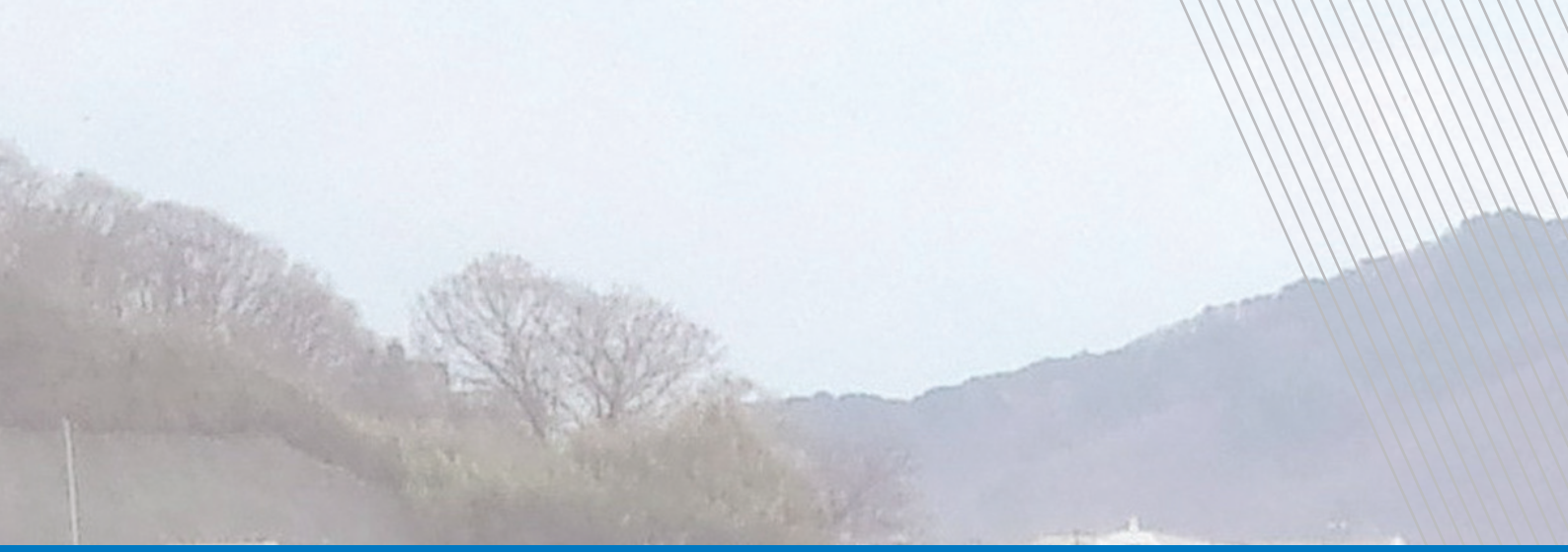
Considering the scale of the losses to be insured by EPIC, the project advisory team did the following:

- A property valuation survey of middle-class residential and SME property in major urbanised areas across the Philippines was launched. Recent construction trends have not been captured by local government unit statistics, thereby requiring an independent survey of property values. An international survey firm was hired to undertake valuations across 109 urban areas capturing 90 per cent of the population, and the results subsequently verified with the insurance market and major building companies.
- An open-source catastrophe modelling company was appointed to identify the estimated maximum losses based on this property survey.
- An international actuarial firm was engaged to work with the modeller to derive the initial risk-based premium and thereby assess the competitiveness of the new market rate. Once this was established, the firm began work on developing EPIC's business plan model, based on international capital adequacy ratio methodology. During stress test analysis, the business

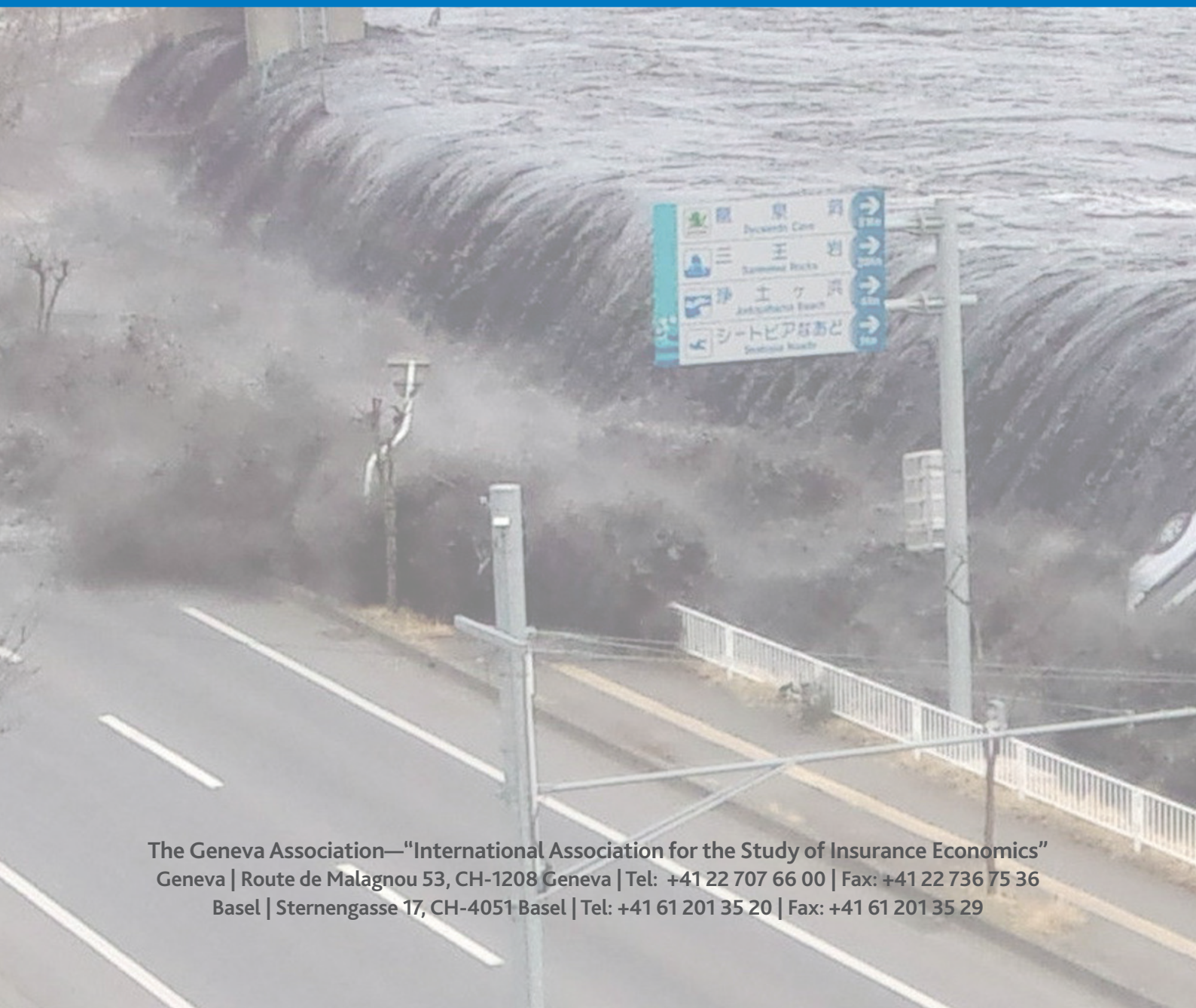
plan was submitted to a major loss/shock in year 3 of operation and, notwithstanding the loss, profit ratios indicated sustainability according to industry investment standards.

- Technical subcommittees were formed to facilitate regular coordination with representatives of key national stakeholders from the Insurance Commission, Department of Finance, the central bank (Bangko Sentral ng Pilipinas), PIRA and senior legislators. The legal, finance, technical and distribution subcommittees held monthly meetings to draft legislation on: (i) a mandatory earthquake insurance, (ii) the sources of investment capital, (iii) building codes, wording of insurance policy, rate adjustments in the market and claims management, (iv) distribution mechanisms.

Legislators have expressed support for EPIC and the mandatory legislation to expand market penetration of earthquake insurance. PIRA has circulated the draft business plan model of EPIC for extensive membership review and it is expected the Annual General Meeting will hold a vote on the incorporation of EPIC in March 2014.



On 28–29 October 2013 The Geneva Association hosted a seminar on disaster risk reduction in Sendai, Japan, a city devastated by the earthquake and ensuing tsunami in of March 2011. The meeting provided a forum for the discussion of the risk management lessons learned from that disaster and the implications for global disaster risk reduction measures elsewhere in the world. This document provides reviews and articles by many of the presenters from the conference and aims to provide a wider dissemination of the information exchanged.



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