

HOLBORN PERSPECTIVES

LOOKING CLOSER AT...

The March 11th Japan Earthquake and Tsunami

May 1, 2011

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Overview

Published estimates of insured and reinsured losses from the March 11th disaster do not include all insured coverages. Considering all lines, this is one of the largest insured losses, and a very substantial loss for reinsurers. Combined with the January earthquake in Christchurch, New Zealand, and continuing development on 2010 losses, some reinsurers will report losses for the full year 2011.

The loss began with an extremely powerful quake (magnitude 9.0) thirty miles off the coast of northern Japan. The tsunami that followed was over 25 feet high when crossing straight coastlines, much higher in constrained bays, and affected hundreds of miles of Japanese coastline with many towns and harbors, killing over 25,000 persons. The epicenter was 235 miles from Tokyo, which was largely spared, but only 80 miles from the city of Sendai (population 1,000,000) which sustained massive shake damage. There were many aftershocks with magnitudes between 7.0 and 7.5 and a surprising amount of soil liquefaction. The shake, tsunami and resulting fires damaged property over a wide area, most notably the reactors and spent fuel storage pools at the Fukushima power station, causing evacuations. Power outages and damage to roads, rail and other infrastructure have interrupted a wide variety of manufacturers and exporters. In late April, 200,000 remain homeless.

Insurance coverage issues will be complex. Earthquake and Tsunami coverage is different under Japanese residential forms, Japanese commercial forms, and forms used by international carriers for global exposures. The loss involves Property, Marine, Automobile, Life, Personal Accident and Travel coverages and others. Estimates for the event have a wider than usual degree of uncertainty. But in general, the ranges published by catastrophe modeling companies for industry losses and by individual insurers are higher than seen this early after other significant losses.

Reinsurers have better controls for managing their aggregate exposures to individual events than in prior disasters, and also stronger surplus levels. However, reinsurers have fewer resources after this event (both capital and retrocessional protections) than they did before. Another event later in the year would cause significant stress.

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Our analysis follows at the links shown below:

- Section A. Damage Reports
- Section B. Modeled Insured Losses
- Section C. Losses by Coverage
- Section D. Losses by Market Segment
- Section E. For More Information

A. Damage Reports

How big is a 9.0? – The Richter scale measures the size of earthquakes by comparing the strength of shaking at the earth’s surface. Each successive point on the scale represents peak shakes ten times more disruptive, so a 9.0 represents ground motion that is 100 times greater than in the 7.0 quake in Haiti in 2010. Because stronger earthquakes also cover a wider area, a 9.0 represents 1,000 times more destructive energy than a 7.0. The March 11th Japan quake was the strongest since the 2004 Indian Ocean earthquake and tsunami, and was one of the five strongest earthquakes in the previous hundred years. It is the strongest to ever occur near a major city in a developed country. Even without the tsunami, this would have been the largest ever non-U.S. insurance loss.

Economic loss estimates (and what they are intended to mean) – Economic Loss is intended to supplement insured loss figures by including direct property damages that are self-insured by governments or others, or that are not covered due to policy deductibles, limits or exclusions. It reflects clean-up costs, business disruptions, either as Business Interruption coverage on specific properties, or as reduced levels of overall economic activity. The catastrophe modeling firms estimate economic losses as a first step in their analysis of most events, and then assess insurance coverages to produce their forecasts of insured losses. For modeling purposes, business interruption would be considered more narrowly at specific structures, and will generally be lower than the figures government or banking sources would use. Current estimates of economic loss are higher than for any previous natural disaster.

Published Estimates of Economic Loss		
EQECAT	March 13 th	At least \$100 Bn
RMS	March 16 th	\$200 Bn to \$300 Bn
Worldbank	March 21 st	\$122 Bn to \$235 Bn
Govt. of Japan	April 19 th	\$198 Bn to \$309 Bn

Values exposed to shake and to tsunami – Holborn estimates that seven million persons lived in the area exposed to severe shaking, one million owner-occupied homes were damaged, and that the total exposed property values are approximately one trillion dollars. We estimate that the tsunami flooded well over one hundred miles of coastline, and ten square miles of settled areas with average property values of one billion dollars per square mile. Notable high-valued properties that were destroyed included the Sendai airport and many rail and port facilities.

Deaths and injuries – As of April 20th, there were 14,063 reported dead and 14,175 missing. Some of the missing were buried in mass graves and may be included on both lists.

Fire and other perils – Fires began after both the earthquake and the tsunami, with a major loss at Cosmo Oil's Chiba refinery near Tokyo. There were also losses due to dam failures, landslides, spoilage and survivors taking food and water from closed stores.

Radioactive contamination – This exposure appears to be excluded under all coverages and is not included in our estimates. It likely increases cost inflation on insured perils.

B. Modeled Insured Losses

The three modeling firms include different coverages in their estimates, and so they are not readily comparable. To draw conclusions, we have adjusted their estimates to a common basis, excluding Life, but including Marine and Auto lines. Because they are not consistently included and difficult to model, this comparison also separated any estimates the modelers included for Contingent Business Interruption (CBI) and on-shore Marine Cargo.

EQECAT's March 16th estimate of \$12 billion to \$25 billion excludes CBI and LAE, although in their description it is not clear whether they considered the Commercial or the non-coastal parts of Marine exposures on the tsunami, or Demand Surge. Conservative adjustments result in a range of \$19 billion to \$32 billion.

AIR's March 25th estimate of \$20 billion to \$30 billion excludes LAE, Demand Surge, Auto, Marine, Life and CBI. Adding Demand Surge, Auto and Marine produces an adjusted range of \$26 billion to \$40 billion.

RMS's April 12th estimate of \$21 billion to \$34 billion is intended to cover all insured losses, although not LAE. Their narrative doesn't address CBI or on-shore Cargo for non-Japanese insureds. After subtracting the CBI that they have included and Life, RMS is actually the lowest estimate with an adjusted range of \$16 billion to \$24 billion.

Insured Loss Estimates Excluding Life, CBI, and On-Shore Cargo

Modeler	Released On	Published Range	Modeled Exclusions	Adjusted Range
EQECAT	March 16th	\$12Bn to \$25Bn	Commercial Tsunami, Demand Surge	\$19Bn to \$32Bn
AIR	March 25th	\$20Bn to \$30Bn	Auto, Marine, Demand Surge	\$26Bn to \$40Bn
RMS	April 12th	\$21Bn to \$34Bn	CBI on Non- Japanese Insureds	\$16Bn to \$24Bn
Range excluding outliers				\$19Bn to \$32Bn

C. Losses by Coverage

To develop estimates by coverage, and also to objectively review the modeled estimates, we have compared the degree of damage and values in this and previous events.

Shake and Fire Following – We base our estimate largely on the 2010 Chile earthquake, which had insured shake losses of approximately \$8 billion, excluding CBI, and consider that the Japan event had an affected population about 150% greater, per capita GDP about 50% higher, but lower take up rates and better building codes. There was more fire following loss than in Chile (such as the Chiba refinery) and more strong after-shocks. We estimate \$15 billion to \$20 billion of market loss, prior to demand surge, and after the government’s share of the Japanese Earthquake Reinsurance Company (JER).

Tsunami onshore – About ten square miles of settled areas were destroyed. Five structures per acre of development with \$250,000 of TIV each and several autos imply \$10 billion of values. Take-up rates are much less than 100% and some flooded property was already damaged by shake. But other affected properties to consider include the Sendai airport and the six trains which were total losses. We estimate \$7 billion to \$10 billion in insured property values.

Tsunami on the coast – At least 100 miles of docks, piers and small vessels were struck, and there is some (or total) damage to at least seven blue-water vessels. That lines up with the \$1 billion to \$3 billion that EQECAT estimates for these properties under Marine coverages.

Demand Surge – Because of the many perils involved, demand surge will be higher than in Chile, so we have an addition to each of these estimates of 5% to 15%, for a range of \$25 billion to \$38 billion,

suggesting the modelers have a view of damage and values for these perils that is generally consistent with exposed values, damage reports and prior losses.

Contingent Business Interruption and Cargo – These two coverages are hard to underwrite and model, because by definition an insured cannot know much about what is where and at what time. The modeling companies have analyzed the policies provided by Japanese companies and reflected that coverage is limited, and often does not include earthquake. But their analysis appears to not consider the coverages U.S. and European insurers give for their insureds' indirect Japanese exposures. These coverages are often included in blanket policies purchased by Fortune 500 manufacturers and other large multinationals.

For CBI to be covered here, all of the following must apply: CBI coverage must be added to the policy, the contractual territory must be worldwide (or at least name Japan), the “dependent location” must be scheduled or blanket language used, and Earthquake or Flood must not be excluded. Clearly, a BOP policy does not do any of these things. But equally, many large commercial insureds request all of these covers at each renewal, and some of them get it. We note that:

- General Motors has presented a \$1 billion CBI claim for plant closures in the U.S.
- There are several other individual CBI claims, each for well over \$100Mn.
- Most of the market loss on the Chile earthquake was incurred by non-Chilean insurers.
- The market loss on Chile to the direct and facultative (D&F) units of worldwide reinsurers was \$5 billion, mostly on forms that include some degree of CBI or Cargo.

Cargo is all-risks and worldwide coverage. It is usually purchased by the shipper to benefit the recipient, and protects for the entire time that goods are between their two premises. Goods are not only covered while they are moving, but also in piers, warehouses and storage yards. It is difficult to see how the modelers can know what values were exposed or covered. Some Cargo coverage is provided on separate policies, but some large commercial insureds are able to endorse it onto their main policies.

If General Motors is a guide, these two coverages are worth more than \$5 billion, and potentially much more. In the case of Fortune 500 accounts (and comparable Europeans), policy limits would typically be set at the value of the largest individual domestic plant.

Life and Accident – There is overlap between the toll of dead and missing, and when whole families were lost, there may not be survivors to report a claim. The identifiable toll will be approximately 25,000. We estimate that half will be insured with Life (not Accident) policies. Many Japanese Accident policies exclude deaths caused by earthquakes or other natural disasters. Also, Workers Compensation is insured by a monopolistic plan and not by the private market. Model estimates of \$2 billion to \$4 billion for the current cost to Life insurers are reasonable. RMS's Life estimate of \$5 billion to \$8 billion also includes existing reserves on Whole Life and other cash value products, and is thus higher than the current-year cost to insurers.

Other loss considerations – The modelers do not attempt to estimate Trip and Event Cancellation and Interruption. Some estimates for Auto note that Earthquake coverage on APD is often not taken up. There are damages to many leased and financed cars, which if not insured as

APD, will fall to Auto “Gap” or Credit coverages. Finally, nuclear evacuations might worsen Time Element coverage for the insured perils. (Example: a house is damaged and is also just outside the evacuation zone, so contractors will not go in yet for repairs. What part of the Living Expense is due to shake and insured? What part is due to radioactive contamination and excluded?)

Loss Adjustment – Model companies do not include LAE in their estimates, although reinsurance covers it. On large U.S. events, LAE often averages 6% to 8% of the direct loss amounts. The Japanese legal system is less contentious than the U.S.’s, but this loss will be more complex to handle. Although, in the most devastated areas, insurers are accepting claims for policy limits based on aerial photos. A reasonable range for estimated LAE would be 4% to 8% of loss.

Market Total – The estimated market loss and LAE is \$35 billion to \$55 billion as shown in the following table. (Since different coverages may not all be at the same end of their ranges, the market total range is narrower than the sum of the coverage ranges.)

Estimated Losses By Coverage (Including Demand Surge)	
Shake and Fire Following	\$16 Bn to \$23 Bn
Tsunami On-shore	\$7 Bn to \$12 Bn
<u>Tsunami on the Coast</u> Sub-total: Comparable Lines	<u>\$1 Bn to \$3 Bn</u> \$25 Bn to \$38 Bn
CBI and On-shore Cargo	\$5 Bn to \$10 Bn
Life and Accident	\$2 Bn to \$4 Bn
<u>Travel, Auto “Gap”, Credit</u> All Insured Losses	<u>\$1 Bn to \$2 Bn</u> \$33 Bn to \$52 Bn
<u>Loss Adjustment</u> Market Loss and LAE	<u>\$1.5 Bn to \$4 Bn</u> \$35 Bn to \$55 Bn

D. Losses by Market Segment

Direct Losses – The Japanese domestic Property Casualty industry is divided into General companies and Co-operatives, which are similar to stocks and mutuals respectively in the U.S. market, although they offer somewhat different products from each other. In addition, foreign companies can insure multi-nationals on the equivalent of an excess or non-admitted basis.

Residential losses of General insurance companies are protected by the Japanese Earthquake Reinsurance (JER) system, with a mix of pooling, government support and an external retrocession. If losses are much better or worse than expected, the industry's share will partly swing to compensate. Taking the modelers' ranges, excluding outliers, gives a range of \$5 billion to \$7.5 billion, excluding LAE and Auto. We estimate \$4 billion to \$10 billion including those areas, net of the government's share.

The Co-operative companies are another group of residential insurers. The largest of these, Zenkyoren, which handles farm and rural members, has advised a ground-up loss of \$7.9 billion to its reinsurers. There are other co-operatives, and the Fishermen's Co-operative has been badly affected, with all of its offices in the north destroyed by the tsunami, so no data is available yet. But \$8 billion to \$12 billion for the Co-operatives is a reasonable range.

Using Chile as a guide, excluding CBI and Cargo, the commercial shake and fire following loss would be about \$10 billion and on-shore tsunami is split between residential and commercial, for a total commercial loss of roughly \$15 billion. More of that will be incurred by the domestic General companies than by foreign companies. We estimate a total personal and commercial loss to the General companies of \$15 billion to \$20 billion.

The foreign companies will have the other share of the commercial loss, most of the Cargo and CBI claims, and a large portion of the "wet" marine, refinery, rail and aviation losses. AIG and Zurich have advised net losses of \$978 million and \$500 million, respectively. These are after reinsurance and tax, so we estimate their direct losses are near \$3 billion. There will also be losses at larger international insurers, likely including Allianz, Chubb, CNA, RSA and Travelers, and direct lines by Lloyd's syndicates, Swiss Re and Munich's Ergo operation, among others. Using Chile as a benchmark again, \$5 billion of D&F loss there, on a smaller event, implies over \$15 billion directly insured by foreign companies. Foreign companies' after-tax charges through the end of April are over \$10 billion. We expect a further \$5 billion to \$10 billion of these charges, with some booked after the first quarter.

Reinsured Losses – Cat covers for many Japanese ceding companies are not total losses in this event. Based on market reports, we expect \$8 billion to \$12 billion ceded to Catastrophe programs by the General companies, cooperatives and the JER, with the largest two programs, Tokio and Zenkyoren being approximately \$6 billion of that.

There are also Cat covers for foreign companies and Risk covers for both foreign and domestic. Reportedly, the worldwide aggregate limit committed by reinsurers on Japanese business is \$25 billion. However, there are also losses on U.S. and European companies' Per Risk programs and worldwide Marine programs that were not considered to be exposed in Japan. A reasonable range

for the worldwide treaty loss would be \$10 billion to \$15 billion. Reinsurers also wrote direct lines and fac and will have a large part of the \$15 billion or more of direct loss by foreign companies.

Reinsurers may have as much as a \$25 billion gross loss, matching their losses on Katrina and 9/11. For example, Munich Re and Swiss Re have taken \$3.3 billion of net charges. Backing out tax benefits and Swiss Re's 20% quota share with Berkshire Hathway, their losses are well over \$4 billion, and likely \$4.75 billion before other credits, such as inward reinstatement premiums and reductions to profit commissions. These two firms have about a 20% share of the reinsurance industry, so that implies a reinsurance industry gross loss of \$17.5 billion to \$27.5 billion, including reinsurers' direct lines. The net losses shown in the simplified table below are consistent with other estimates by peril and insurers' loss announcements.

**Direct and Ceded Loss by Market Segment
 (\$Billions)**

Market Segment	Direct Losses	Ceded to Cat	Ceded to Risk	Non-Market Retro	Net
Japanese General	\$15 to \$20	(\$4 to \$8)	(\$2 to \$4)	\$0	\$8 to \$16
Co-operatives	8 to 12	(3 to 5)	0	0	4 to 8
Foreign Direct	5 to 10	(1 to 2)	(1 to 2)	0	4 to 8
Life Companies	2 to 4	(0 to 2)	0	0	2 to 3
Rated Reinsurers	5 to 15	8 to 12	3 to 5	(1 to 2)	17.5 to 27.5
Cat Bonds / Collateralized	0	0	0	1 to 2	1 to 2
Total	\$35 to \$55				\$35 to \$55

E. For More Information

Sources:

AIR Worldwide - <http://air-worldwide.com/NewsAndEventsItem.aspx?id=20437>

EQECAT - <http://www.EQECAT.com/in-the-news/2011/japan-tohoku-earthquake-march.html>

Insurance Insider - www.insuranceinsider.com

RMS - <https://www.rms.com/Catastrophe/Catupdates>

Wall Street Journal - <http://online.wsj.com/article/SB10001424052748703858404576214010231936914.html>

Worldbank - http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/Resources/550192-1300567391916/EAP_Update_March2011_japan.pdf

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About Holborn

Holborn is the largest independent reinsurance brokerage firm in the U.S., offering advanced analytic tools, global market access and responsive account services to clients. The company was formed in 1920, making us one of the most experienced reinsurance brokers in the world. We are owned exclusively by our employees. This contributes to Holborn's stable client base and noteworthy ability to attract and retain talent.

Holborn prepares the latest information on these issues in a variety of easy-to-use formats. We provide updates on recent and potential catastrophe events for several regions through an email service. We also offer clients a monthly summary of reinsurer financial news and rating information. Holborn's Eye in the Sky^(SM) data management tool provides individually-tailored, real-time alerts on events that expose clients' accumulations.

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