Earthquake Risk Transfer for Japan

Overview

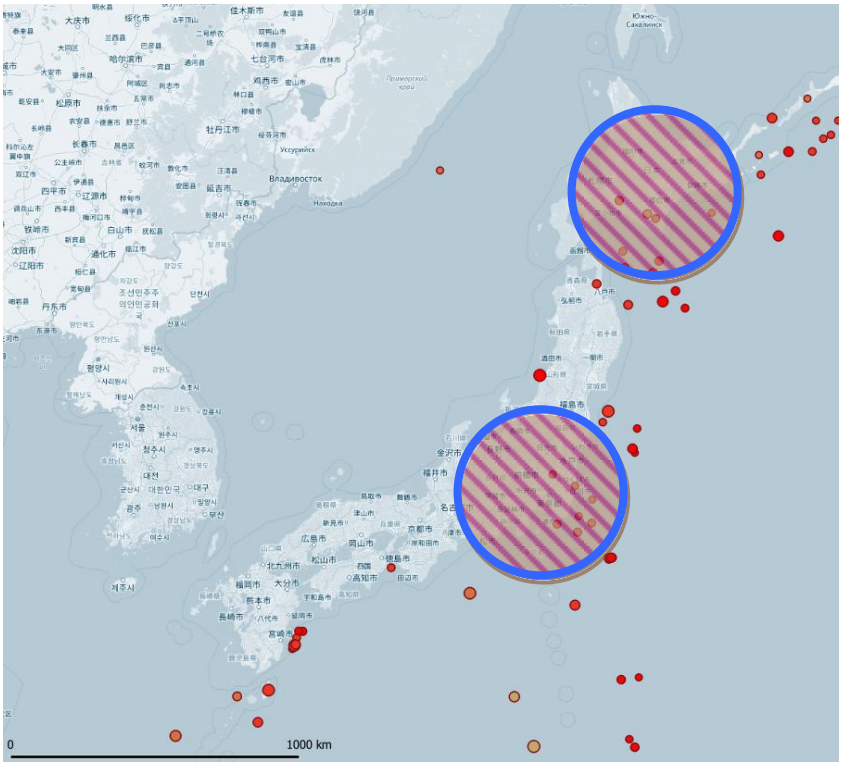

Figure 14. Hashed circles represent Earling undercover regions

Each day about 1,000 tremors that can be felt are produced in Japan. On a long run expected basis, Japan's earthquake loss potential (insured and uninsured) averages to over $20 billion per year. Over 37 M7 and greater damaging earthquakes have impacted Japan since 1900, and property damage from the costliest events of the past few decades are estimated to total over $400 billion. Based on recent events, 10-15 percent of Japan's total earthquake loss potential is covered

by the global (re)insurance community (Quantifying and managing Japan earthquake risk, 2019).

The amount insured under Earthquake Insurance can be set within a range of between 30% and 50% of those under fire insurance. The amount insured is also limited to 50 million yen for buildings and 10 million yen for household goods (Outline of Japan's Earthquake Insurance System, 2019). Therefore, an earthquake preparedness alert, which shows the probability of a major earthquake is increased, causes waves of new high-risk customers and expanding penetration rate in all of the insurance policy categories for total loss, large half loss, small half loss or partial loss.

Buildings and household goods

Total loss	100% of the insured amount (limited to the market value)
Large half loss	60% of the insured amount
Small half loss	30% of the insured amount
Partial loss	5% of the insured amount

Table 2. Under the Earthquake Insurance, insurance claims are paid out when insured buildings or household goods have sustained a total loss, large half loss, small half loss or partial loss. Large half loss limited to 60% of the market value, small half loss limited to 30% of the market value, Partial loss limited to 5% of the market value (Outline of Japan's Earthquake Insurance System, 2019).

Since July 2018, Earling was able to issue earthquake preparedness alert before some of the recent major earthquakes in Sapporo, Sendai, and Nagoya. The 4 December 2018, M6 earthquake and the M5.2 Honshu earthquake on 8 Dec 2018 are some of the events that Earling was able to issue EPA before they happen. Reliable accuracy of the issued EPAs remarkably improves user experience and gradually increases insurer losses in challenging with the further major earthquakes, which in Japan can be $34 billion annually. More than 21% of the citizens made a comparison on insurance prices to choose a new earthquake

contract or extending their current policy coverage after they received an EPA.

How EPA Affects Recent Insured Losses

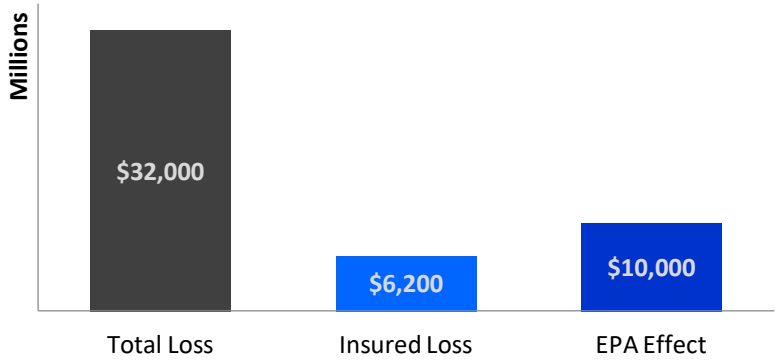

Figure 15. Japan Apr 14, 2016 earthquake loss and earthquake preparedness effect on short-term insured loss.

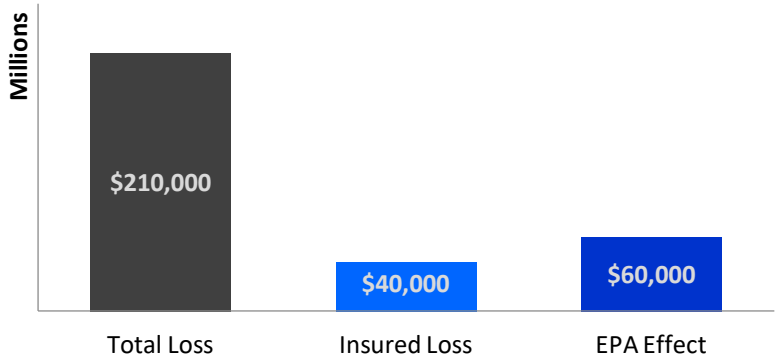

Figure 16. Japan Mar 11, 2011 earthquake loss and earthquake preparedness effect on insured loss.

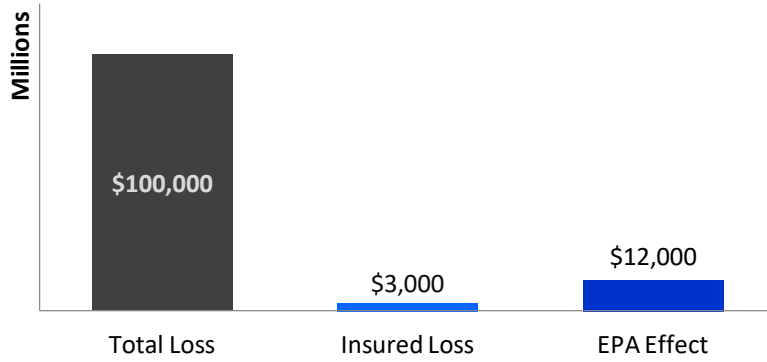

Figure 17. Japan Jan 17, 1995 earthquake loss and earthquake preparedness effect on insured loss.

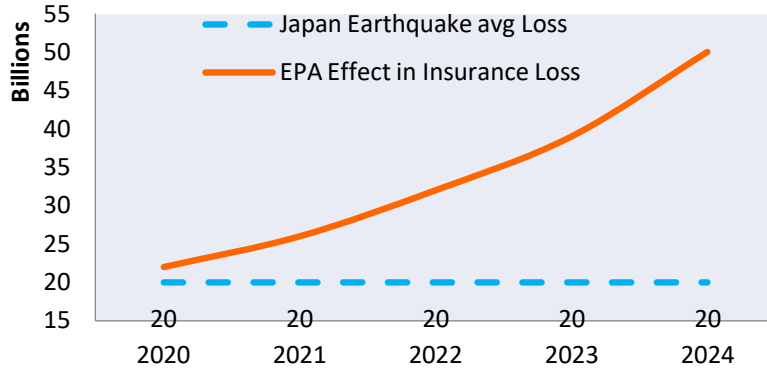

Figure 18. Estimated effects of issuing public EPAs without preparing for new high-risk customers on Japan earthquake loss.

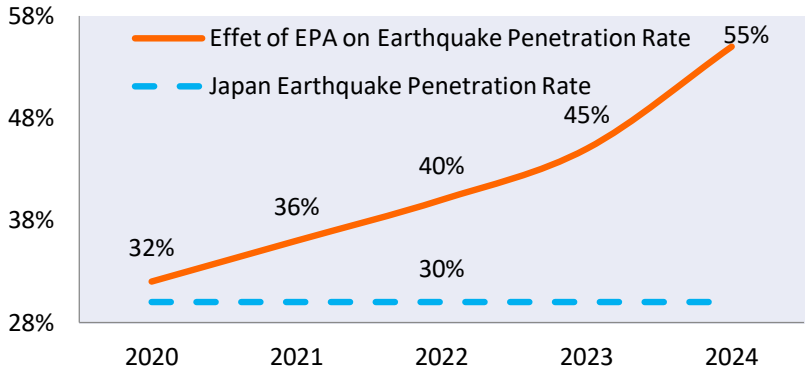

Figure 19. EPA's effect on the Japan earthquake insurance penetration rate.

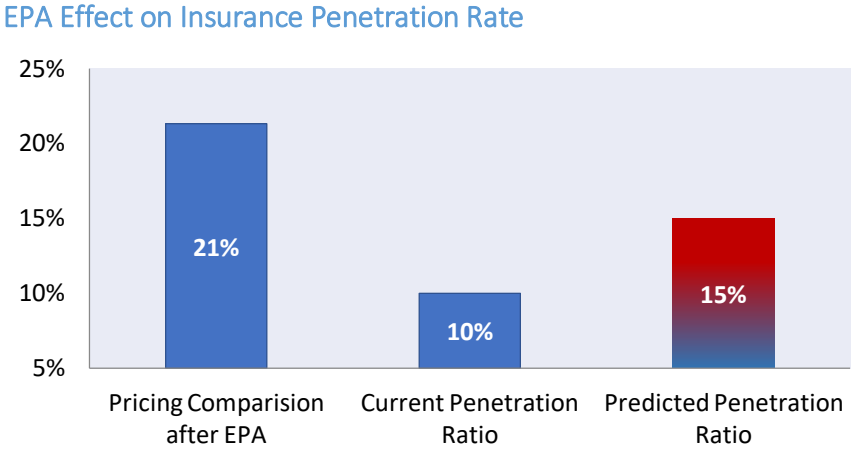

Figure 20. More than 21% of the users who received EPA moved to online broker websites to compare different insurance pricing. We expect EPAs can easily increase the current earthquake insurance penetration rate by 5%.

EPA Effect on Insurers Predicted Revenue - 11 Mar 2011

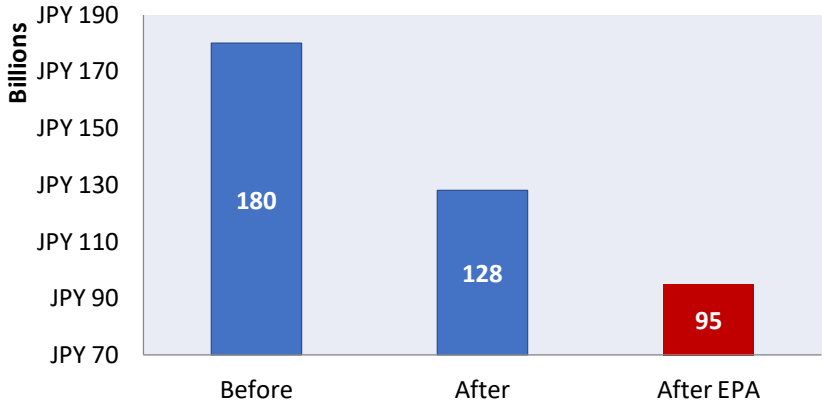

Figure 21. Increasing earthquake insurance penetration rate, when public EPA is issued, affects (re)insurances revenue. The predicted revenue of the Tokio Marine was estimated 180 billion for 2011, but it decreased by 30% after the 11 Mar 2011 earthquake. Public EPA can decrease the loss until 50% or even more for the same event in 2020.

EPA Effect on Stock Market - 11 Mar 2011

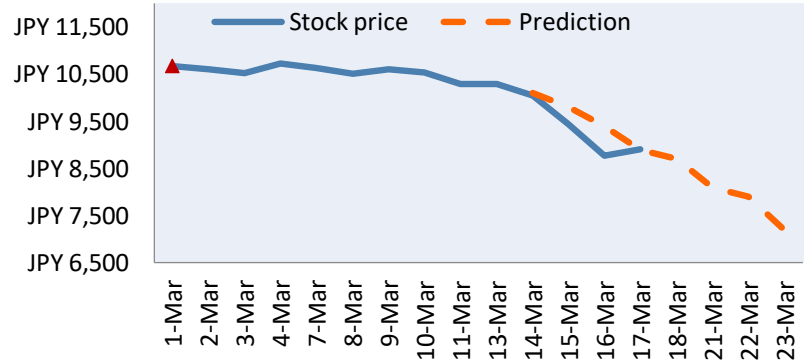

Figure 22. On day 3 after the 11 Mar 2011 earthquake, Tokio Marine stocks decreased by 8%. An unmanaged risk, that comes from public EPAs makes it worse, for each of the 10, M6 > earthquakes that rock Japan annually.

EPA Effect on Probable Maximum Loss

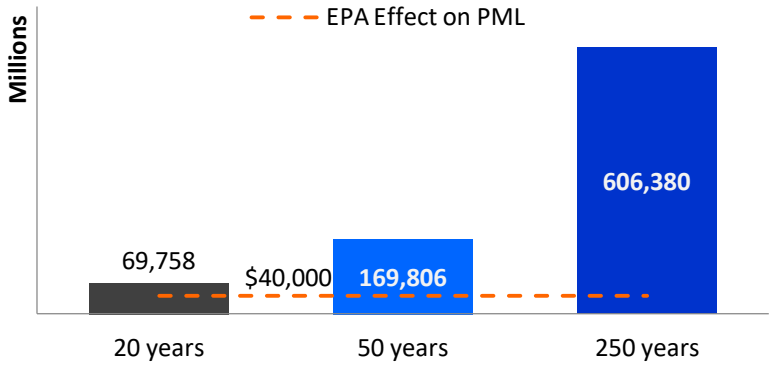

Figure 23. Probable Maximum Loss - Mean return period in year. Japan earthquake Average Annual Loss is $31,857.11 million (Japan Disaster & Risk Profile, 2014).

Japan Documented EPAs

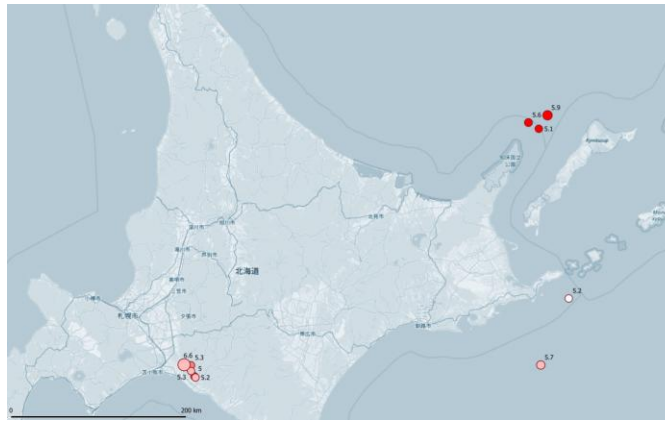

Figure 24.10 shallow earthquakes greater than M5.0 Richter hit North of Japan in 2018. We've documented one of the EPAs issued for an M5.2 earthquake that hit the region on December 11, 2018.

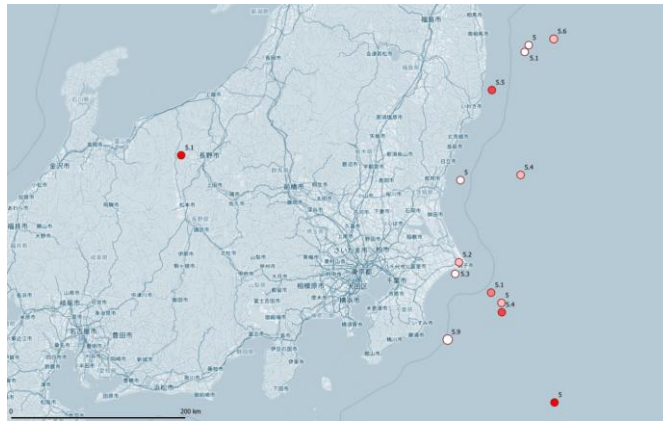

Figure 25. Center of Japan seismicity map. The region hit by 13 earthquakes > M5 in 2018, but 10 of them were near Tokyo and other populated cities in the center of Japan. We've documented one of the M5 earthquakes that hit the region on October 18, the day after EPA issued for the region.

EPA issued date	Earthquake	Mag	Status	Average Annual Loss AAL (million)
Dec 8, 2018 [1]	Dec 11, 2018[2]	5.2	Hit	$32,000
Oct 17, 2018[3]	Oct 18, 2018[4]	5.3	Hit	

Table 3. EPAs that issued for North and Center of Japan in 2018.

Japan Recent Major Earthquakes

Place	Date	Magnitude
Tsuruoka earthquake	18-Jun-2019	6.4 Mw
Hokkaido Eastern Iburi earthquake	06-Sep-2018	6.6 Mw
Osaka earthquake	18-Jun-2018	5.5 Mw
Fukushima earthquake	22-Nov-2016	6.9 Mw
Kumamoto earthquakes	16-Apr-2016	7.0 Mw
Kumamoto earthquakes	14-Apr-2016	6.2 Mw
Bonin Islands	30-May-2015	7.8 Mw
Off the east coast of Honshu	26-Oct-2013	7.1 Mw
Kamaishi earthquake	07-Dec-2012	7.3 Mw
Izu Islands, Japan	01-Jan-2012	6.8 Mw
Fukushima earthquake aftershock	10-Jul-2011	7.0 Mw
Fukushima earthquake aftershock	11-Apr-2011	7.1 Mw
Miyagi earthquake aftershock	07-Apr-2011	7.1 Mw
Tōhoku earthquake aftershock	11-Mar-2011	7.1 Mw
Tōhoku earthquake	11-Mar-2011	9.1 Mw
Tōhoku earthquake foreshock	09-Mar-2011	7.2 Mw

Table 4. Japan recent major earthquakes.

[1] https://www.instagram.com/p/BrVYXR8A9Ch/
[2] https://geofon.gfz-potsdam.de/eqinfo/event.php?id=gfz2018yeny
[3] https://twitter.com/FarzadAzima/status/1052799352287186944
[4] https://earthquakes.ga.gov.au/event/ga2018umtdog