AIR Currents Special Edition

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The Next Megadisaster: Powerful Typhoon Strikes Japan—Are You Prepared?

EVENT	LOCATION	ESTIMATED INSURED LOSS	ANNUAL EP
Severe Typhoon	From Mie to Chiba, including Tokyo Metropolis	JPY 3.0 trillion (USD 29.4 billion) for Japan JPY 810.4 billion (USD 7.9 billion) for the Tokyo metripolitan area	~0.5% (200-year return period) for Japan; ~1% (100-year return period) for the Tokyo metropolitan area

The Next Megadisaster *is a quarterly feature that spotlights a scenario taken from the stochastic catalogue of one of AIR 's peril models to help risk managers prepare for the unexpected.*

THE SCENARIO

A strong typhoon slams into Japan, bringing fierce winds in excess of 160 km/h and torrential rains to large parts of the country. Surface transportation is disrupted, hundreds of flights are cancelled, and tens of thousands of buildings are damaged. A storm surge more than three metres high ploughs into the levees surrounding Ise Bay, threatening Nagoya, but the city's flood defences hold. Weakened, the storm passes north of Tokyo, triggering landslides and causing extensive wind damage to residential properties around Tokyo Bay and areas to the west. The storm makes a total of five landfalls in Japan before dissipating.

AIR estimates that if such an event were to actually happen today, insured loss would exceed JPY 3.0 trillion (USD 29.4 billion).

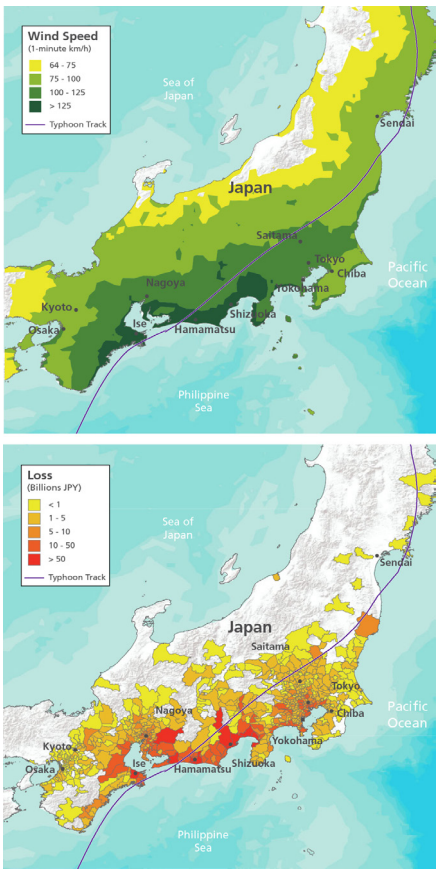
UNDERSTANDING THE IMPACT

More than half of all insured loss from the modelled storm occurs in Shizuoka and Aichi prefectures. Much of this loss is industrial—the region is a manufacturing hub and home to companies such as Toyota, Brother Industries, Makita, Yamaha, and Suzuki. However, on an insurable loss basis, damage to residential properties, which have lower insurance take-up rates, exceeds industrial losses.

Shizuoka Prefecture alone sustains over JPY 950.6 billion (USD 9.2 billion) in insured loss, much of it to industrial exposures in Hamamatsu and around the northern portions of Suruga Bay. Most of the JPY 594.8 billion (USD 5.8 billion) in insured loss in Aichi Prefecture is to industrial exposures on the Atsumi Peninsula and in and around the city of Toyota. The Tokyo metropolitan area (consisting of the prefectures of Chiba, Kanagawa, Saitama, and Tokyo Metropolis) experiences JPY 810.4 billion (USD 7.8 billion) in insured loss, most of which is residential.

ARE YOU PREPARED?

This scenario is just one example of the extensive and widespread damage a major typhoon could produce in Japan. However, it is not an extreme tail event; far greater losses are possible. While no model can predict what the next megadisaster will be, this fundamental uncertainty makes it all the more important for companies to use fully probabilistic catastrophe models to prepare for such losses. Risk managers should carefully analyse model results to ensure that scenarios such as this are not entirely unexpected.



Wind intensity footprint (1-minute maximum sustained winds) (top) and insured loss by municipality (bottom) (Source: AIR)

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Monte Carlo

AIR WORLDWIDE®

Exploring the Impact of Risk from Non-Catastrophe Perils

Catastrophes are not the only challenges facing insurers. In many situations, non-catastrophic sources of loss—primarily fire, but also lightning, explosion, vandalism, and sprinkler leakage—contribute significantly to losses. Non-catastrophe perils can be the key to truly understanding the entire risk profile.

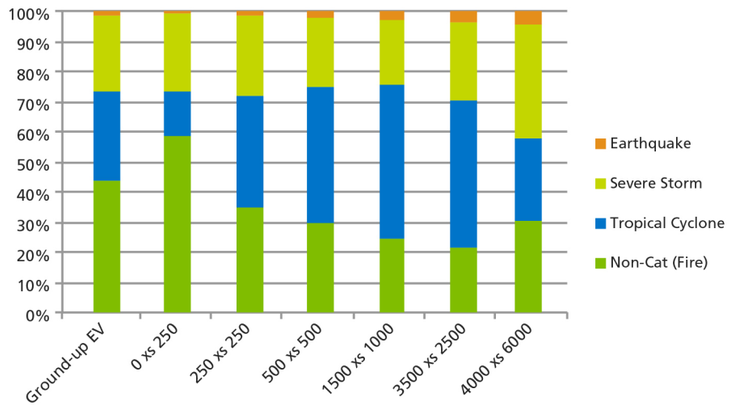
Various business situations require analysis of both catastrophe and non-catastrophe perils. Underwriters often need to address both, as many direct and facultative accounts are written on an "all risk" basis. To price them appropriately, all aspects of loss must be assessed. Similar situations arise in treaty reinsurance or in the periodic reporting of managing general agents with binding authority.

New functionality added to Touchstone® this year allows companies to analyse non-catastrophe risk to property exposures using exposure data that have already been input for catastrophe modelling. As well as accounting for both catastrophe and non-catastrophe risks in a single platform, Touchstone leverages data from our sister company, ISO®, a leading source of information about property/casualty insurance risk.

For example, non-catastrophe expected losses for a specific account can be calculated quickly by running the catastrophe models for tropical cyclone, severe storm, and earthquake, and then using the ISO Commercial Property Basic Group I loss costs. ISO loss costs can be adapted for use outside the US, or user-specified loss costs can be entered.

The expected ground-up non-catastrophe losses can be distributed into excess layers using ISO's Property Size-of-Loss Database (PSOLD™) curves. With over one million individual curves, PSOLD is well-validated to distribute losses into multiple layers of coverage, both in the US and around the world.

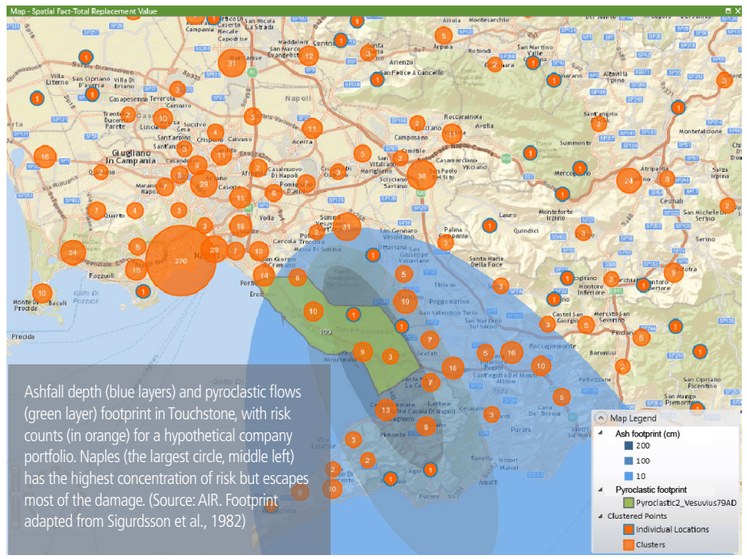
In the example analysis below, drilling into each layer of coverage to show the contribution by peril reveals that non-catastrophe losses make up the majority of the total in the lowest layer. The contribution of non-catastrophe losses decreases in the higher layers, but it still remains a significant portion of the total—almost a third of the highest layer analysed.



The contributions to layer losses by peril

Quantifying Non-Modelled Volcanic Risk near Naples, Italy

The purpose of modelling is to anticipate the likelihood and severity of catastrophes so that companies can prepare for their financial impact—before they occur. Therefore, no risk assessment is complete without giving due consideration to non-modelled risks. Volcanoes pose one such risk, and while no fully probabilistic model exists yet for all of the world's volcanoes, the risk posed by eruptions can be quantified using the Geospatial Analytics Module in Touchstone.



Ashfall depth (blue layers) and pyroclastic flows (green layer) footprint in Touchstone, with risk counts (in orange) for a hypothetical company portfolio. Naples (the largest circle, middle left) has the highest concentration of risk but escapes most of the damage. (Source: AIR. Footprint adapted from Sigurdsson et al., 1982)

Nearly 2,000 years ago, southern Italy's Mount Vesuvius buried the towns of Pompeii and Herculaneum in ash and pyroclastic flows, killing an estimated 16,000 people in two days. Today, Vesuvius threatens about 4 million people in and around Naples, including 600,000 in the so-called Red Zone at its base. While no actual event will happen again in the exact same way, an AIR analysis reveals that if the 79 AD eruption were to happen today, the total property replacement value at risk is more than EUR 74 billion (USD 100 billion) based on AIR's industry exposure database (IED).

Companies can easily perform a geospatial analysis to assess their own exposure to non-modelled risks. In the example below, the user first imports a shapefile created by geo-referencing a published study of the ancient eruption's ashfall depth and pyroclastic flows footprint. The user can then analyse the footprint against exposures in the company's portfolio.

Touchstone users can analyse not only replacement values within the affected footprint but the potential losses as well. Damage ratio assumptions can be assigned to different intensity bands within the footprint, and—because Touchstone's geospatial capabilities are fully integrated with its financial module—policy terms can be applied to calculate exposed gross loss (exposed limits).

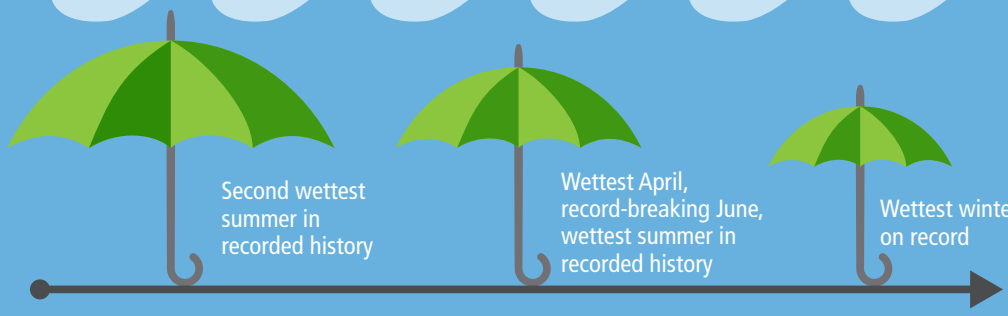
Volcanoes, including Mount Vesuvius, are just one non-modelled peril that can affect client portfolios. Touchstone's powerful and intuitive Geospatial Analytics Module makes it easy to assess risk from volcanoes and other non-modelled perils and regions so that companies can prepare for their financial impacts before they occur.

ASHFALL DEPTH	DAMAGE RATIO	REPLACEMENT VALUE	GROUND-UP LOSS	EXPOSED GROSS LOSS
200	90.00	233,684,632	201,316,169	77,072,454
100	70.00	545,729,935	382,010,954	319,100,727
10	25.00	957,208,368	239,302,092	152,737,245

User-specified damage ratios for each intensity band are applied to calculate ground-up loss and exposed gross loss for a hypothetical company portfolio. (Source: AIR)

RISING WATERS · The Growing Need for Proactive Flood Risk Management in the UK

5 million properties are at risk of flooding across the UK. Notable losses in recent years include:



AIR-modelled average annual insured loss from inland flooding **GBP 550M** two-thirds of which is residential.

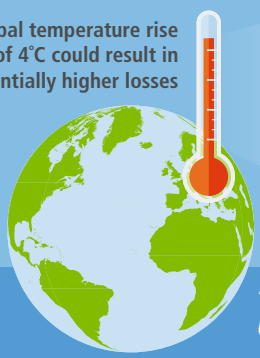
Uncertain Future, Rising Losses

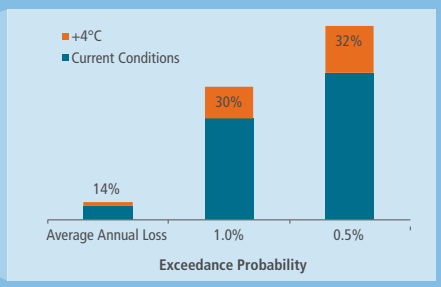
Property owners and insurers face increasing probability of loss:

- Properties continue to be built on the floodplains
- Increasing value of property and contents
- Ageing flood defences

The impact of climate change remains uncertain, but studies suggest more frequent extreme rainfall events.

A global temperature rise of 4°C could result in substantially higher losses





"Increased flood risk is the greatest threat to the UK from climate change."
-UK Committee on Climate Change

Proactive Risk Management

Insurers and reinsurers need robust modelling tools:

Capture **WHAT** leads to flooding

Identify **WHERE** the risk is

Understand **HOW** damage occurs and causes loss

AIR is proud to have been selected as the primary modeller for ABI in preparation for **Flood RE** a not-for-profit insurance pool established to ensure the continued availability and affordability of flood insurance in the UK.

AIR has nearly a decade of UK inland flood modelling experience. The AIR Inland Flood Model for Great Britain provides a fully probabilistic view of potential losses to help companies:

- Identify vulnerable properties
- Inform pricing and risk selection
- Manage exposure accumulations
- Plan reinsurance

Sources: AIR, ABI, Munich Re, UK Committee on Climate Change

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