

Risk Management Property

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Industry must adjust to climate change loss

Sharing data is vital for countering extreme weather events, reports *Sarah Murray*

Videos produced by the Insurance Institute for Business & Home Safety – in which simulated tornadoes and hurricanes tear off rooftops and force structures to collapse – make it easy to understand why climate change might prompt insurance companies to rethink their exposure to property risk.

Yet, in response to the increased frequency and severity of storms and floods, insurers can do more than simply raise their premiums.

The storms that appear in the US-based IBHS videos were generated using giant fans and massive tanks of water. But recent years have produced plenty of hard evidence of the damage that can

be wreaked on property by actual storms, from severe flooding in Bangkok in 2011 to Hurricane Sandy in New York and New Jersey in 2012.

And these events are costly. The Thai floods led to \$47bn in economic losses, according to Swiss Re, the global reinsurer, while Hurricane Sandy caused \$68bn of damage across the eastern seaboard of the US, destroying more than 300,000 homes.

Emerging markets are particularly at risk, since they are urbanising rapidly – often in the absence of the building codes needed to ensure that developments can withstand storms and floods.

Moreover, in many cases, the insurance sector is less well developed in these countries than in mature markets.



Sunset over the City of London: many urban areas are vulnerable to extreme weather – Dreamstime

Whether in emerging or mature markets, metropolitan areas are often located near coasts, which means that threats are a central concern for insurers. And as the value of city real estate increases, so do the potential losses.

For insurers, the challenge is not only to price into their risk models the greater frequency and severity of storms, but also to take account of the changing value of assets located in exposed areas.

The relative vulnerability of real estate fabric is another consideration for insurers. This includes the age of infrastructure. For example, climate-resilient measures – such as water-resistant construction materials – are more often present in new

developments than in older structures.

However, while new buildings may be able to withstand windstorms and tornadoes more effectively, newer structures can be less resilient when it comes to flooding, since far more infrastructure – from heating and electricity systems to computer servers – is now placed underground.

Tim Bunt is global head of risk management at CBRE, the property services company, and points to Hurricane Sandy as an example. “The wind damage was one thing,” he says. “But with the flooding, a number of high-value assets were impacted not just for weeks but months.”

In addition to climate change, a range of other factors must inform pricing

models, says Andreas Schraft, head of catastrophe perils at Swiss Re.

“It’s not just climate change. Several developments are leading to increased exposure and claims,” he says. “We need to know those risks, so we can charge the right price.”

Sophisticated weather modelling technologies can help. “What the insurers now have is big data,” says Mr Bunt. “And their models are giving them better insight, not only as to how to price their risk but also where to take risk.”

This can lead some insurers to alter the geographic emphasis of their risk portfolio.

Cynthia McHale, director of the insurance programme at Ceres, a US-based

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Danger in the digital age: the internet of vulnerable things

Technology

Cyber security breaches in an increasingly connected world could be catastrophic for infrastructure, warns *Ian Wylie*

Since the first PC virus was set loose in the mid-1980s by two brothers in Lahore – reportedly to deter piracy of software they had written – technology users have discovered that the connected world delivers risks as well as benefits.

Less well understood are the growing cyber threats to physical assets, as the online world merges with the real one.

The internet of things – the network of physical objects embedded with electronics, software, sensors and connectivity – allows domestic appliances to be controlled automatically or production lines to be managed remotely.

But it also creates the possibility of cyber kinetic attacks – opportunities for hackers to target anything from fridges and factories, traffic lights or water treatment plants.

In industries such as oil and gas, for example, the ability to monitor and alter well pressure, temperature and flow extraction rates remotely offers opportunities to streamline operations and maximise production and profitability. But these networked systems also create areas of vulnerability.

At the end of last year, Germany’s Federal Office for Information Security revealed that hackers had managed to access the control systems at an unnamed steel mill in the country, preventing a blast furnace from shutting down properly and causing “massive” – though unspecified – damage.

The attackers had gained access through the plant’s business network, using a “spear-phishing” email – a targeted email that appears to come from a trusted source but contains a malware attachment or link to a malicious website. Once a foothold had been established on the corporate system, the hackers were able to explore the company’s networks, before causing damage via the production network.

Dr Larry Ponemon of Ponemon Institute, a US security research centre, estimates that: “Approximately 15 per cent



Hackers gained access to control systems at a German steel mill

of attacks that penetrate corporate networks or enterprise systems damage or destroy physical equipment such as servers, storage devices, routers and other IT devices.”

Atif Kureishy, a principal from Booz Allen Hamilton’s technology and analytics practice in the Middle East, notes that: “Reporting of a cyber security breach can have massive legal, financial and reputational implications on a business, and many will think twice before going public on an incident.”

For hackers, the task of finding interfaces to domestic, business and industrial systems has become easier, thanks

‘The perpetrators of attacks vary from the lone wolf to organised criminals . . . sponsored by nation states’

to search engines such as Shodan that scour the web for internet-connected devices, from heating systems and geothermal energy plants to building control systems and manufacturing plants.

Dr Ponemon says: “The perpetrators of cyber attacks vary from single individuals and lone wolf attackers to organised criminal enterprises. Some of the more sophisticated attackers

are sponsored by nation states.”

According to a Ponemon Institute/Unisys survey of almost 600 IT security executives in 13 countries from the utility, oil and gas, alternative energy and manufacturing sectors, only 17 per cent of respondents thought their company had a mature level of cyber security.

Mr Kureishy says organisations must accept that the traditional perimeter approach to cyber security is no longer enough. “Organisations must adopt a defence-in-depth model that has security in layers, protecting their most valuable assets and deploying intrusion, detection and monitoring systems to manage incoming information.”

What puts many networked physical assets most at risk of cyber attack is that they are running on old software. Yet according to the Ponemon Institute/Unisys study, 54 per cent of companies are not confident they could upgrade legacy systems cost-effectively “without sacrificing mission-critical security”.

Appropriate risk cover is another form of defence, although the cyber insurance market is still in its infancy. Some 98 per cent of large UK companies lack insurance that could help them recover from a serious cyber attack, claimed a report this year by the UK Cabinet Office, even though 81 per cent admitted to suffering a security breach in the previous 12 months.

Brit Insurance, a specialty insurer, and Coalfire, a corporate governance auditor, have launched cyber attack insurance cover for first-party property damage, business interruption, the cost of restoring digital assets and reimbursement for resultant business income losses. The product also offers comprehensive cyber security risk assessment and loss mitigation.

According to Russell Kennedy, underwriter at Brit, there should be a greater sharing of experience and information about physical losses through cyber attacks, particularly as many companies use similar control systems.

“There’s a reluctance . . . to discuss the losses being incurred, so little information is being shared,” he says. “It’s similar to the situation three or four years ago with regard to data and privacy losses, when companies such as eBay, Target and Amazon were being hacked, but they wouldn’t talk about it.”

“Now that they have insurance in place, they’re more willing to discuss and share information.”

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Scientists begin to get ahead of the weather

Model approach
New techniques are allowing more accurate storm forecasting, writes *Sarah Murray*

With gusts of almost 170 miles an hour, Hurricane Andrew generated a total insurance payout of \$15.5bn when it hit Florida in 1992.

The storm was a giant wake-up call for the industry and prompted the development of sophisticated modelling techniques that help insurers and organisations assess the risks of windstorms and other weather patterns.

Of course, Hurricane Andrew – which led to the insolvency of several insurance firms – was not the only catalyst for advances in the modelling of catastrophic storms. Over the years, programmers have developed better skills and gained a clearer understanding of the atmosphere.

Global co-operation has helped, as was the case with Hurricane Sandy in

2012, when scientists were able to predict its path, including its highly unusual 90-degree turn northwards.

“With Sandy, we had amazing international collaboration between scientists in Europe and the US,” says Erwann Michel-Kerjan, executive director of the Risk Management Center at Wharton business school, University of Pennsylvania.

Many of the advances have been made possible by increased computing power. This reduces the time it takes to run numerical models – which use grids to calculate changes in variables such as wind, humidity, temperature and surface pressure – to predict the weather.

“When you’re dealing with massive data on extremely complex systems, you need to aggregate and correlate those data very quickly,” says Prof Michel-Kerjan. Once, predicting the path of a hurricane such as Sandy might have taken six months. “Now, we can do it in 24 hours. That’s pretty remarkable,” he says.

Increased computing processing power has also expanded the range of storms that can be modelled, explains Richard Hewston, principal environmental analyst at Verisk Maplecroft, the risk analyst group. This allows model-



Stormclouds: a tornado just misses a farm in the US – Dreamstime

ling of big windstorms that might have footprints of 300km and also smaller storms, such as tornadoes, of just 1-2km in width.

Processing power also helps a type of forecasting that, unlike traditional models, can use observations of the current state of the climate to project forward and produce possible weather events.

James Done of the Colorado-based National Center for Atmospheric

Research (NCAR), says: “Our latest weather and climate models are at a point where you can generate hundreds of hurricanes that haven’t happened, but could.” He is working on a project to determine how hurricanes may change as the climate heats up.

Shifts are also taking place in the way insurers and others use this information, with the advent of open-source approaches and the entry of technology companies into the field.

Start-ups are offering companies customised, real-time risk reports. For example, an app from Maptycs allows insurers and others to make instant assessments of their property and business interruption exposure, identify and monitor local events and produce customised reports.

“It’s all mobile-friendly,” explains Prof Michel-Kerjan, who is on the Maptycs board. “So if you see that there’s a massive flood in Thailand, you go on to the programme, download the map, increase the map with your finger and it tells you exactly what your exposure in Thailand is.”

And while traditionally, companies such as AIR Worldwide, Egecat (now part of CoreLogic) and RMS have sold their proprietary catastrophe risk mod-

els to insurers, which use them to price their policies, alternatives are emerging.

For example, NCAR has launched the Engineering for Climate Extremes Partnership, which brings together companies, governments, academics and others in an open-source approach to developing weather and climate risk models.

“It will provide a benchmark view of risk against which companies can compare their results with the vendor modelling companies,” explains Mr Done. “For too long, these companies have dictated the insurance view of risk – now it’s being opened up to a broader community view.”

However, simply watching storms should not be underestimated. In the US, field teams at the National Severe Storms Laboratory use everything from vehicles that launch weather balloons to radars mounted on trucks to monitor the atmosphere in and around storms.

Combined with computer modelling, observation data, weather apps and even social media, the ability to predict the frequency, severity and potential impact of storms is likely to increase.

“The more data you put into these models, the more you test and validate them, the better they become,” says Mr Hewston.

Industry must adjust to deal with climate change losses

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coalition of investors and environmental organisations, says: “Some companies are making decisions about not being involved in a market or limiting their coverage in a certain market.”

However, she adds that in highly regulated markets such as some US states, cherry-picking their coverage is not an option for insurers. “In the past, insurance companies can and have pulled out of markets wholesale,” she says. “But where the regulator might step in is if an insurance company wants to operate in only parts of a state.”

To remain in certain markets, it is in the insurers’ interests to play a role in reducing the risks to property from extreme weather.

“There are a few things we can do and already do,” says Mr Schraft. “We can share our view of the risks.”

Swiss Re does this through reports such as last year’s “Mind the Risk”, in which it highlighted the perils facing more than 600 of the world’s largest metropolitan areas.

In addition, Swiss Re publishes both a global map of flood-prone areas and a regular assessment of global insured losses from natural catastrophes.

‘In the past, insurance companies can and have pulled out of markets’

Insurers can also integrate risk engineering and consulting services into their coverage, to help cities and businesses increase the resilience of their buildings to minimise future losses. These services range from helping companies understand the risks their property assets face and producing natural hazard loss models and simulations, to developing mitigation strategies.

Industry associations are also playing a role. In the UK, the Association of British Insurers hosts events and produces reports and guidance documents to help developers, planners and buyers identify and address a range of climate change threats to property.

Through industry associations, insurers can help to shape zoning laws and building codes. In 2014, for example, the IBHS joined New York-based groups



in advocating the adoption of updated construction and renovation codes to increase the resilience and energy efficiency of the city’s buildings.

Meanwhile, the IBHS “Rating the States” report ranks 18 hurricane-prone coastal states along the Gulf of Mexico and the Atlantic coast on how they have strengthened their residential building code systems since its previous study was published in 2012.

Even so, Ms McHale sees a marked difference between the willingness of the US insurance industry to address climate change and that of European companies, partly because the issue is still so contentious in the US.

“The industry [in the US] has been too reluctant to jump into the whole area of climate change and not only sound the alarm, but roll up its sleeves and work with cities, planners and property owners to look at where the risks are going to increase,” she says.

A study of 330 US insurance companies, that Ceres published last year, highlighted this. The report found that 82 per cent of the 330 companies surveyed gained only a “beginning” or “minimal” rating in their response to climate risks.

Meanwhile, Mr Schraft argues that the industry could do more to share claims information globally. “The insurance industry has a wealth of data about what can help and that is also relevant for architects and city planners.”

The issue of privacy is one barrier to this, however. Additionally, much valuable information remains siloed in insurance companies, stored in everything from their claims departments to their underwriting offices.

Finding ways to tap this rich vein of data could help the industry work more effectively with planners, engineers and architects on developing more resilient infrastructure. And, of course, doing so could allow the industry to remain profitable while meeting the insurance needs of the real estate sector in an increasingly risky world.

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Risk Management Property

Californians step up plans to counter the 'big one'

Earthquakes The odds of the state experiencing a massive tremor have increased, writes *Amy Bell*

The 800-mile San Andreas Fault, which runs from northern California to Mexico, has been the source of the state's biggest earthquakes. Known as the 'sleeping giant', it is one of more than 350 faults that are found across the state.

Scientists now predict that the risk of a mega quake in the next 30 years is higher than was previously thought.

The Third Uniform California Earthquake Rupture Forecast (UCERF3), published in March, includes newly discovered fault zones and accounts for the possibility of an earthquake jumping between them. This could result in multiple faults shaking in a simultaneous mega quake (magnitude-8), releasing enough energy to cause massive destruction.

The report says that, while there is a lower likelihood of moderate-sized earthquakes, the odds of a mega quake occurring in the next 30 years have increased from 4.7 per cent to 7 per cent.

Earthquakes are nothing new for Californians. The state experiences 1,000 quakes a year, but most are too small to be felt. While the San Andreas Fault has experienced massive earthquakes in the central and northern segments – Fort Tejon in 1857 and San Francisco in 1906 – the southern section has not had a large quake for more than 300 years.

Preparing for the next 'big one' is the formidable challenge facing state policy

makers. In his 2015 inaugural address, California's insurance commissioner Dave Jones said that earthquake protection was his top priority.

"If you ask me what keeps me awake at night, it's the strong likelihood of a large earthquake," he said.

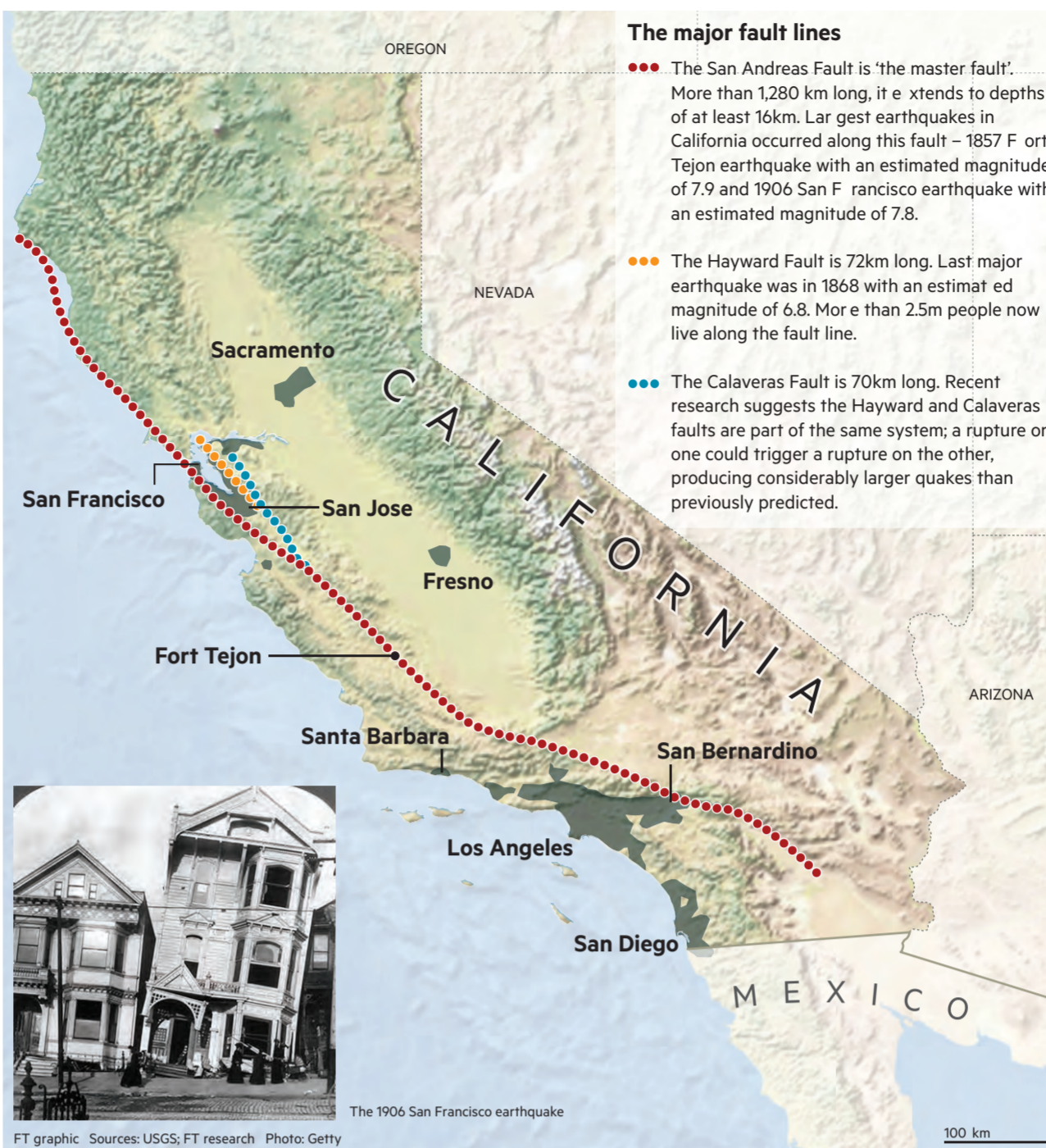
Robert Hartwig, president of the Insurance Information Institute, says that California is now better prepared for a big earthquake from a structural standpoint than it was in 1994 when the last significant quake hit the state.

The Northridge quake caused 57 deaths and an estimated \$20bn in damage. Improvements have resulted from stronger building codes for new constructions and infrastructure and retrofits of older buildings, he says.

Public schools and hospitals have stringent, enforced building codes, with design and construction managed by the state. All codes are updated regularly, based on scientific studies of past earthquakes, ensuring that the most effective design and construction procedures apply. These include using improved materials and employing structural measures such as base isolators where buildings rest on flexible bearings and only move a little during an earthquake.

However, many buildings in California, particularly concrete or soft storey wooden structures (where one floor is open space, causing a weak point), were built before the development of modern

At fault: seismic map of California



seismic maps and are not considered earthquake-safe. Current building codes apply exclusively to new constructions; existing buildings need only adhere to the codes in place at the time of construction.

Seismic retrofitting can improve the resilience of older structures by strengthening structural elements, but in most cases it remains voluntary.

Eric Garcetti, mayor of Los Angeles, recently implemented a seismic safety campaign to improve the city's resilience, following a report led by Lucy

Jones, a US Geological Survey seismologist. The report proposes fortifying buildings, the water system and telecommunications networks at an estimated cost of more than \$1bn and appears to be progressing. Previous calls for mandatory seismic upgrades met with protests from building owners and there is still concern about how the cost of retrofits will be covered.

Better public understanding of the earthquake threat has been a crucial part of the process. Dr Jones liaised with community groups and city

departments over a year-long period, warning of the risk of doing nothing.

The estimated cost of damage to Los Angeles in its current state, if a big earthquake were to hit, would be more than \$210bn.

The risk to Los Angeles, with a population of approximately 18.5m, is particularly high because of the many faults, but other densely populated zones are also at risk, including the San Francisco Bay area, which is working on a plan to strengthen the area's resilience.

The findings of the UCERF3 report

have been included in the 2014 update of the earthquake hazard maps. Such maps are essential in earthquake preparation, as they are used by engineers, planners and building code officials.

The risks are reflected in the insurance rates for earthquake coverage. Chris Schultz, deputy insurance commissioner, estimates that in high-risk areas insurance may cost \$3,000 a year or more. In some cases he says, retrofitting at a one-off cost of \$3,000-\$10,000 could be a better choice.

Many insurers were caught off-guard by the 1994 quake and began to restrict coverage and increase rates as a result. Unlike flood insurance, earthquake cover is not provided by the state and must be purchased from private companies. Separate earthquake insurance must be offered under Californian law to policyholders, but it is not mandatory and many choose not to purchase it because of the cost.

Mr Schultz says a mere 11 per cent of homeowners and tenants in California currently have earthquake insurance, and commercial uptake is similarly low. The California Department of Insurance is trying to secure funding for grants to encourage people to retrofit their properties he adds.

Mr Hartwig believes the reason so few Californians have earthquake insurance is complacency. "It has been 21 years since the last major earthquake in the state and many rationalise that they can do without."

Unfortunately, too many seem willing to play Russian roulette with what is likely to be their most valuable asset, their home."

'What keeps me awake at night is the strong likelihood of a large earthquake'

Christina Curry, assistant director at the governor's Office of Emergency Services, believes that better public awareness and support are crucial. She cites the importance of current work on earthquake early warning detection and continued focus on the state's Shakeout Scenario to ensure citizens know what to do in an earthquake.

However, for now, the onus is on individuals to insure their properties against earthquakes. The latest UCERF3 report may well serve as a reminder to property owners of the risks they face.

Authorities move to impose tougher building standards

Japan

Regulations are being tightened to improve resistance to shocks, writes *James Simms*

Four years after the devastating Tohoku earthquake and tsunami, governments, insurers, real estate owners and developers are taking steps to improve the ability of structures to withstand and survive such disasters in Japan.

Even before the recent legal changes to prod more property owners to follow stricter seismic building standards, structures stood up well to the strongest quake on record to hit Japan. But steps to deal with the impact of tsunamis – which were the most deadly and destructive force in the catastrophe – and long-period ground shaking that affects skyscrapers in cities, such as Tokyo, are still a work in progress.

Nearly 16,000 people died and almost 130,000 homes and buildings were destroyed, mainly in three northern prefectures on the Pacific coast in the March 2011 disaster. The financial tally for insurance companies was almost \$37bn in earthquake and tsunami damage and business interruption claims paid – making it the second costliest payout worldwide in the past four decades, after Hurricane Katrina's almost \$79bn, says reinsurer Swiss Re.

Japan's current regulations, to protect residential and commercial structures against earthquakes, date to the 1981 Building Standards Law and subsequent minor revisions. The Tohoku quake and the most destructive one before that, Kobe in 1995, indicated that the 1981 law was sufficiently strict, because almost all of the damage occurred to structures built under the prior 1950 law, says Hiroshi Fukuyama, director of the National Building Research Institute's Structural Engineering Department.

Nonetheless, in 2013, Japan made further revisions to a 1995 law promoting seismic retrofits passed after the Kobe quake, to push more structures to meet the 1981 code. It compels owners of large buildings used by the public, such as hotels and shopping centres, to have third parties assess whether they meet the 1981 law and for public disclosure of the results by the end of 2015.

The goal, by the end of the year, is to



Floating shelter being installed on the top of a tsunami evacuation tower

increase the percentage meeting the code to 90 per cent from about 80 per cent in 2007. The national government and most local governments will provide financial assistance, up to 80 per cent in some instances, to pay for seismic retrofits to meet tougher standards. For assessments, the assistance can cover the entire cost.

Miyagi, the prefecture hit hardest in Tohoku, has some of the most generous residential subsidies in Japan and had promoted quake insurance before the 2011 earthquake. Half the households now have coverage, up from one-third before the quake, compared with the national average of 28 per cent.

High-grade buildings that exceed seismic standards are often better located and receive higher rents

Insurers offer discounted premiums for residential property that follow the 1981 code, with larger reductions for meeting greater quake-resistance standards. The maximum discount jumped to one-half last year from 30 per cent in 2010, according to the General Insurance Rating Organization of Japan, after regulators assessed the efficacy of quake-resistance features and also drew up new hazard maps.

For corporations insuring property from quakes and tsunamis, there are no across the board rates or discounts and coverage is not guaranteed, in contrast to residential quake insurance.

In general, says insurer Sampo Japan Nipponkoa Holdings, the conditions for setting rates include location, seismic resistance and the risk of tsunamis and liquefaction – the rate the strength and stiffness of soil is reduced by earthquake shaking.

Atsuhiko Dodo, head of property treaty underwriting at Swiss Re in Japan, says: "The key determinant is which building code/seismic resistance is installed." Corporate quake insurance, which is a rider on fire coverage, is harder to attain, because the national government does not act as the reinsurer, as it does for dwelling insurance.

Norio Morioka, general manager of the planning department at Tokio Marine & Nichido Risk Consulting, a subsidiary of insurer Tokio Marine Holdings, says reducing risk is the priority for companies: first protecting personnel; then structures used for production and providing services; and thirdly, ensuring business continuity. The last step is insurance or other coverage such as catastrophic bonds.

Property owners and developers have an incentive to meet or exceed the 1981 standards to attract customers and tenants. Hiroshi Okubo, head of research at the real estate group CBRE in Tokyo, says: "Relocation demand on the back of facility upgrades [to quake-resistant buildings] and [business continuity planning] compliance has been the trend, particularly after the Tohoku earthquake."

High-grade buildings that exceed seismic standards are often also larger and better located and therefore receive higher rents, he adds.

The government is working on regulations to help deal with the stresses that tsunamis can put on structures, in addition to the current tsunami evacuation and shelter requirements and improved hazard maps. It is also looking at rules to deal with long-period ground motion of one to two seconds, which affected skyscrapers in Osaka, nearly 800km from the Tohoku quake epicentre.

Japan has taken significant steps to protect itself from future earthquakes, but only time will tell if these preparations are sufficient.

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