Weathering the Storm

Ensuring business resilience for natural disasters

Abstract

Disasters sparked by natural events have become a risk that cannot be overlooked in today’s age of globalisation. With businesses and communities casting their nets wider, natural hazards can no longer be considered isolated geographical problems as they hold the potential to cripple local, regional and global economies at an unprecedented scale. In 2016 alone, recorded losses caused by natural catastrophes reached an estimated USD175 billion, marking an all-time high in a span of four years. With that in mind, it has become a key priority for businesses to understand the risks and potential mitigation options for these events. Armed with sufficient information and expert knowledge, any business entity can prepare for the worst, reducing potential losses and minimising the risk of business interruption when the inevitable happens. Through this in-depth report, business owners and stakeholders can gain a clearer view of the business risks caused by natural hazards, and the routes businesses may take in facing the challenge.
Contents

ABOUT THE TÜV SÜD EXPERT .................................................................................. 2

1  INTRODUCTION ..................................................................................................... 3

2  THE CHALLENGES FACED .................................................................................. 4

3  RISING TO THE CHALLENGE ............................................................................ 7

4  A COMPREHENSIVE BUSINESS PLAN FOR NATURAL HAZARDS .................. 9

5  CONCLUSION ........................................................................................................ 10

About the TÜV SÜD expert

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Tom has assisted many corporations and governments in damage assessment and reconstruction efforts following major disasters, including developing and setting up the United Nations’ damage assessment programme following the M7.0 Haiti Earthquake in 2010, which involved the damage inspection and tagging of over 300,000 buildings. Following the Cat-5 Philippines Typhoon Haiyan (locally known as Yolanda) in 2013, Tom served as lead structural engineer and technical advisor for the World Bank damage assessment, repair and reconstruction team.
1. Introduction

Disasters related to natural events continue to grow in number, intensity and impact. Since 2005, an estimated USD 1.4 trillion has been lost to natural disasters; in 2016 alone, damage caused by natural catastrophes were estimated at USD 175 billion – the highest in four years – and future numbers are only likely to increase as climate change affects global weather and rapid development continues with growing economies and populations. In the competitive race to reduce costs, many businesses choose to ignore important safety measures and often build to minimum standards or simply purchase insurance blindly. The result is that many are caught unprepared in the event of a natural disaster – especially in less-developed countries or countries where regulations may not be as stringent.

The rise in globalisation has brought this problem to the forefront. With many companies in developed countries moving their production facilities and supply chains offshore, there has been a growth in systematic risk exposure for businesses of all types and sizes. This was especially apparent in 2011, when the Tohoku earthquake in Japan and severe floods in Thailand greatly affected local businesses and their overseas partners that depended on them for critical production components. The Japan earthquake and tsunami was particularly devastating, as it destroyed many coastal towns and caused the nuclear melt down at the Fukushima power plant, resulting in the leakage of radioactive materials. Four million households were left without electricity or functioning water facilities, and global economic losses are projected to top USD 300 billion, making the 2011 Japan earthquake the costliest natural disaster in world history. Only months later, Thailand was subjected to its worst flooding in 50 years, with floodwaters besieging over two thirds of the country. In addition to the over four million households and 13 million people affected, an estimated USD 45 billion was lost globally, with dozens of factories closing down as a direct result of the flood. The devastation in both countries resulted in extensive supply chain disruptions, affected companies as far as Europe and the United States, with much of the impact focussed on the automotive and computer technology industries.

With every major disaster, the importance of resilience, preparation and solid business continuity and disaster recovery plans is highlighted. Business interruptions (BI) from natural disasters are not infrequent events. The numerous large losses over the past decade demonstrate that they are becoming more common. Often, BI losses in natural disasters are higher than property damage. According to the Allianz Global Corporate & Specialty group, large BI property insurance claims now average an excess of EUR 2 million – 36 per cent higher than the corresponding average direct property damage loss in the same period.

Besides large multinational corporations (MNCs), small businesses are just as likely to be adversely affected by natural hazards as they are less likely to have the resources to recover. One in four small- and medium-sized businesses do not reopen after a major storm, and the ones that do generally find themselves losing an average of USD 3,000 a day.

An annual study by Allianz shows that BI – characterised as an unexpected stall in business that leads to a loss in income – was the top global business risk for 2017, with fire and natural catastrophes being the greatest causes of BI.

Businesses are becoming aware of the dire need for understanding natural hazards risk, mitigation and development of effective disaster plans, but many remain uncertain of how to begin or what exactly their plans must entail.

FIGURE 1: KEY CAUSES OF BUSINESS INTERRUPTION

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>44%</td>
<td>Fire, explosion</td>
</tr>
<tr>
<td>43%</td>
<td>Natural catastrophes</td>
</tr>
<tr>
<td>33%</td>
<td>Supplier failure, lean processes</td>
</tr>
<tr>
<td>29%</td>
<td>Cyber incidents</td>
</tr>
<tr>
<td>29%</td>
<td>Machinery breakdown</td>
</tr>
<tr>
<td>24%</td>
<td>Interdependencies from global networks</td>
</tr>
<tr>
<td>15%</td>
<td>Product quality incidents</td>
</tr>
<tr>
<td>12%</td>
<td>Unplanned outage of IT or telecommunications systems</td>
</tr>
<tr>
<td>10%</td>
<td>Political risks and violence (war, terrorism)</td>
</tr>
<tr>
<td>10%</td>
<td>Power outage</td>
</tr>
</tbody>
</table>

Source: Allianz Global Corporate & Specialty
2. The challenges faced

Modern businesses face a multitude of challenges, but none is more catastrophic than a natural disaster. Losses from catastrophic events such as earthquakes, floods and windstorms represent an increasing burden for corporations, and this burden will only grow as climate change, population growth and widespread development increase in high hazard areas.

2.1 The financial impact of natural hazards

As many companies rely on increasingly sophisticated technologies and machinery, disaster-borne business losses can be crippling. Modern commercial buildings and plants are being built larger and more sophisticated than ever before, equipped with costly machinery and new technology that are hard to replace or have very long replacement times. As BI increases, industry claims exceeding USD 1 billion have become more frequent. In some cases, these claims may come from sources not traditionally anticipated by insurers.

The rise of globalisation has exacerbated this risk, as companies shift their key business activities and assets to emerging markets. While cheaper to operate in, emerging markets largely struggle to handle large-scale natural and man-made disasters, either due to a lack of awareness, highly vulnerable facilities, funding, support and poor infrastructure.

In the absence of proper disaster planning, many companies choose to simply insure what they can and hope for the best. In the aftermath of the 2011 Thailand floods, many companies in the disaster areas suffered severe damage and high losses. Many were uninsured or underinsured.

Some companies based in Europe and the United States made contingent BI insurance claims for disruption of commercial chains. However, while wide insurance coverage can help in addressing the cost of disasters, companies and organisations based in developing and emerging markets may find themselves facing the challenge of inadequate or no insurance coverage. In fact, average penetration rates in non-life sectors (measured in premiums as a % of GDP) are estimated to reach only 2.9 per cent in developing countries, significantly lower than the 8.6 per cent of industrialised countries.

The financial impact of disasters on a company also extend beyond company assets. Even companies that successfully secure their own interests, protecting their buildings and machinery, are likely to experience BI as a result of large disasters; this is primarily due to the fact that many companies fail to take into account the inevitable loss of public infrastructure (utilities and roads) and the impact of disasters on company workers, customers and key partners.
2.2 High stakes

In the past decade, yearly damage directly attributed to natural disasters ranged from USD 74 billion at the best, to USD 364 billion at the worst\(^9\). In 2011 alone, around 65 per cent of damages resulted from earthquakes and tsunamis, with majority of losses being sustained in Asia\(^11\). The 2011 Tohoku Earthquake, measuring 9.0 in magnitude, devastated Japan, causing an estimated USD 250 to 300 billion in damages\(^12\), including damage to critical infrastructure such as roads, power facilities and shipping ports. Accounting for the cost of indirect damages, this is the highest economic loss from any earthquake historically, eclipsing the USD 210 – 280 billion loss from the 1923 Great Kanto Earthquake\(^13\). In addition to the economic damages, the human toll was high; final numbers distributed by the National Police Agency of Japan put the number of dead at 15,853, injured at 6,023 and missing at 3,282\(^14\), with insured damage estimates reaching as high as USD 35 billion\(^15\).

In the same year, there were several other incidents worldwide: an unrelated 6.3 magnitude earthquake hit Christchurch, New Zealand, causing an estimated USD 32 billion in losses\(^16\); severe flooding in Thailand and Australia brought losses of USD 12 billion and USD 1.8 billion respectively, with over USD 13 billion in insurance claims; while two massive tornadoes hit the United States, causing roughly USD 14.5 billion in losses.

![FIGURE 2: ECONOMIC DAMAGE BY DISASTER TYPE AND REGION FROM 1995 TO 2015](source: UNISDR)

2.3 Pitfalls of insufficient knowledge

Most companies understand that natural hazards are a common problem, but many do not know how resilient their facilities truly are. Most assume their buildings are safe as they have a misconception that their buildings are built to the latest building codes, and that building to code implies a safe building. While disaster-prone areas such as California and Japan generally have strict building codes with better seismic provisions due to their high-risk areas, other countries are often less regulated or less stringent about upholding them. Developing and emerging economies are often more likely to have buildings with quality and construction issues due to corrupt constructors that may take potentially disastrous shortcuts during the building process. It is also important to note that even California and Japan’s best building codes are designed simply to protect lives, not assets.

External factors should not be ignored either; many companies find themselves experiencing compounded issues due to a lack of understanding of external factors. A case study from Hat Yai in southern Thailand shows the consequences of insufficient knowledge; knowing the area’s propensity for flooding, the local government built a flood control system to protect the city. When the floods arrived and the rising waters met the new floodgates that the government had erected at the major rivers, upstream facilities were caught unaware and sustained severe flooding for prolonged periods.

Therefore, it is important for companies seeking to create a comprehensive disaster plan to account for not only...
their own facilities’ protections, but also relevant geographical and societal factors. Governments will usually have their own measures in place to mitigate the effects of natural disasters, but these measures will inevitably cater to the protection of the majority, meaning those in less-populated areas may be unprotected or, worse, adversely impacted.

Another mistake companies make is depending on catastrophe (CAT) models to determine natural disaster insurance coverage needs. CAT models are mostly run by insurance brokers, who are not natural hazards experts. CAT models are incapable of accounting for buildings with unusual architecture, properties with high-value equipment (such as power plants, manufacturing and processing plants), or instances where BI exposure is higher than building value. CAT models require accurate structural and site-specific data simply to get average results. Since input data collected by non-structural engineers is often wrong or assumed, broker projections are often significantly off the mark. This can cause serious issues following an actual disaster; if the CAT model underestimates potential damages, the affected company can find itself in severe financial risk if actual loss is higher than available coverage. Conversely, if the potential damage is overestimated, companies can find themselves purchasing far more insurance than necessary, and sometimes, higher deductibles (to reduce policy premiums in order to afford the higher coverage).

2.4 A multi-tiered risk profile

The primary driver of the increasing risk in BI losses is the growth in complex global supply chains, led by the increasingly standard “Just-in-Time”, “Just-in-Sequence” and “Lean Manufacturing” operating models. With companies depending on their supply chains operating with clockwork efficiency, any disturbance in the chain can lead to a disruption of business operations.

This is especially true when supply chains are largely located offshore in distant countries. In these cases, disasters that occur far from the location of a company can still lead to significant BI. Furthermore, facilities owned by external parties are difficult to assess or protect; if a disaster happens, the onus is usually on these external parties to create and execute their own disaster mitigation and recovery plans – which often are non-existent.
3. Rising to the challenge

Despite a proclaimed understanding of the dangers of natural hazards, 48 per cent of business owners surveyed by Travelers in 2012 admitted to having no business continuity plans in place. This number increases to around 75 per cent among small business owners – though small businesses are the ones most likely to be impacted by disasters, they are the ones least likely to have disaster plans or insurance. Natural hazards have the potential to affect everyone. To improve business resilience in the face of a natural disaster, there are three key aspects that need to be addressed.

3.1 Understand the risks

Understanding the risks and exposures in a facility is a critical first step in risk management. Facility risks can be quantified through an analysis of the (natural) hazard, the vulnerability of the business’s infrastructure (facilities), the capability of its people and plans (recovery and response), and the impact from surrounding infrastructure (external factors) by experts in natural hazards risk assessment. With a holistic view of a company’s assets and external factors, an expert can quickly pinpoint problem areas and determine the best way to safeguard and/or insure the company in the event of a natural disaster. Disaster management and risk analysis experts are capable of identifying hazards that affect different facilities, prioritise exposures (based on key factors such as occupancy, value and business interruption), identify high risks that threaten the company, and develop recommendations for risk reduction (through the GRC Risk Reduction Programme).

CAT models do not provide adequate data for risk mitigation. Site-specific analysis is imperative for sites that are primary/critical sites; highly protected risks; market-share driven sites; content- and/or equipment-intensive facilities; and in countries where design, construction, and inspection practices are weak or more variable. Engaging expert structural engineers to conduct site-specific assessments can provide corporate risk managers with the accuracy and level of detail needed for key risk management and business decisions.

3.2 Mitigate the risk

Mitigation of life safety risks and improving business resilience is only achievable with a solid understanding of the risks and mitigation options. Only then can cost-benefit analysis be performed to provide valuable information to allow decision makers to determine the best areas for sensible investment. It is important to note that facility strengthening is a one-time cost, while insurance is a recurring cost that is subjected to the cyclic and fluctuating nature of the worldwide reinsurance market.
Another key factor is the protection (life-safety) of employees and customers in facilities.

Risk reduction can be in the form of hard or soft fixes, or a combination of both. Hard fixes are permanent solutions, such as building barriers to keep out flood waters. Soft fixes are less permanent solutions, such as putting up sandbags or inflatable barriers just before a flood arrives. Depending on the nature of the hazard and available funds, different combination of fixes can be developed. Events with long warning times, such as floods, may allow businesses to implement a soft fix. Other events, such as typhoons or hurricanes, may have a shorter warning period, and so more hard fixes may be needed. Earthquakes have no warning, so businesses must ensure their facilities, at a minimum, have enough hard fixes to survive without collapse – to guarantee at least a life-safety level of protection for its employees and customers.

To ensure business continuity, business owners may choose to strengthen (retrofit), relocate, repurpose, or replace/rebuild their facilities.

Risk mitigation may also include installing back-up systems and redundant operating facilities to support critical infrastructure in the event of a disaster. The decision-making process must also include a review of regional infrastructure impacts.

A risk reduction programme based on site-specific analysis should do the following:

- Utilise structural engineers specialising in natural hazards risk assessment
- Define risks and quantify the damage and loss (PML)
- Develop mitigation options that may be in the form of hard- and/or soft-fixes, along with retrofit cost estimates for cost-benefit evaluations.
- Use key information to make informed decisions for expected hazard levels, company risk tolerance and prioritisation of next steps.
- Develop a mitigation plan based on priority and cost-benefits.
- Implement a risk reduction programme; which may include facility retrofitting (construction), emergency response and recovery planning, training, and appropriate insurance.

### 3.3 Set the disaster plan

The key objective of any disaster plan is to minimise business interruption by getting operational again as fast as possible. Planning requires a holistic, overarching approach – considering not just the physical assets, but also elements such as employee expertise and training, and external resources and infrastructure (e.g., utilities and roads). Rapid recovery requires the business owner to understand the comprehensive risk rather than simply asset risk. Without a full understanding of risk, business owners may find themselves misspending their limited finances and gaining insufficient protection.

Effective disaster plans need to address preparation activities before the onset of a disaster (such as a flood or a typhoon), the course of action during the event, and the post-event damage assessment and recovery operations. The key to a plan’s success is employee training and disaster drills.

After an event has occurred, a business needs to return to functionality as soon as possible. Initiating the disaster plan and careful assessment of damages immediately after the occurrence of a disaster is critical to the subsequent post-event health of the business. Even moderate weather events have the ability to cause business interruption when improperly handled. Thus, a comprehensive disaster plan should account for all manner of scenarios and should be properly communicated to all members of staff to ensure readiness.

![Outdoor treatment facilities set up after destruction of San Salvatore Hospital in M6.3 L'Aquila Italy Earthquake in 2009.](image)
4. A comprehensive business plan for natural hazards

The key weapon in the arsenal of any business looking to mitigate or minimise their natural hazard risk is an experienced expert. With the assistance of an experienced risk engineer with decades of disaster recovery and natural hazards mitigation experience, any business can improve the disaster security of their business substantially.

As a global testing, certification and inspection provider with over 24,000 employees in 1,000 locations worldwide, TÜV SÜD operates through its Risk Management subsidiary company, Global Risk Consultants (GRC), to provide the means and capacity to equip companies with the assistance they need to address the challenge of natural hazards. GRC’s experienced risk engineers and planners are capable of delivering engineering-based and accurate site-specific results for risk identification, loss determination (PML), cost-benefit analyses, BI assessments, infrastructure reliability reviews, facility strengthening designs, and emergency response planning and training.

In managing risks from natural hazards, we provide key services such as:

- **Natural Hazard Identification**
  Using addresses provided, we can geo-locate facilities using digital mapping sources to review general hazard information and develop a preliminary flood, wind and earthquake hazards rating for a site.

- **Natural Hazard Data Collection and CAT Model Results Review**
  TÜV SÜD’s team of specially-trained engineers can collect primary and secondary CAT modelling data for input into any of the major modelling systems (RMS, AIR, EQECAT). Our team will work with your broker’s modelling staff to review modelling results to ensure appropriate modelling input and output, and correct errors that result in crazy loss numbers.

- **Site-specific Natural Hazard Analyses**
  Our expert structural engineers can provide a range of site-specific analyses depending on the needs of a project, including vulnerability consultation, natural hazards risk surveys, Phase 1 risk surveys and PML determination for buildings and equipment, Phase 2 detailed analyses and development of conceptual strengthening schemes, cost-benefit analyses, and Phase 3 retrofit designs for construction.

- **Natural Hazard Disaster Services**
  TÜV SÜD’s natural hazards disaster services include both pre- and post-disaster services. Our pre-disaster services include the assessment and identification of facility risks for insurance, mitigation and disaster planning efforts, along with training for the in-house damage inspection teams (staff at affected locations that will be the first responders).

  Our post-disaster services include damage surveys and structural safety assessments to clear surviving facilities for re-occupancy, design and coordination of structural stabilisation immediately after the event, and permanent repairs. The TÜV SÜD team can also provide technical assistance to support insurance claims in the aftermath, along with expert litigation support.

4.1 Business Benefits

By partnering with TÜV SÜD, you can rest easy with the assurance of an experienced natural hazards specialist. Our global team of experts equip us to provide organisations of all sizes with the certainty needed to tackle disasters. Using site-specific information maintained in our databases, along with careful field investigations, the team can provide loss estimates, recommendations, human element programmes and associated property information to give companies a clear view of the challenges they face.

Risk mitigation measures from engineering-based assessments is the best alternative to improving company risk profiles and minimising potential losses. With our dedicated assistance, any company can improve its business resilience and disaster preparedness.
5. Conclusion

As disasters continue to grow in intensity and number, the losses associated with disasters can only mount. However, through stringent planning practices and due diligence, companies can take measures to mitigate the risks associated with natural hazards. With the assistance of an experienced natural hazards engineer, any company – big or small – can accurately assess the risks associated with their assets and facilities and develop an appropriate risk reduction program.

Natural hazards can be catastrophic when they occur, and allow no do-overs. To ensure optimal disaster preparedness and fast recovery, choose the partner with the experience and knowledge you need.

Newer concrete building undamaged after the 2011 Japan earthquake and tsunami.
GLOSSARY OF ACRONYMS

BI – Business interruption
UNISDR – United Nations International Strategy for Disaster Reduction
GDP – Gross domestic product
GRC – Global Risk Consultants
PML – Probable Maximum Loss
CAT – Catastrophe (modelling)
RMS – Risk Management Solutions
AIR – AIR Worldwide

FOOTNOTES


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Add value. Inspire trust.
TÜV SÜD is a trusted partner of choice for safety, security and sustainability solutions. It specialises in testing, certification, auditing and advisory services. Since 1866, the company has remained committed to its purpose of enabling progress by protecting people, the environment and assets from technology-related risks. Through more than 24,000 employees across over 1,000 locations, it adds value to customers and partners by enabling market access and managing risks. By anticipating technological developments and facilitating change, TÜV SÜD inspires trust in a physical and digital world to create a safer and more sustainable future.