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Lloyd's City Risk Index 2015–2025

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Executive Summary

Centre for Risk Studies

UNIVERSITY OF CAMBRIDGE Judge Business School

About Lloyd's

Lloyd's is the world's only specialist insurance and reinsurance market that offers a unique concentration of expertise and talent, backed by strong financial ratings and international licences. It is often the first to insure new, unusual or complex risks, providing innovative insurance solutions for local, cross-border and global risks. Its strength lies in the diversity and expertise of the brokers and managing agents working at Lloyd's, supported by capital from across the world. In 2015, more than 90 syndicates are underwriting insurance and reinsurance at Lloyd's, covering all lines of business from more than 200 countries and territories worldwide. Lloyd's is regulated by the Prudential Regulation Authority and Financial Conduct Authority.

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About Cambridge Centre for Risk Studies

Cambridge Centre for Risk Studies is a multidisciplinary centre of excellence for the study of the management of economic and societal risks, and is an independent research centre at the University of Cambridge Judge Business School. The Centre's focus on the analysis, assessment and mitigation of global vulnerabilities for the advancement of business risk managers, individual decision-makers and policy strategists. The research programme pursued by the Centre explores catastrophic systemic risk and interconnectivity in the economy. The Centre is supported by the business community as well as the academic research councils and focuses on research that is highly application-oriented.

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Foreword

The world is changing faster than at any time in human history.

The balance of economic power is moving from West to East. The digital revolution has replaced its industrial predecessor. Across the world, more people now live in cities than in the countryside.

We live in a truly international society where financial, manufacturing and food systems are linked and wealth is concentrated. This is driving greater efficiency, but also makes us more exposed to systemic shocks with far-reaching (and often unconsidered) consequences.

Understanding our exposure to disruptive threats and the impact that these can have on the global economy has never been more important.

In this respect, Lloyd's City Risk Index 2015-2025, which highlights the economic exposure of 301 leading cities across the world to 18 threats, is a wake-up call to us all.

It shows that trillions of dollars are at risk from manmade and natural disasters – disasters that have occurred in the past and are likely to do so again in the future.

The nature of these threats is changing too. Certain extreme weather events linked to climate change are increasing in severity and frequency. Manmade threats, such as cyber attack and market crash, are increasingly significant as companies expand into new markets and territories.

A twin-track approach is required.

First, we need to identify and quantify these risks better. Lloyd's City Risk Index, developed with Cambridge University's Centre for Risk Studies, contributes to this process. Second, governments, businesses and communities need to consider how they can improve the resilience of infrastructure and institutions.

Insurance is part of the solution. Lloyd's research shows that a 1% rise in insurance penetration translates into a 13% reduction in uninsured losses – a 22% reduction in taxpayers' contribution following a disaster. Insurance also improves the sustainability of an economy and leads to greater rates of growth – a 1% rise in insurance penetration leads to increased investment, equivalent to 2% of national GDP. Insurance de-risks governments, business and communities. It takes the financial burden of recovery off the taxpayer and boosts economic growth.

Using Lloyd's City Risk Index as a starting point, governments and businesses, together with insurers, must work to ensure that the potential for losses is reduced and, as a result, contribute to a more resilient international community. Insurers must continue to innovate, ensuring their products are relevant and offer customers the protection they need in the rapidly changing risk landscape.

At stake is improved business and community resilience, the protection of valuable assets and future global economic growth.

My hope is that this unique Index can stimulate discussion – and, where appropriate, prompt innovation – among insurers, governments and businesses to help improve resilience, mitigate risk and protect infrastructure.

Inga Beale
CEO, Lloyd's

Executive summary

Lloyd's City Risk Index 2015-2025 (lloyds.com/cityriskindex) presents the first ever analysis of the economic output at risk (GDP@Risk) in 301 major cities from 18 manmade and natural threats over a ten-year period.

Based on original research by the Cambridge Centre for Risk Studies at the University of Cambridge Judge Business School, the Index finds that a total of $4.6trn of 301 cities' projected GDP is at risk from all threats – out of a total projected GDP between 2015 and 2025 of $373trn.

The changing risk landscape

The analysis identifies three important emerging trends in the global risk landscape:

1. Emerging economies will shoulder an increasing proportion of risk-related financial loss as a result of their accelerating economic growth – more than 70% of Total GDP@Risk is associated with emerging economies, with their cities often highly exposed to single natural catastrophes. Earthquake alone represents more than 50% of both Lima's and Tehran's Total GDP@Risk, for example.

2. Manmade threats are becoming increasingly significant. Market crash, cyber attack, power outage and nuclear accident alone are associated with almost a third of Total GDP@Risk. Market crash puts the most GDP@Risk globally – representing nearly a quarter of all cities' potential losses.

3. New or emerging threats – cyber attack, human pandemic, plant epidemic and solar storm – are also having a growing impact. Together, they represent nearly a quarter of Total GDP@Risk.

Economies under threat

Cities with high asset values are the most financially exposed in absolute terms. Tokyo, Seoul, New York, Hong Kong, Shanghai and London all have significant levels of economic exposure to the impacts of catastrophic events.

Taipei, Tokyo, Istanbul and Osaka exemplify those cities that have a combination of high economic value and high exposure to both natural catastrophes and manmade risks, such as market crash and oil price shock.

The same is true of Los Angeles and New York, where cyber attack is also a significant emerging risk. In Hong Kong and Shanghai, human pandemic is an additional risk.

Implications for the insurance industry

Lloyd's City Risk Index 2015-2025 supports the case for more resilient infrastructure and institutions, and increased global access to insurance. How quickly a city recovers after a catastrophe is a key component of the total risk. The impact of events is mitigated by rapid access to capital to help to restore the economy afterwards.

Insurance claim payouts are a key source of capital injection after a catastrophe, and insurance plays an important part in the recovery and reduction of the impacts of catastrophes. Investment in risk management measures, including increasing insurance take-up, could mitigate the economic losses associated with all threats – both manmade and natural.

In principle, about half of Total GDP@Risk can be protected by improving aspects of all cities' infrastructure and crisis management, with insurance playing a key role in this process.

To do this, the insurance industry must:

- **Innovate** – continue to research, design and deliver products for new and emerging risks.
- **Collaborate** – work with other risk stakeholders and research partners to enhance the quality of data available and continue to develop probabilistic modelling.
- **Communicate** – better promote the vital role its products and services can play in protecting GDP from the impacts of natural and manmade disasters.

Lloyd's City Risk Index 2015-2025 is the first step in this process. We hope it will raise the awareness of risks across the world, drive innovation in the insurance sector and prompt the managers and policy-makers who govern, invest in and live in these cities to manage risks appropriately and reduce them over time.

References and supporting documentation

Coburn, A.W.; Evan, T.; Foulser-Piggott, R.; Kelly, S.; Ralph, D.; Ruffle, S.J.; 2014, *World City Risk 2025: Part I Overview and Results*; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Coburn, A.W.; Evan, T.; Foulser-Piggott, R.; Kelly, S.; Ralph, D.; Ruffle, S.J.; 2014; *World City Risk 2025: Part II Methodology Documentation;* Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Cambridge Centre for Risk Studies; 2014; Cambridge World City Risk Atlas: Threat Hazard Maps of the World; World City Risk 2025 project; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Documentation and other supporting materials available from: cambridgeriskframework.com/wcr

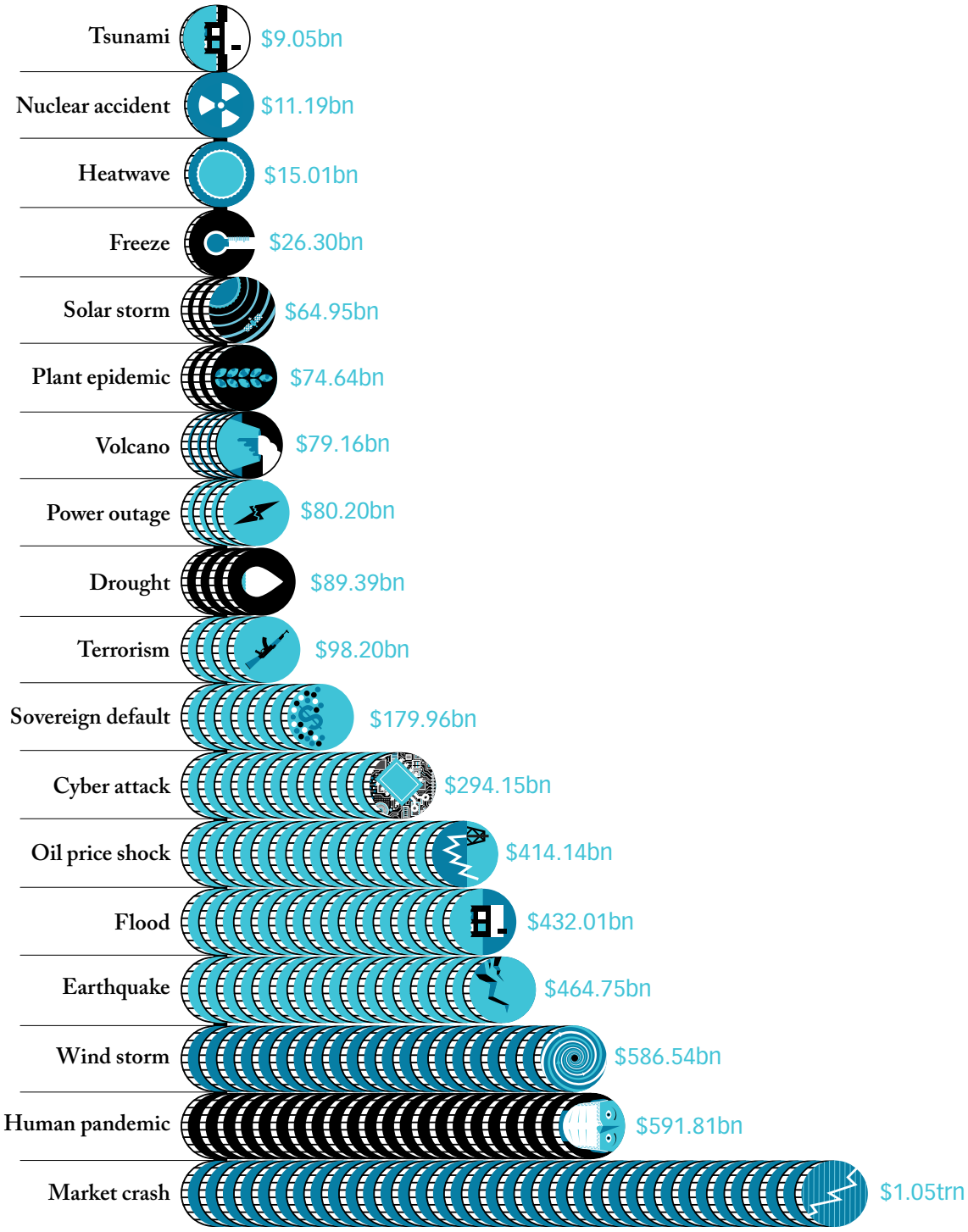
To view the Lloyd's City Risk Index 2015-2025, visit lloyds.com/cityriskindex

Facts and figures

Total GDP@Risk: All cities

$4.56trn

Market crash represents nearly a quarter of all cities' potential losses, while just ten threats account for 91% of Total GDP@Risk:



About Lloyd's City Risk Index 2015-2025

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To view the Index, visit lloyds.com/cityriskindex

GDP@Risk

When a catastrophic event such as an earthquake, pandemic or financial crisis strikes a city, it reduces that city's economic output. Its economy may recover but it could take several years. The loss of economic output, relative to the economic output that would have been expected, is the GDP@Risk from an event. Because economic recovery from some catastrophes can take many years, Lloyd's City Risk Index 2015-2025 takes the first five years of lost economic output as the standard measure of GDP@Risk from an event.

Cities are at risk from multiple threats; the Index considers 18 of them. Each threat type has a range of events of differing magnitudes that could affect the city in the future. The Index estimates the likelihood of each city being affected by events of differing magnitudes between 2015 and 2025 through a Threat Assessment Grading or TAG.

The range of possible magnitudes was simplified into three representative scenarios – a "small", "moderate" and "severe" event. These likelihoods vary from city to city depending on their locations and risk characteristics but all of these events are rare and the probability of a city being impacted by any particular event scenario in the ten-year period may be only a few per cent.

The GDP@Risk was estimated from each individual event were it to occur and the amount of impact it would have on each city was measured. The "expected loss" from that event is the loss combined with its probability, so if a moderate pandemic is likely to affect New York with a 10% probability in the period 2015-2025, and if it were to cause a loss in economic output of $50bn, the expected loss for that scenario would be $5bn (10% of $50bn).

Summing all the expected losses from the different threats and their representative scenarios that could occur in each of the years from 2015 to 2025 gives the Total GDP@Risk for the city from all threats. This is a probability-weighted expected loss to the economy of that city from all threats. GDP@Risk values are broken down by different threats and cities in the Index. We compare this with the average annual GDP of the city expected over 2015-2025 to provide a risk index in terms of a percentage of average annual GDP.

Selection of the regions

The 301 cities are grouped into ten regions based on Lloyd's interpretation of the United Nations Geoscheme.

Definition of emerging economies

Emerging economies are defined as any countries that fall outside the G8 (Canada, France, Germany, Italy, Japan, Russia, the UK and the US).

Choosing the 301 cities

The 301 cities represent the world's leading cities and were selected from the more than 5,000 cities in the world with populations over 250,000 because of their significance to global GDP. The selection includes all cities of more than three million people, the largest cities from the 50 largest national economies and includes half of all the national capital cities in the world. The largest economies have more cities represented. Together, these cities are expected to produce about half of the world's GDP in 2015 and around two-thirds by 2025. The selection inevitably entails making choices and almost certainly omits some cities that arguably ought to belong on a list of the "world's leading cities".

Choosing the 50 cities for further analysis

Among the 301 cities, 50 cities have been selected for further analysis of their GDP@Risk, to include those that reflect their national economic importance. The analysis can be found in city factsheets that can be downloaded from the Index.

Cities at risk

For the threats we have analysed, this Index represents our assessment of the cities most at risk from catastrophic disruption to their economies. However, it is not a prediction of when any of the 18 threats might occur.

For further details see *World City Risk 2025: Part II Methodology Documentation,* available from: http://cambridgeriskframework.com/wcr


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