

INSURANCE FUTURES

Cities: Underwriting risk and innovation

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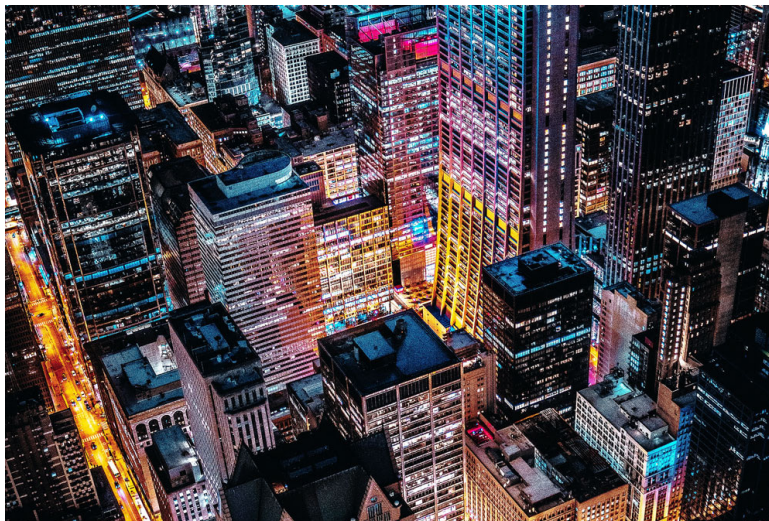
Cities: on the edge

Cities concentrate creativity, jobs and economic power. They also concentrate risk. At the same time they are playing a leading role in driving the sustainability agenda, often in the face of weak national political commitments to large-scale, urgent change. Most recently, the C40 coalition, a collaboration of city mayors, announced support for the Global Green New Deal and targets to cut emissions in half by 2030.

Cities are on the front line in the race to reduce climate change and biosphere risks, and avoid the ‘too little, too late’ scenario. The decisions city leaders take over the next decade will shape the future of the planet. Time is short.

The insurance industry has a vital role to play in underwriting and financing responses to both the physical and systemic transition risks, working in partnership with city leaders. It also has an opportunity to drive systemic innovation, in the public interest.

The challenges are formidable. They range from extreme urban temperatures, intense rainfall, storm surges, frequent flooding, higher sea levels and pollution to wildfires, droughts, food shortages, mass migration and population growth. Urban areas consume 78 per cent of global energy and produce 60 per cent of carbon emissions.¹ According to the World Health Organisation, 93 per cent of the world’s children breathe toxic air every day.



Some of the world’s leading cities will become uninhabitable, sooner or later, as sea level rises overwhelm defences. The stark choice looming on the horizon is invest in long-term resilience that is credible to investors and insurers, or retreat to higher ground.

Many of the challenges might be met over generations, not a decade or two. Some of these demands they impose are in conflict: find a path to zero emissions and zero waste; cut pollution; secure water and food supplies; generate jobs; re-invent mobility; and transform well-being and health.

Above all, the urgent priority is to cut fossil fuel consumption. The fundamentals of energy in particular are a major barrier to sustainability. Energy consumption is expected to rise by almost 50% to 2040 and world population by two billion. Multiple projections suggest that without structural change, supplies will continue to be dominated by oil, gas and coal, despite rapid growth in renewables and the revolution in electric vehicles. We may see runaway climate change and growing social unrest in the world's major cities if energy fundamentals are not transformed.



Cities face similar challenges to financial institutions and corporations. One of the principles that underpins this series of essays is that in a world characterised by complex interdependencies, radical uncertainty and speed, the challenge is to invent hedging strategies that will work, even in the most extreme scenarios, short and long-term. This defines resilience.

The challenges are not just about ‘physical’, natural world and infrastructure risk, but risks associated with cultural change. Transparency, led by public activism and investment specialists will transform the risk landscape, leaving some systemically important cities, sectors and companies facing existential failure if they cannot adapt quickly. If cities are to attract investors and insurance support, as well as talent, they need sustainable narratives to match the sustainable world narrative.

This essay explores a single, pivotal theme: that narratives about the resilience and inventive capability of individual cities to climate change risk over the long-term will shape the endgames. In other words, the ‘imagined future’, derived from innovative ideas, sophisticated data aggregation, and scenario and complexity modelling will set the agenda and determine the winners and losers.

Radical transparency

The starting point is that radical transparency will expose cities around the world to detailed scrutiny. Models will show vulnerability in a variety of scenarios to everything from floods and sea level rise, to storm surges, both short and long-term. One recent example shows vehicle emissions in US cities over the last three decades at a granular level.² These new forms of analysis will ultimately force city leaders to develop coherent strategies that demonstrate resilience, or face losing investor and insurance support.

To put this in another context, there is evidence that credit ratings agencies, institutional investors and insurers—who stand at the top of the asset management system—are already pricing climate risk into municipal and corporate bonds.

In the past, climate risk was seen as a long-term challenge that could be addressed over time. No longer. Wildfires in California and the disasters in Australia illustrate that extreme weather is clear and present. Fears of both physical risk and future, simulated financial market risk, have momentum. Regulators are demanding that financial institutions assess climate risk, as the Prudential Risk Authority puts it ‘over decades’, to 2050. The interplay between short and long-term investment perspectives and insurance modelling is a new frontier for financial services, corporations and, above all, for cities that face the challenge of transforming core infrastructures at scale and against shortening timescales.

Radical transparency will pervade the risk landscape as more complete information and sophisticated predictive modelling and real-time decision support tools emerge. This means short-term action to develop scenarios and strategies for the long-term will have immediate, systemic impacts (see Financial Stability: inventing the big hedge in this series of essays).

In parallel, investigative journalism is exposing contradictions between green ‘rhetoric and reality’. Public activism, focused on language like ‘climate emergency’ has viral qualities, much of it felt directly in cities where, to some, it presents security risks.

Equally important, institutional asset managers, credit ratings agencies, academic researchers and risk specialists are developing data sources, climate scenarios and complexity models that will reveal how individual cities, core infrastructures and industry sectors are vulnerable. Catastrophe models, until recently focused typically on short-term risk, are beginning to rise to the challenge of evaluating complex risk over time.

Hyper-localisation

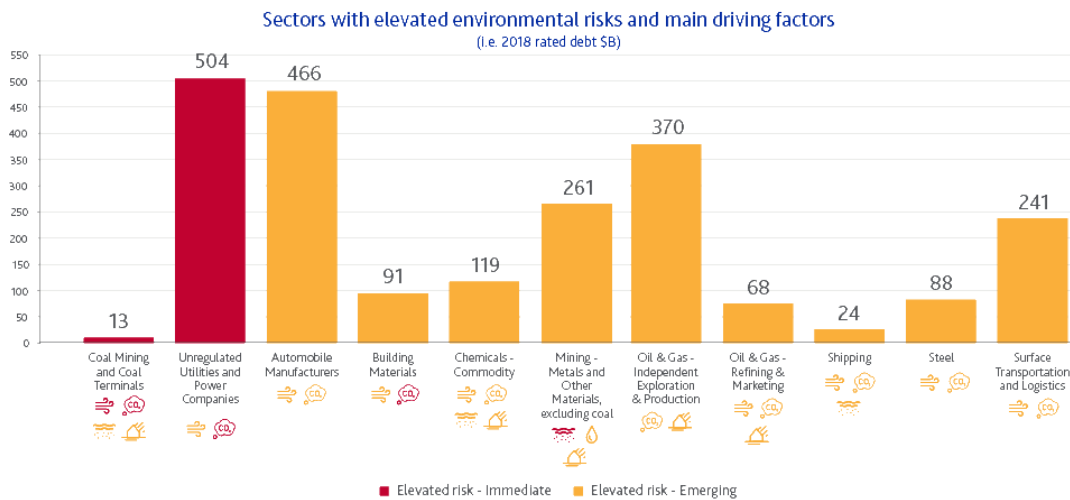
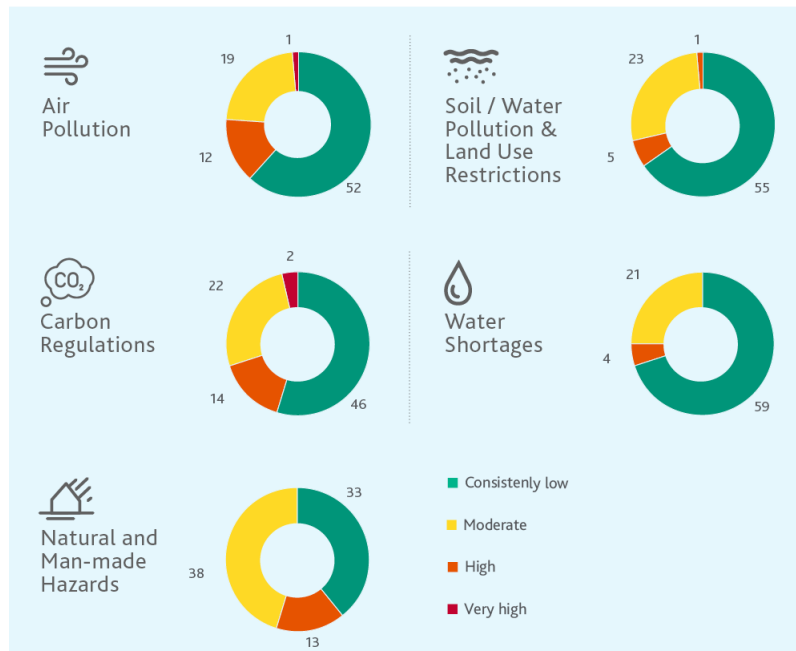
This fundamental change in perspective, from short to long-term and from generalised views of global climate risks to detailed impact maps transforms not just risk, but geography.

Whilst carbon emissions and sea level rise are global, the real impacts and challenges are uniquely local. Each city and coastal region has particular systemic vulnerabilities and faces future scenarios specific to local geography, demographics, economic models and infrastructure. There is no one-size-fits-all. Some cities are sinking for natural structural reasons. Some have developed rapidly on outdated assumptions, making them vulnerable to subsidence. Many are also vulnerable to torrential rain and flash floods that are likely to become more common as global temperatures rise. The threat, in other words, is from the sea and the sky. Houston is an example: planners ignored warnings that development left some areas acutely vulnerable to heavy rain and flooding.

The long-term security of coastal regions depends not simply on climate, oceans and geography, but on multiple local factors, from the politics of foreign aid and investor confidence, to the quality of resilience-oriented designs and ‘managed retreat’.

Take some examples. In 2017, the drought in Cape Town and lack of resilient water infrastructure led to a downgrade by Moody’s. Wildfires in the Trinity Public Utilities District in California led to similar downgrades in 2019. Moody’s have developed a ‘heat map’³ that shows the credit exposure to environmental risk across sectors representing US\$74.6 trillion in debt. In the short-term, the unregulated utilities and power companies are exposed to ‘elevated risk’. The risks to automobile manufacturers, oil and gas independents and transport companies are growing.

Blackrock's report from April 2019, focused primarily on physical climate risk, showed that securities backed by commercial real estate mortgages could be confronted with losses of up to 3.8 per cent due to storm and flood related cash flow shortages.⁴ Climate change has already reduced local GDP, with Miami top of the list. The report was amongst the first to link high-level climate risk to location analysis of assets such as plants, property and equipment.



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In other words, adaptation and resilience options are also uniquely local. The outcomes hinge on mapping long-term interdependencies to predict physical world changes and explore how core economic and social systems transition to a sustainable world. The redesign, renewal and re-engineering of resilient core city infrastructures has, as Goldman Sachs puts it 'the potential to drive one of the largest infrastructure build-outs in history' in which both innovative financing and innovative insurance play a role.⁵ City-wide engagement of all stakeholders in all aspects of the urban redesign is a source of both risk and opportunity.

Adapt or retreat

This perspective cannot be reduced to debates about insurance risk, asset management judgment, infrastructure re-design, or city futures, as if they exist in isolation. It is about a ‘system-of-systems’ view, over time. Nothing is static: some cities will become uninhabitable. Others will adapt. Others will be naturally resilient, even in the most extreme possible futures.

In any case, investment and insurance sentiment and judgment will be more recursive than ever as key indicators of resilience are refined and as cities respond.

Cities and key infrastructure companies will face higher insurance and funding costs if they fail to act, or produce convincing strategies.

From a financial perspective, for example, climate-resilient city utilities are already trading at a premium. Cyrus Taraporevala, President of State Street Global Advisors predicted recently that investors will reward companies that focus on the long-term through a ‘patience premium’. The same will apply to individual regions and cities.

From an insurance perspective, some cities face heightened risks before they are forced to retreat to higher ground. The Indonesian government’s decision to relocate Jakarta is a sign of things to come.

For the rest, heightened risks may simply mean higher premiums, or lack of insurance availability, which will amplify the protection gap, increasing pressure on government institutions, the public, or both. The picture is not simple. For example, some parts of cities will be more resilient than others, or more vulnerable to specific risks like flooding. Perspectives are changing, as more advanced catastrophe models, geospatial techniques and property-specific information—down to a few metres—automates underwriting and refines the relationship between price and risk.

The problem is that many models, at least for the time being, rely on historical data. They lack scenario-based, forward-looking context. Given the uncertainties associated with climate science and systemic failures to core infrastructures like power and water networks, city leaders face a decision that in practice is rooted in how they see time. Long-term, to 2100, sea levels are projected to rise by up to three feet. Sea level rise is ‘locked in’ and irreversible. In more extreme scenarios, with global temperatures rising to four degrees Celsius above pre-industrial levels, rises of 27 feet and more are possible.

Model risk comes in many forms. Models are estimates, capturing some dimensions of, say, climate and simplifying real-world complexity. Others are proved inaccurate, or incomplete and are refined over time. One example illustrates fundamental uncertainties: the so-called ‘sensitivity’ of global warming to carbon emissions. According to established models going back decades, warming was expected to increase between two degrees and four and a half degrees over pre-industrial levels with a doubling of carbon dioxide in the atmosphere. New models suggest five degrees centigrade⁶ may be more accurate.

This level of uncertainty alone explains why policy based on achieving certainty and consensus before action is taken is fundamentally flawed. More important, it explains why scenarios that explore extreme possible, distinct from probable or consensus, outcomes, are so important. The gold standard for city leaders is to develop strategies that work in even the most extreme futures—one of the recurring themes of these essays.

Regardless of the primary uncertainties and model risk, city adaptation strategies will come under ever-increasing scrutiny. The dangerous myth is that long-term resilience is a technological and financial challenge that can be met by building sea defences and adopting flood-resistant architecture.

Exploring extremes, if a sustainable environment is to be delivered and the natural world regenerated, the underlying narrative reads: ban or heavily tax oil, gas and coal consumption; ban fossil fuel transport; impose heavy restrictions or costs on commercial aircraft until they are sustainable; close non-renewable primary power plants. This may seem unimaginable, yet there is growing evidence that this is the pathway ahead.

The questions are about how and when. Take mobility. On the near horizon, as we illustrated in *Radical Innovation*, the convergence of hydrogen fuel cells and electric vehicles, city-scale sensor networks, traffic and vehicle automation, ‘mobility as a service’, and restrictions or bans on fossil fuels are all emerging. Cities like Copenhagen, Amsterdam and Helsinki illustrate what is possible. In Brazil, Curitiba has transformed bus transport. In China, autonomous electric vehicles look set to dominate urban centres within a decade.



Scenarios

To recap, cities face major challenges from rising temperatures, extreme rainfall, storm surges, flooding, higher sea levels, pollution, wildfires and population growth. If they respond with aggressive restructuring agendas to deliver long-term sustainability, there may be high short-term political costs. Policy and regulatory complexity, uncertainty and growing volatility add to risks.

In the most likely scenario, many cities face both extreme weather and long-term climate risks and at the same time major economic, political, social and cultural disruption, driven in part by the imperative for exponential innovation.

Maintaining social security and stability in the face of climate change is one of the defining challenges of the 21st century. Mass migration will expose cities to a new class of security and political pressures.

At one extreme, many of the world's cities fail to deliver coherent resilience strategies against short and long-term risks. Sea defences will fail to protect the most exposed coastal regions and become a decisive factor in raising long-term infrastructure capital. In this scenario, public loss of confidence in city leadership, weak investment funding and insurance restrictions on major developments create political crises. Funding and insurance for renewal of water, energy, agricultural and transport systems become prohibitive. Residential housing prices collapse in vulnerable areas that fail to develop coherent strategies.

In this scenario the insurance protection gap widens, as local and national governments and insurers scale back. This sends shockwaves through political and financial systems. It creates a chaotic risk and investment environment, squeezing the insurance and re-insurance markets. The impacts are, however, specific to individual locations.

In an alternative scenario, city leadership teams, many collaborating across regional and national boundaries, pioneer a sustainability revolution. They take radical action, irrespective of national and international political agreement. Long-term assessments of risk for particular locations shape the investment and insurance industry agenda. Vulnerability is assessed according to a set of new criteria, from long-term projections about sea levels and temperatures to resilient infrastructure. Flexible, adaptive, ecosystem-oriented strategies emerge that provide assurance against even the most extreme scenarios. A new realism about long-term risks and the importance of flexible strategic options emerges. Digital technologies transform understanding of strategic and operational risk.

For some cities, radical transformation is seen as an opportunity to address long-standing social and cultural inequalities. Cities are re-invented and redesigned, not just to meet the challenges of climate risks, but wider and deeper questions of security and automation. Transport is revolutionised within a decade, cutting both emissions and pollution, easing pressure on urban space and opening up sustainable regeneration of central areas. Food production is localised. Energy efficiency and renewables focus on decentralised self-sufficiency as green investment delivers jobs.

Insurance: Underwriting long-term security

In all scenarios, at least in some parts of the world, retreat to higher ground, or to cooler, climate-resilient regions will emerge as the preferred option, driving mass migration, even in the most developed, wealthy countries.

In the more extreme climate scenarios, even amidst radical innovation, corporations will relocate at scale, contributing to the emergence of havens, as an entirely new political and economic geography emerges. Climate resilient cities and regions will attract both investors and talent.

For the insurance industry, sanctuaries on the new, post-retreat front line of climate change will become focal points of activity. Underwriting of relocation risk will become a growing market. As we have described in separate essays, the convergence of green technologies with sensor networks; the Internet of Things; and artificial intelligence will transform the risk environment. Augmented and hybrid reality; drones, robotics; and mass automation will add to the momentum.

Early warning, prediction and machine control systems will become pervasive. Complexity risk alone may slow progress. In any case, demand for risk products and advisory services will rise.

More specifically, both government insurance systems and the industry play a vital role. In cities, how risk is shared between the public, government and private insurers will remain highly contested. There is, however, a shared agenda, which begins with cutting energy demand, primarily through well-known efficiency measures.

City-scale projects that demonstrate long-term resilience through vision-led innovation that integrates multiple services, such as water, waste management, energy and transport, will be rewarded. Insurers are key stakeholders, with multiple options, including:

- Increasing premiums or withdrawing insurance cover for fossil-fuel intensive sectors, such as oil, gas, coal and transport;
- Reducing premiums and tax burdens for cities, municipal areas and corporations that make long-term commitments to sustainable development and reduce systemic risk. For example, banning development on projected flood plains, or encouraging reforestation, or building 'natural' defences such as wetlands and marshes;

- Delivering novel predictive models, 3D virtual reality tools (such as ‘Virtual Singapore’), to design support and real-time monitoring by city planners so they can assess and price infrastructure design, renewal and development risk; and
- Develop ‘mass automation’ and insurance systems that accelerate the growth of green transport systems, as illustrated in our essay on Radical Innovation, particularly to cut traffic volumes, density, energy use and pollution.

The overarching challenge for the industry is to play an active role in accelerating redevelopment, with multiple national and local government institutions, investors, infrastructure designers and the public.

1 Source: UN Habitat.

2 <https://www.nytimes.com/interactive/2019/10/10/climate/driving-emissions-map.html?smid=nytcore-ios-share>.

3 <https://www.moody's.com/sites/products/ProductAttachments/Infographics/Environmental-Risks-Global-Heatmap-Overview.pdf>.

4 <https://www.blackrock.com/us/individual/insights/blackrock-investment-institute/physical-climate-risks>.

5 <https://www.goldmansachs.com/insights/pages/taking-the-heat.html>.

6 <https://www.sciencemag.org/news/2019/04/new-climate-models-predict-warming-surge>.

About the author

Peter Kingsley, Chairman and Co-Founder of The Oracle Partnership, chairs PJR, a specialist foresight and strategic advisory firm. He has provided foresight and thought leadership to major financial institutions, corporate boards and wealth managers for more than 20 years. Earlier in his career, he held senior strategic positions at Reuters and Dow Jones, amongst other things designing information and editorial services. He was a partner at Stanford Research Institute's futures think tank. His more recent work has included advising the leadership teams of international banks; the senior partner of a major hedge fund; the leadership team of one of Lloyd's largest insurance underwriters; one of the world's leading software companies; a regulator; one of the world's largest water engineering firms; and several utility firms. He originated, designed and led the Coutts 'Futurescope' foresight and thought leadership programme.

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