

Investing for resilience



ClimateWise

ClimateWise is a growing global network of over 30 leading insurers, reinsurers, brokers and industry service providers with a shared commitment to reduce the impact of climate change on both society and the insurance industry. It is a voluntary initiative, driven by its members and facilitated by the University of Cambridge Institute for Sustainability Leadership (CISL).

All members are independently annually audited on their integration of the six ClimateWise Principles across their business activities. The ClimateWise Principles include leading on climate risk analysis and climate-resilient investment, raising customers' climate awareness, and reducing the member's own carbon footprint.

Through ClimateWise, members also deliver a range of far-sighted and innovative Action Research Collaborations (ARCs), which bring together experts from across the insurance industry, partner organisation, regulators and academia. Participants identify and address gaps in how insurance can best support the transition to a low-carbon, climate-resilient

society, and ultimately mitigate the impact of climate change on international insurance markets.

The insight generated by ARCs is of vital importance, not only to the insurance industry and its customers, but to governments and civil society more broadly.

As ClimateWise expands its global membership and leverages the outputs of the ClimateWise Principles and ARCs, it is becoming an increasingly powerful leadership voice for the global insurance sector on climate change.

By joining or partnering with ClimateWise you will help to shape this debate and directly contribute to the successful transition to a low-carbon, carbon-resilient future.

The Societal Resilience Programme

ClimateWise Action Research collaborations bring together member and specialist expertise, to identify and develop commercial solutions to the challenges facing society as it transitions to a zero carbon, climate resilient future.

The Societal Resilience Programme explores ways the industry can proactively respond to the climate-risk protection gap – the growing divide between societal exposure to climate risk versus an overall decline in the penetration of commercial insurance.

Consequently, the Programme explores how insurance can leverage its full value chain, across its underwriting and investment activities, to support other parts of the financial system, and society more broadly, in its response to climate risk.

Three distinct, yet interconnected research pillars underpin the Societal Resilience Programme; resilient investing, resilient cities and resilient regulation on climate change.

Rewiring the Economy

Rewiring the Economy is Cambridge Institute for Sustainability Leadership's (CISL) ten-year plan to lay the foundations for a sustainable economy.

The plan is built on ten interdependent tasks, delivered by government, finance and business co-operatively over the next decade to create an economy that encourages sustainable business practices and delivers positive outcomes for people and societies.

CISL is particularly focused on supporting a just transition to a zero carbon economy and the role the financial system reform can play in that. In that context, CISL is pleased to convene ClimateWise, which exists to be the global insurance industry's leadership group to drive action on climate change risk.

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Lead author disclaimer

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Executive summary

As climate change progresses, severe weather such as flood, winds, and drought will increasingly impact people's health and wellbeing, as well as the broader economy. Climate change resilience will become increasingly important for society.

The insurance industry has a significant part to play in helping to promote societal resilience, given its expertise in assessing and managing risk and the vital role of insurance as a financial risk transfer mechanism. However, a protection gap is beginning to emerge as societal exposure to climate risk increases whilst insurance penetration declines.

Consequently, some commentators are questioning why the industry has not been more proactive in helping society to enhance its physical resilience to climate risks, particularly given its potential influence over the broader financial markets. With over US\$30 trillion in invested capital, the industry's asset management activities in particular have drawn increasing attention because of their potential to support the transition to a low carbon, climate-resilient economy. Although the current understanding of the potential financial risks posed by climate change—to companies, investors, and the financial system as a whole—is still at an early stage, the lack of consistent information has hindered investors and others from considering climate-related issues in their asset valuation and allocation processes. Despite this the role that insurers' asset management activities have played in respect to climate change mitigation has been prominent, with several of the larger international insurers making recent public announcements of divestment, from carbon intensive assets. However, at the same time there has been much less emphasis on understanding how the insurance industry could use its influence to promote broader societal resilience to climate-related perils.

The objective of this study is therefore to explore the relationship between the insurance industry, its investment activities and its potential support for climate resilience. This has been addressed through an overview of the existing and potential capabilities within the insurance industry's asset management, underwriting and risk management activities that could promote broader societal resilience to climate risk. This report is intended to act as a foundation for further research and discussion across this crucial area. In order to provide a broad overview, we engaged with a wide range of stakeholders across the industry's underwriting and asset management activities, as well as a variety of external stakeholders including representatives from rating agencies, engineering firms and central and local governments.

We found that insurers are not the natural investors in resilience infrastructure many external commentators perceive them to be. Whilst there is clearly a strong customer-oriented motive to

improve risks through good risk management to reduce losses for an individual insurer there is not a direct relationship between increased investment in resilience infrastructure and increased underwriting profits. However, it is evident that insurers have significant opportunities to support climate resilience across the broader financial markets through three distinct areas of activity:

1. Considering resilience within insurers' own investment activities,
2. Promoting resilience indirectly across the broader financial markets; and
3. Promoting societal resilience to climate risk in general.

This report identifies a number of specific actions that individual insurers (and other industry stakeholders) can take to promote climate resilience. While the individual impact of these actions may be limited, they could be significant collectively, especially if used to reinforce and support one other.

The report also identifies a major contribution that could be made by a number of industry participants working in partnership. It is notable that there is currently no effective method of measuring resilience: the resilience of investments, of property, of municipalities, of corporates – indeed any entity for which resilience is important. A widely applicable rating system would enable resilience to be considered across many areas of decision-making, including asset management, policymaking, and risk management. For example:

- Assessing the efficacy of actions taken to improve resilience;
- Supporting policymaking and urban planning;
- Supporting resilience impact bonds;
- Setting standards for new buildings;
- Supporting decision-making for investment in resilience;
- Service-level agreements for resilience services; and
- Supporting communication and education.

As a common language readily understandable by a broad range of stakeholders, a resilience rating system would provide a basis for communication. But defining such a system is not easy, and would require significant input and co-operation from many sources. The insurance industry, with its broad range of stakeholders and involvement in so many spheres of economic activity, is well placed to help lead and co-ordinate this effort and many new commercial opportunities could be realised by doing so.

ClimateWise members 2016



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Forewords



Maurice Tulloch

Losses caused by natural catastrophes in the first half of 2016 were significantly higher than the corresponding figures for the previous year, driven by powerful earthquakes in Japan and Ecuador, storms in Europe and the US, and forest fires in Canada. In total, losses to the end of June came to US\$ 70bn (HY15: US\$ 59bn), of which US\$ 27bn (HY15: US\$ 19bn) were insured.ⁱ

The impacts of earthquakes aside, these figures starkly illustrate the growing threat from climate change. Moreover, the relevance of our industry's role, as society's financial risk transfer mechanism, is being undermined by the widening protection gap – the gap between rising societal exposure to climate risks and declining insurance penetration.

Ironically, it may well be our specific focus on the financial transfer of risk that is, in part, further fuelling the protection gap.

Our traditional response to rising levels of risk – to re-price, withdraw or transfer exposure to others – will always remain a central feature of how insurance manages its risk pools, but we will struggle to reduce the protection gap if our response to climate change is limited to avoiding, rather than managing, risk.

Managing societal resilience to climate change will therefore become more pressing as exposure to it intensifies. In response, ClimateWise's Societal Resilience Programme, of which this study is part, brings our members together with key experts to identify actionable solutions for how the insurance industry can better manage and support society's response to climate risk right across its value chain.

Investing for resilience focuses specifically on the industry's role as a key stakeholder within the financial services sector, with respect to investing for resilience, and provides a valuable contribution to help better understand where untapped potential currently resides within the insurance industry and its potential to help others in their response.

I want to personally thank all those who contributed to this study, especially the many representatives from across the ClimateWise membership base who gave their valuable time and insight.

A handwritten signature in black ink, appearing to read 'Maurice Tulloch', written over a horizontal line.

**Maurice Tulloch, Chair, ClimateWise and
Chairman, Global General Insurance, Aviva**

ⁱ Munich Re. (2016, July 12). Loss review for the first half of 2016: Storms and earthquakes drive losses up. [Press release.] Retrieved from <https://www.munichre.com/en/media-relations/publications/press-releases/2016/2016-07-12-press-release/index.html>



John Scott

Investing for Resilience is an important report that attempts to clarify and explore how the insurance industry can support societal resilience to climate change. It seeks to help policymakers understand the prudential limitations of using insurers' balance sheets for direct investment in climate resilient infrastructure, whilst highlighting areas of expertise from insurance underwriting and risk engineering that can guide effective impact investing approaches such as green bonds.

It is in these areas where the insurance industry can work with multiple stakeholders to guide and influence the most effective resilience-enhancing investments.

As a risk carrier and risk manager, the insurance industry has a significant role to play in helping to shift the broader financial system to start investing in ways that can promote resilience to climate risks. In so doing, the report is intended to inform both the investment industry, on its untapped potential and to act as a reference point for other stakeholders as investing in resilience becomes more mainstream e.g. national and local government, planners, property developers, land owners including the farming community, utilities (especially water) and business.

If society is truly to address the threat of climate change and fulfil the COP 21 goals targeted policies and investment in GHG mitigation technologies, in particular in the powergen, transportation, heating and energy-efficiency sectors is critical. In parallel, finding viable ways to help society adapt and become more resilient to the inevitable changes related to ongoing climate change, will be crucial. The insurance industry has the potential to lead the charge in this respect.

A handwritten signature in black ink, appearing to read 'John Scott', written over a light blue horizontal line.

John Scott, Investing for Resilience Research Chair and Chief Risk Officer, Zurich Global Corporate, Zurich Insurance Group

1. Introduction

Resilience to climate hazards such as flood, winds, and drought is of growing importance for society, as a more resilient society is more likely to thrive and maintain healthy economies. However, as weather patterns continue to shift due to climate change, the pattern of climate-related hazards is also changing. It is now widely accepted that society will become increasingly exposed to the negative impacts of climate change, making the need for climate resilience more pressing.

The insurance industry has historically played an important role in helping to minimise the impact of climate losses, based on its provision of a financial risk transfer mechanism (via underwriting climate risk) and its unique expertise in helping to assess, manage and communicate risk exposure. Yet, although there has been important work done on how the industry's investment activities can help to mitigate climate change through a reduction in greenhouse gas emissions, there has been little focus on the role its activities can play in helping to promote climate resilience.

This report therefore maps out the current resilience landscape, and explores how the insurance industry can help to foster societal resilience to climate risks through its own investment portfolios, through its influence and support for other parts of the financial system and through supporting society more broadly.

There are many ways that the insurance industry can foster climate resilience through its everyday activities. Insurers can invest directly in projects that increase resilience and encourage and support resilience more generally by investing in resilient assets or through shareholder action. The industry can also promote resilience through its underwriting activities. The data and expertise of the broader industry – including brokers, loss adjusters, modellers and consultants – can be used to investigate what measures would be most effective in improving resilience. Finally, the industry's corporate social responsibility programmes can help to educate people about the value of resilience and provide financial support for activities that can help to achieve it.

From an insurance industry perspective, resilience is a nuanced concern. Outside the industry, it is widely believed that insurers, more than other financial industry stakeholders, have a vested interest in promoting climate resilience and are therefore obvious investors in, for example, projects to improve resilience. However, the relationship between resilience and insurance profits is far from straightforward. In some cases, increased resilience might result in more profitable underwriting, if the reduced risk is not matched fully by a reduction in premiums, while in others it could actually reduce profits as premium income comes under pressure as a result of the new lower risk profiles of the insured.

Yet there are likely to be significant indirect benefits for the insurance industry from increasing societal resilience to climate risks over the long term. With increased resilience, fewer assets are likely to become uninsurable, thereby helping to maintain or improve overall insurance penetration and enable the insurance industry to continue to perform its role as “society's risk manager”.¹ Improving resilience is therefore a vital component in managing the growing climate risk protection gap (see figure 1).

While achieving a more climate-resilient society is an important concern for a wide variety of stakeholders, there are no silver bullets, and insurer actions alone will not provide the levels of resilience society needs. Yet insurers do have a unique perspective, thanks largely to their combination of underwriting and asset management activities. They are well positioned to lead many of the societal changes required, together with other stakeholders, including policymakers, regulators, rating agencies and asset managers.

Consequently, the objective of this report is to understand the relationship between the insurance industry, its various investment activities and the broader support it can offer for climate resilience. It attempts to provide an overview of the potential capabilities within the industry that could help to promote societal resilience to climate risk, thus acting as a foundation for further research and discussion in this crucial area. In so doing, the report introduces some of the ways the insurance industry can make a significant contribution to fostering societal resilience to climate risks by helping to nudge the broader financial system into a new trajectory.

Many of the actions that individual insurers (and other industry stakeholders) can take are comparatively small scale. Yet while their individual impact may be small, they could be collectively significant, especially if used to reinforce and support multiple efforts by a broad range of stakeholders.

Economic versus insured catastrophe losses, 1970–2015

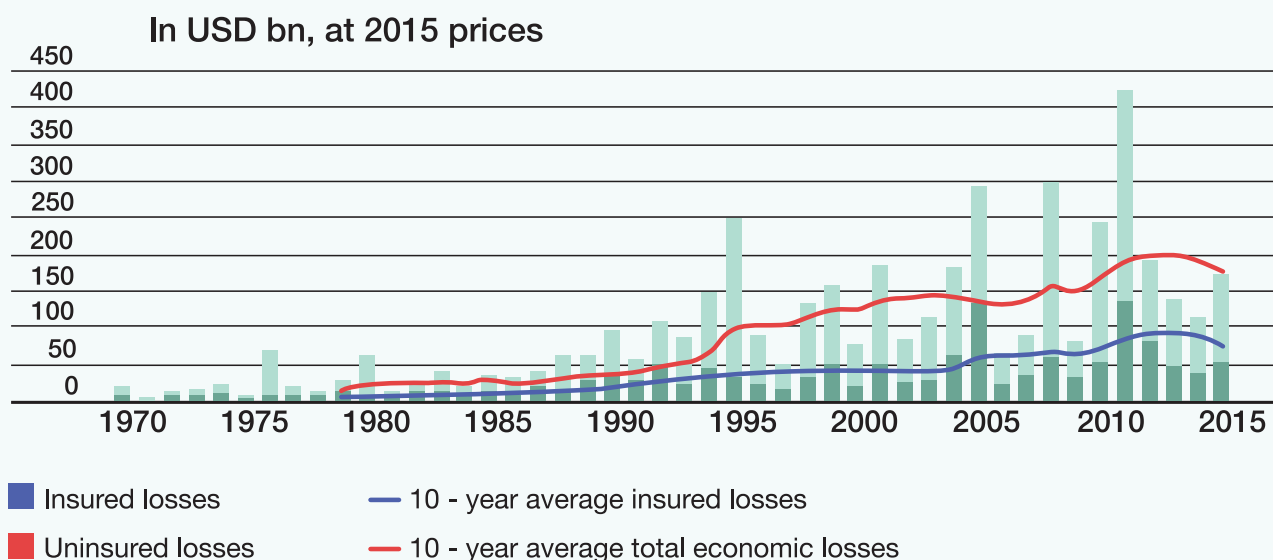


Figure 1: Source: Swiss Re Economic Research & Consulting, 2015.

These actions would be further enhanced by the existence of a universal climate resilience rating system that would allow resilience to be considered, benchmarked and communicated across different areas of decision-making. This could include the resilience of investments, of property, of municipalities, of corporates – indeed any entity for which resilience is important.

The insurance industry, with its extensive data, array of stakeholders and engagement in so many different spheres of economic activity, is well placed to help lead and co-ordinate the development of such tools. From this, many new commercial opportunities could be realised.

Actions for insurers

- Initiate a virtuous circle reinforcing the desirability of resilience by adding resilience as an appropriate feature of investments (section 3.1);
- Offer options for resilience investing to policyholders (section 3.4);
- Develop new types of insurance cover or adapt existing ones to support the monetisation of returns on investing in resilience (section 4.3);
- Support platforms to package, market and sell investments in resilience projects (section 4.4);
- Adopt indemnity bases that include resilience reinstatement (section 5.2);
- Provide long-term incentives to policyholders through multi-year insurance policies (section 5.3);
- Provide long-term incentives to policyholders through profit-sharing insurance pools (section 5.4);
- Participate in stakeholder partnerships with municipalities and government agencies (section 5.6);
- Second staff to local and national government departments and agencies (section 5.6); and
- Increase the focus on resilience in CSR activities (section 5.7).

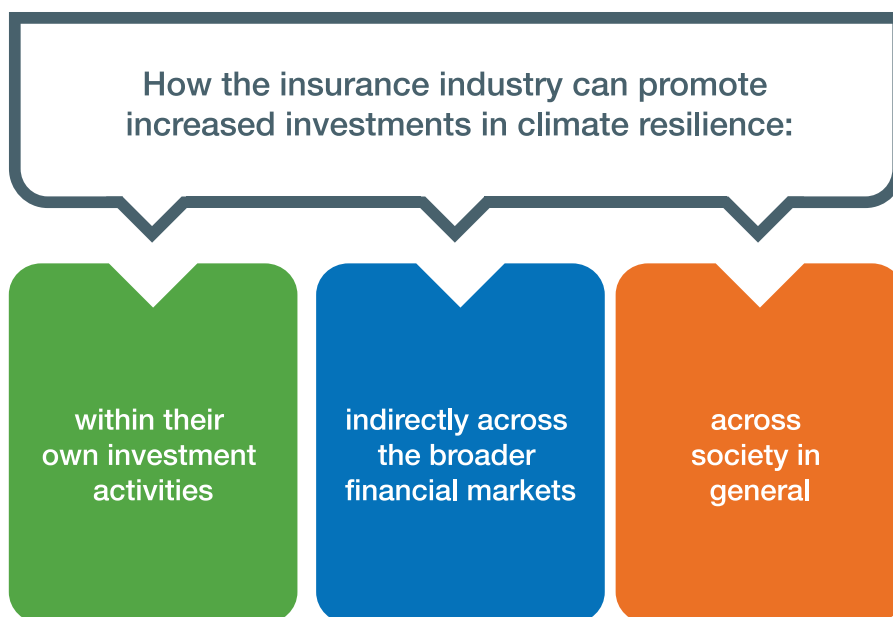
1.1 Report outline

Section 2 discusses what is meant by resilience, starting from the position that being more resilient means suffering less overall damage from an adverse event, by avoiding it, minimising its impact, or helping to enhance recovery. We summarise a range of definitions of resilience, and consider the forms it can take, where it is found, and methods of improving it. We conclude that the lack of a consistent means of measuring resilience is a major hindrance (section 2.3) and the development of a standardised resilience rating tool would be an invaluable device as society responds to climate risk (section 2.4).

Section 3 explores how insurers could start to consider climate resilience directly within their investment portfolios. It considers some of the benefits of investing for resilience and how resilience could be integrated into insurers' investment decisions. We note that, although there is a widespread perception that insurers are natural investors in resilience, the reality is far more nuanced. Improved resilience will not necessarily result directly in increased profitability. Yet improved resilience is an important contributor to increasing the overall penetration of insurance,

thus enabling the industry to maintain its role as society's risk manager (section 3.1). We also observe that the widespread incorporation of resilience into investment decisions could lead to a virtuous circle, reinforcing the desirability of resilience and its societal importance (section 3.2). After discussing the potential role of resilience in asset allocation and risk management (sections 3.3 and 3.4), we note that the existence of methodologies and tools for benchmarking the resilience of various investments would further encourage the explicit incorporation of resilience into investment decisions (section 3.6).

Section 4 considers how the insurance industry could promote climate resilience more broadly through the financial markets. Resilience is moving up the agenda at local and regional levels, with the establishment of a number of national and international city networks. Several cities have started to issue green bonds, and the use of such instruments to finance resilience is a natural progression (section 4.1).



However, not all resilience projects can be funded by local governments, many of which are already struggling with limited budgets and competing priorities. The beneficiaries of projects that improve resilience are often broad and diffuse, raising the challenge of how economic returns from resilience can be monetised to provide the necessary returns on investment (section 4.2). We consider how potential beneficiaries of resilience can co-operate as groups, and how developing new types of insurance cover might support them, while assisting in the monetisation of returns (section 4.3). Even if projects with clear financial returns can be identified, there is still the difficulty of finding investors – or alternatively, of investors finding suitable projects (section 4.4). One proposal is that centralised platforms be set up to package, market and sell urban infrastructure investments to the private sector. We note that the problems are not limited to urban infrastructure investments, but apply to resilience projects more generally, and that the insurance industry could have a key role to play in establishing and operating such platforms.

Section 5 considers how insurers can promote societal resilience more generally by supporting investments by others. We discuss how insurance can help to incentivise resilience in sections 5.1 to 5.4, concluding that in some instances the incentives provided by insurance policies are misaligned with the promotion of societal resilience to climate risks. Section 5.5 discusses the possible emergence of ‘resilience services’ and the need for closer alignment by policymakers and regulators. A number of observers highlight the need for holistic thinking around city resilience, and the skills and knowledge required to fully understand the implications that proposed policies – including environmental, financial and commercial – may have. With its risk management and investment expertise, the insurance industry could add significant value (section 5.6). Section 5.7 notes that it will probably never be possible to provide sufficient financial returns on all investments in resilience to make them attractive to insurers and other institutional investors. Insurers have a long track record of contributing to such projects as part of their corporate social responsibility (CSR) programmes.

1.2 Methodology

This report is based on desk-based research and on a number of interviews and workshops we held with a broad range of stakeholders from the insurance industry and beyond.



2. Resilience

Theoretically, resilience should be considered in relation to risk, as resilience to one type of risk does not necessarily imply resilience to all other risks: an entity might be very resilient to flooding, for example, but have poor resilience to earthquake or windstorms.

Resilience is often thought of in terms of natural disasters (such as weather events, earthquakes, volcanic eruptions and so on), yet resilience to other risks (such as cyber or financial) might be equally important in some contexts.² However, some aspects of resilience, especially those concerned with social structures that enhance recovery (such as organisation and government) rather than physical aspects that limit damage in the first place (such as building construction techniques), are probably common across a broad range of risks.

In this report we take a broad view of what constitutes resilience. We characterise it in relative terms: being more resilient means suffering less overall damage from an adverse event, whether as a result of avoiding it, reducing its impact or enhancing recovery.

2.1 Defining resilience

Resilience is often considered in the context of disaster relief: for example, the “United for disaster resilience” statement sponsored by the Principles for Sustainable Insurance framework of UNEP FI.³ The United Nations Office for Disaster Risk Reduction (UNISDR) developed the Hyogo Framework for Action 2005–2015, and the 10-year international disaster risk reduction plan, which preceded the Sendai Framework for Disaster Risk Reduction 2015–2030.^{4,5} The World Bank and Asian Development Bank have also identified investing in disaster resilience as a crucial component of sustainable development.^{6,7}

Many definitions of resilience have emerged (see box for examples), mainly focusing on complex adaptive systems (cities, institutions, forests and so on) consisting of large numbers of interacting agents; the resilience of the system as a whole emerges (or fails to emerge) from the cumulative effect of those interactions. However, more simple resilience is certainly possible on a local or individual scale – such as the ability of a building to withstand a windstorm. This individual resilience is especially prominent when considering less severe events.

Definitions of resilience

Rockefeller Foundation⁸

- Helping cities, organisations, and communities better prepare for, respond to, and transform from disruption.

Stockholm Resilience Centre⁹

- Resilience is the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop. It is about how humans and nature can use shocks and disturbances, like a financial crisis or climate change, to spur renewal and innovative thinking.

100 Resilient Cities¹⁰

- Urban resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience.

NJ Resiliency Network¹¹

- Municipal resilience is the ability of a community to adapt and thrive in the face of extreme events and stresses. Municipal resilience is achieved by anticipating risk, planning to limit impacts, and implementing adaptation strategies that integrate all community systems – civic, environmental, social and economic – to support recovery and growth.

Department for International Development (DFID)¹²

- Disaster resilience is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses – such as earthquakes, drought or violent conflict – without compromising their long-term prospects.

Hyogo Framework of Action¹³

- Disaster resilience is the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.

2.2 Where resilience can be found

Resilience can be evident at all levels of society, from international coalitions through nation states, local governments, corporate and other organisations down to individual SMEs, households and individuals. In this report we focus on resilience at the local or regional level, corporate resilience and SME or household resilience.

Climate events

Some examples of possible events that could occur more frequently or with more severity due to climate change include:¹⁴

- Heatwaves;
- Freezes;
- Heavy precipitation (rain, snow, hail);
- Drought and water shortages;
- Landslides;
- Windstorms and cyclones;
- Flooding (storm surge, pluvial, fluvial, rising groundwater); and
- Fire (wild and urban).

We also focus specifically on resilience to climate hazards – to physical risks arising from the weather or more general climatic conditions. Climate hazards will be affected by climate change, as rising global average temperatures are likely to lead to more extreme weather events and rising sea levels. Both short-term climate events and long-term changes (such as changes in groundwater levels causing subsidence) can disrupt people's lives and the economy in many ways. They damage property and physical infrastructure and can cause infrastructure services, such as water, energy and communications, to fail. Through infrastructure failures and their impact on supply chains, their effects can be felt over wide geographical ranges. Food security can be threatened through agricultural or transport failure. Some of these changes will affect what areas are habitable or viable for agriculture. Some industries, especially those dependent on abundant water supplies, may have to change how they operate.

These physical risks are not the only risks posed by climate change. Other risks are also significant – for example, the transition to a low carbon economy will have significant effects on investments.¹⁴ However, the implications of that transition, and the role that investors will play in it, are not the focus of this report.

There are many ways in which resilience to climate hazards can be improved (see box). Another way, not considered in this report (as it is covered extensively in the existing literature), is to limit the incidence of adverse events through the mitigation of climate change – if the scale of climate change can be limited, then some adverse events are less likely to occur.

Improving resilience

Resilience can be improved by avoiding adverse events, limiting their impact, or enhancing recovery. For flood risk, this could mean:

Avoiding adverse events

- Relocating out of a flood plain;
- Switching to a supplier that is not located in a flood plain;
- Disinvesting from companies located in a flood plain.

Limiting impact

- Creating upstream flooding and retention areas;
- Building flood defences to prevent the incursion of water;
- Designing floatable buildings or buildings on stilts;
- Retrofitting buildings to be more resistant to flood damage, such as by raising electrical systems above ground level;
- Having an effective business continuity plan in place;
- Avoiding an over-dependence on a single supplier or group of suppliers.

Enhancing recovery

- Having effective evacuation plans in place;
- Having sufficient back-up resources to effect rapid repairs.

2.3 Ways of quantifying resilience

Although the definitions discussed in section 2.1 are helpful in considering resilience, they are qualitative rather than quantitative. They do not directly enable us to answer such questions as “how resilient is [X] to risk [Y]?” or “by how much will this project increase resilience?”

One useful way to consider resilience in this context is to think about maximum probable annual losses across various return periods.¹⁵ Halving the maximum probable annual loss to flooding, over a given return period, would indicate a significant increase in resilience. Resilience to different levels of risk or event type can be analysed by looking at different return periods. For example, resilience to catastrophic events may well not be the same as resilience to all insurable events – a house or other building may be very resilient to a 100mm flood, but not to one greater than 900mm.¹⁶

However, reducing the maximum probable annual loss at, say, a 1-in-100 return period does not in itself constitute resilience. In the case of flooding, the improved flood defences might lead to a misplaced sense of security. Over a period with no floods, crucial knowledge of how to manage them could be lost, so the arrival of a 1-in-500 year event that overwhelms the flood defences could have a far greater impact than would otherwise have been the case. Relying solely on return periods to measure resilience could also lead to a focus on controlling the effects of extreme events, thereby ignoring the many smaller events that can significantly impact lives and property. Any measure of resilience should therefore address the question of scale as well as that of frequency, and look at the effects of a broad range of events.

Moreover, considering only probable annual losses could lead to a neglect of the non-financial impacts of an event, such as health, society and the environment – the natural capital aspects that are such a crucial aspect of many of the definitions of resilience. The work on integrated reporting that is currently underway might provide some useful tools for incorporating the value of natural capital into loss assessments, but it is not only the scale of loss that is affected by resilience – it is also the time period over which the loss occurs.¹⁷ Increasing resilience should, other things being equal, reduce the time needed to recover from an event, an aspect that should be considered when assessing it.

Resilience can operate on varying timescales. As a generalisation, recovering from adverse events requires a shorter timescale than avoiding future events – and recovery can inhibit longer term resilience. For example, the rapid restoration of a building to its former state immediately after a windstorm is a result of good resilience in the short term, but higher levels of long-term resilience could be achieved by relocating to an alternative location, or rebuilding to a higher standard than before. In some senses, then, if interpreted too rigidly, resilience could become a conservative force, inhibiting change and innovation (see also section 5.2). A longer term notion of resilience is likely to be more beneficial to society, although this may make its assessment even harder.

Quantifying resilience is far from simple. However, it is a problem that needs to be addressed. Without being able to quantify resilience, it is difficult to assess it, and in particular to assess the effectiveness of actions to improve it. Further research into quantifying resilience is a vital component in the development of an effective and widely accepted resilience rating system, which itself could be a valuable tool in supporting effective integrated reporting.



2.4 The need for a resilience rating

As this report makes clear, a widely applicable resilience rating system would enable resilience to be considered in many areas of decision-making, including asset management, policymaking, and risk management. As a common language readily understandable by a broad range of stakeholders it would provide within it a basis for communication on resilience and investments.

Defining such a system is not easy, and would require input and co-operation from many sources. The insurance industry, with its broad range of stakeholders and its involvement in so many spheres of economic activity, is well placed to lead and co-ordinate this effort.

There are many questions that need to be answered, not least whether it is possible to develop a single rating system that could be applied across a broad range of entities and risks, or whether it would be more practical to develop a methodology that could be used for ratings systems in a range of different

contexts. In either case, the insurance industry's contribution would be to leverage its existing tools, data and methodologies to contribute strategically to the development of such tools and thereby support more informed decisions by other stakeholders inside and outside the industry.

A new rating system would introduce new information, or present existing information in a different light, to a broader range of stakeholders. This could pose moral and ethical questions: for instance, a city's credit rating could be downgraded due to a poor resilience rating – whereas if its resilience remained unrated, its credit rating could have remained unchanged. The introduction of new information to the market can therefore lead to unintended negative consequences and these need to be taken into account. However, in the long run, the ability of a city to understand (and communicate) its resilience, and plan accordingly, could be crucial in securing new investment opportunities.

The value of resilience ratings

- Assessing the efficacy of actions taken to improve resilience (section 2.3);
- Integrated reporting (section 2.3);
- Asset allocation in investment portfolios (section 3.3);
- Supporting secondary markets in resilience (section 3.6);
- Supporting policymaking and urban planning (section 4.1);
- Supporting resilience impact bonds (section 4.2);
- Setting standards for new buildings (section 5);
- Supporting decision-making for investment in resilience (section 5.2);
- Providing standards for property maintenance for multi-year insurance policies (section 5.3);
- Supporting membership criteria for profit-sharing insurance pools (section 5.4);
- Service-level agreements for resilience services (section 5.5); and
- Supporting communication and education (section 5.7).

3. Promoting resilience within insurers' investment portfolios

Investors, including insurers, have a variety of reasons for holding financial assets, typically based on a need for future cash flows – for instance, in the case of insurers, in order to pay future insurance claims.

The cash flows can be provided through either income or capital growth. The financial returns from investments are consequently of primary importance, in terms of both their magnitude and predictability. However, investments can also provide additional benefits that are not purely financial, which can affect their overall desirability or otherwise. In this section we discuss the effects of resilience on investments, and unpick some of the benefits that investing for resilience could have for the insurance industry.

3.1 Insurers are not natural investors in resilience

It is widely assumed that insurers, more than other investors, have a particular interest in resilience and are obvious sources of funds for investing in resilience. The two arguments generally used to support this view are that insurers will benefit directly from enhanced resilience, via lower claims costs and the resulting higher underwriting profitability; and that improved resilience will lead to more risks becoming insurable, thereby creating new market opportunities.

The limits of insurability

A risk is **insurable** if:

- The risk can be defined so that it can be reasonably and unambiguously determined whether there is a genuine claim under an insurance policy, and how much that claim amounts to;
- An insurer is prepared to write the insurance at a price that can be offered in the market; and
- There are potential policyholders who are prepared to buy the insurance at the price offered by the insurer.

The factors that contribute to insurability include:

- Whether the potential policyholders perceive that there is a risk against which they would like protection;
- Whether the risk aversion of the potential policyholders is high enough to justify the cost of insurance;
- Whether the insurers have enough information to be able to judge the price at which they can write the insurance profitably; and
- The attitude of regulators to the proposed price.

Resilience can improve insurability in the face of climate change by:

- **Limiting the increased risk**, leading to lower premiums, lower policyholder excesses or less restrictive terms and conditions. Resilience can thus increase the demand for insurance (if potential policyholders see it as good value for money), or make it possible to write the insurance profitably (for example, if regulators limit the prices that can be charged).
- **Limiting the uncertainty**. Climate change may make it less feasible to extrapolate from past experience to project the frequencies and levels of claims that might be expected in the future, thus making it more difficult for insurers to price the risk. However, increased resilience can help to limit the possible levels of claims, meaning that insurers can limit the margin they need to add to the premium to allow for the uncertainty.

The weaker argument is that insurers will benefit from improved resilience through lower claims costs. However, in reality, most insurance contracts cover a 12-month period (or less). This means that insurance premiums can (and usually do) respond very quickly to changing levels of risk. A reduction in risk does not therefore necessarily lead to increased profitability, but can result in lower premium rates, particularly in open and competitive markets. The effect on profitability therefore depends on the price sensitivity of policyholders (both potential and actual) – if policyholders are less sensitive to prices, the reduction in premiums may not fully reflect the reduction in risk, so profitability will increase; but if they are more sensitive, or the market is especially competitive, the reduction in premium may be greater than the reduced risk would imply, leading to reduced profitability.

Insurance profitability does not necessarily depend on the level of risk. At high risk levels the volume of insurance policies sold is often low, due to higher premiums. Conversely, at very low levels of risk there may be no demand for insurance (see box). The overall profit to the insurer depends on both the volume of policies sold and the level of profit margins.

Furthermore, any investment by an insurer that results in enhanced levels of resilience, and thus a lower risk, is unlikely to benefit only that insurer's policyholders. Improved resilience is far more likely to benefit a broader cross-section of society, which may itself be insured by multiple insurers or not insured at all. Any positive impact on insurance profitability of a resilience investment would therefore not be limited to a single insurer.

As climate change increases risk levels, insurance for climate risk will generally become more expensive and therefore potentially less attractive to policyholders. If potential policyholders take a different view of risk from that of their insurer, they may consider insurance to be too expensive, leading to the risk becoming effectively uninsurable (see box). However, increased resilience can counteract this trend, by reducing risk levels and maintaining insurability. Improved resilience is thus crucial for maintaining the overall penetration of insurance, thereby enabling the industry to perform its core function as a financial risk transfer mechanism. Insurers should therefore be natural supporters of resilience, even though that support may not necessarily take the form of direct investment.

3.2 Why invest for resilience?

Although insurers may not have as strong reasons for investing in resilience as is commonly thought, there are still many ways in which resilience can play a significant role in investment decisions, from selecting investments that can directly improve another party's resilience; selecting investments that can improve the insurer's own resilience to climate risk; through to investing in assets that are resilient themselves or enhance the resilience of others.

The benefits of resilience to insurers

Investing in resilience can provide the following general benefits to insurers (and other investors):

- Reduces their exposure to climate risks;
- Helps to further diversify their investment portfolios;
- Helps manage the transition risks of moving to a low carbon economy (as resilient assets are less likely to be impaired);
- Supports brand and reputation, thereby reducing the risk of hostile investor activism;
- Strengthens the corporate social responsibility argument by supporting the image of a future-oriented and socially engaged company;
- Investing in projects that increase resilience can help to protect or enhance the value of other, related assets, in the same way that investing in infrastructure improvements (like London's CrossRail project) may benefit the owners of neighbouring land or property;

- Fostering a culture of resilience encourages healthier economies, thereby benefitting the overall business environment and supporting growth; and
- Communicating the value of resilience encourages other stakeholders to embrace it, thereby contributing to a mutually supportive societal trend.

It can also provide benefits that are specific to insurers:

- Helps to avoid unintended concentrations of risk, by minimising exposure to assets subject to the same risks as their underwriting liabilities;
- Reduces the threat posed by the general perception from outside the industry that insurers are natural investors in resilience, yet fail to deliver; and
- Fostering a culture of resilience helps to prevent risks from becoming too severe to insure, which would weaken premium income and exacerbate the protection gap.

3.3 Integrating resilience into portfolio management

Perhaps the most obvious way of investing for resilience is by selecting investments that directly enhance climate resilience, such as flood-defence infrastructure projects or schemes that finance landscape management practices to limit the impact of drought. These types of investments usually enhance resilience collectively for society, and are discussed further in section 4.

Another option is to invest directly in resilient assets, for instance in the shares or bonds of resilient companies, or in property that is resilient to climate risks. As more investors make these choices, the demand for such assets will increase, signalling that resilience is valued by investors, and reinforcing incentives for companies, property developers, local governments and other bond issuers to invest in improving their resilience.

Investing in corporates whose businesses enhance the resilience of their clients is a further option. Such businesses include construction firms specialising in retrofitting buildings against flood or windstorm damage, or that are incorporating resilience into greenfield projects; firms developing technologies that improve the water efficiency of manufacturing processes; and firms developing new construction materials that enable more resilience. Again, selecting such investments could support a virtuous circle that reinforces the desirability of resilience.

Finally, insurers and other investors can improve their own resilience through their investment portfolios. This could involve selecting resilient investments, or strategies such as avoiding geographic concentrations, especially in areas with above-average exposure to climate risks.

Insurers can help to initiate a virtuous circle reinforcing the desirability of resilience by prioritising resilience investments (subject to the need for all investments to meet the usual criteria of financial returns and risk diversification). Asset owners can include resilience as a desirable characteristic in the mandates they give their investment managers; analysts and consultants can include resilience in their analyses; and bond issuers can highlight resilience considerations.

Investors value financial returns from their investments, but they also take account of risk: they balance the benefits of a potentially high rate of return against the possibility of achieving a lower rate or even an outright loss. Investors have different attitudes to risk and return, depending on their own individual goals, and therefore have varying investment strategies. These strategies are generally based on the principle of determining what proportion of an investment portfolio should be invested in particular asset classes (asset classes are groups of assets with similar characteristics in terms of risk and reward). Traditionally, asset classes are based on income volatility and asset liquidity – for instance, asset classes that are commonly used include equities, fixed income and property. The idea is that assets in each class behave differently over time, and are subject to different risks, so that spreading investments across asset classes provides diversification.

However, instead of characterising assets by income volatility, it could be possible to characterise them by the sensitivity of their value (both capital value and income) to specific risks, such as climate risks. Accordingly, investments in industries affected in similar ways by climate risks, or in assets in similar geographic areas, would share similar characteristics. Assets with similar degrees of climate risk resilience could be grouped together. Investors could then allocate their portfolios in terms of the proportions invested in assets that are more or less resilient, rather than by income type or volatility.

In a world where climate risks are recognised as a major driver of investment decisions, the characterisation of investments by resilience, supported by an appropriate resilience rating system, would likely become more common. Assets in industries (or enterprises) that are resilient to climate change would become more in demand under this model, and assets in industries that enhance the resilience of their customers would be likely to perform well as demand for resilience increases.

3.4 Securing client mandates to invest in resilience

Policyholders have no direct financial interest in the investments of most insurers. Whether the investment performance is good or bad has no direct effect on them (although poor performance may indirectly result in more expensive premiums). However, insurers' investment strategies may be of interest to some policyholders even in the absence of a direct financial interest, and the policyholders of many life insurers do actually have a direct financial interest in substantial proportions of the insurers' investments.

Increasingly, policyholders (and other consumers of services) care about the overall social impact of the companies with which they do business. An insurer's investment strategy can thus become part of its overall business model as well as a marketing tool. As society at large becomes more aware of the need for resilience, a strategy of resilient investing will be an increasing advantage. This notion of using an investment strategy as a marketing tool is already being used by QBE in the UK. Under its "Premiums4Good" programme, its policyholders can opt for up to 25 per cent of their premiums to be invested in investments with an additional social objective, including Social Impact Bonds and Green Bonds.¹⁸ This option does not affect the premiums those

policyholders pay. Policyholders that exercise the option get an annual report on the projects that they have supported through this scheme, and can use that information in their own corporate social responsibility reporting (QBE's policyholders are primarily corporates).

Many life insurance policyholders have a direct financial interest in life insurers' investments, as the amount they receive from the policy is directly or indirectly linked to the investment performance. In these cases the insurers are acting as asset managers for their policyholders, and often offer the policyholders a variety of investment options.

As a result of the growing awareness of the need for resilience, it will be increasingly important for life insurers to offer explicit resilient options to their policyholders, and for other investment managers to offer them to their clients.



3.5 Managing resilience across investment and underwriting portfolios

The primary purpose of insurers' assets is to enable them to settle future claims arising from the insurance policies they write. It is therefore important that the assets do not lose value when the claims fall due – in other words, that the asset risk is not highly correlated with the underwriting risk. Insurers with heavy exposure to climate-related risks through their underwriting activities therefore try to avoid assets exposed to the same risks. For instance, an insurer writing property insurance in a region subject to windstorms or flooding is unlikely to invest heavily in property or infrastructure in the same area.

Property is not the only type of asset whose value is affected by weather. Some industries are very weather dependent (in the UK, breweries do better in sunny weather) and some corporates rely on facilities or infrastructure that may be impacted by climate-related risks. Floods in Thailand in 2011 led to massive

disruption in the domestic electronics and automotive industries, but also in those industries in Japan and further afield, which saw a significant drop in their profit margins.^{19,20,21} Assets invested in those industries would therefore not have been suitable for backing the claims arising from the floods. Other industries that might be very sensitive to climate-related risks include the leisure and energy sectors.

Investing in resilient assets can help to reduce the impact of risk accumulations between assets and liabilities, as well as risk concentrations in the investment portfolio.

The reality of insurers' invested assets

Insurers' assets exist in order to enable the payment of future claims. They are needed for two primary reasons: because of the delay between the receipt of premiums and the payment of the corresponding claims, and in order to smooth out the variations in claims over time (some years there will be fewer claims than expected, while in other years there will be more). The investments held by insurers must therefore be able to produce the appropriate cash flows to pay claims, either through being sold or by producing income. Insurers therefore apply criteria such as the following when investing their assets:

- Financial returns: the investments should produce competitive rates of return;
- Liquidity: the investments should be able to be sold if the proceeds are required in order to pay claims; and
- Risk: the investments should not be subject to the same risks that are likely to produce claims.

The detailed criteria that are used depend on the type of insurance that the investments are intended to support. For property insurance, for example, claims are likely to arise due to severe weather events, and are usually paid within a short time. Investments supporting property insurance should therefore be relatively liquid, and their value should not be affected by severe weather events. Payouts under life insurance policies or annuities, on the other hand, typically occur over much longer terms, and the related investments also have longer terms. However, life insurance payouts are usually unaffected by severe weather events.

The investments that are held by insurers are also subject to regulation. In some jurisdictions the types of investments are limited; in others, regulation addresses the characteristics of the investments (such as their liquidity) rather than their specific form.

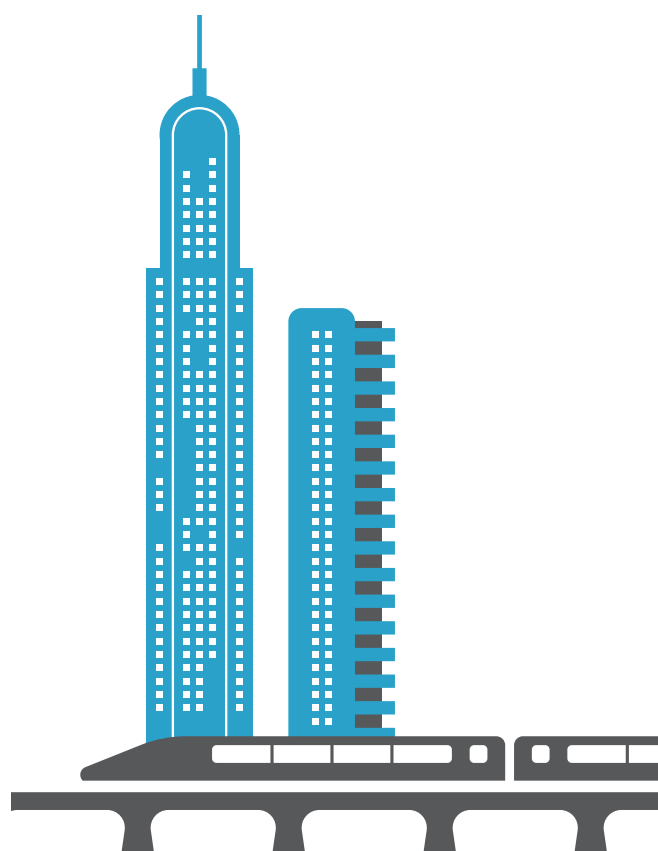
3.6 Assess the value of resilience of investments

If resilience is to play an explicit role in investment decisions, insurers and other investors will need to be able to assess the resilience of specific investments, and adjust levels of resilience without affecting other portfolio characteristics of interest to them. Furthermore, it is likely that a secondary market in resilience would develop, which would require external standards for measuring assets' resilience.

Resilience assessments of investments would therefore need to be consistent across different types of investments, in terms of both the traditional asset classes and industry groupings. However, the standards would need to take varying local or regional considerations into account in order to accommodate the different risks and their solutions. They would also need to change over time, as the risks evolve with climate change. As major investors with extensive expertise in helping to understand and quantify risk and resilience, insurers could play a significant role in helping to develop such standards.

For this scenario to emerge, ratings agencies, investment analysts and others would have to develop specific methodologies and tools to help them assess and communicate the resilience of investments, rather than following the current practice of integrating resilience into their existing credit rating and analytical assessments. While these methodologies and tools do not yet currently exist, some steps are being taken. For example, the Financial Stability Board's Task Force on Climate-related Financial Disclosures has as its mission the development of financial risk disclosures for climate risk.²² This task would be simplified with methodologies that help to quantify underlying levels of resilience (see section 2.3).

The ability to rate the resilience of investments would be an important benefit of a more generally applicable system of resilience rating. Resilience ratings would enable investors to integrate resilience considerations into all aspects of their portfolio management activities.



An artist's impression
of a resilient landscape





4. Promoting resilience through financial markets

Stakeholders ranging from local governments to large corporates and other organisations have a vested interest in improving resilience to climate change risks. This is because few risks are (or can be) fully insured and these organisations therefore carry part of the risks themselves, effectively plugging part of the protection gap. Moreover, natural catastrophe risks worldwide are largely underinsured, and increasing resilience levels could help to enhance insurance penetration as risks become more insurable or insurance becomes more affordable.²³

Indeed, resilience is becoming more prominent as it is accepted that further climate change, and thus risk, is inevitable. Mott MacDonald and the Global Sustainability Institute estimate that within 20 years \$200bn of investment globally will be needed annually to combat losses from climate impacts.²⁴ Urban resilience is becoming a prominent aspect of climate change policy, as such large proportions of the world's population, wealth and economic activity are concentrated in metropolitan areas.^{25,26,27} Especially in Europe, the majority of public spending on environmental policies comes from local government, but private institutional investors, who may find sustainable urban infrastructure an attractive addition to their portfolios, are a potential source of funding.^{28,29}

Infrastructure projects play a major role in increasing resilience. For instance, flood resilience can be enhanced through defences – barriers and dykes to prevent floodwater reaching particular areas – and resilience to drought through the building of reservoirs. Infrastructure projects can also be used to enhance resilience by facilitating recovery – for instance, providing better communication links, or ensuring that power stations suffer less damage. As infrastructure built today will last for many decades, it will be subject to increasing physical risks posed by climate change, so itself should be resilient to future risk levels. This is an important consideration for all large construction projects.

4.1 Supporting green bonds

From a city perspective, climate resilience is moving up the agenda. The New Jersey Resiliency Network supports all New Jersey municipalities in strengthening their local resilience to climate risks, while 100 Resilient Cities currently supports 67 cities worldwide.^{30,31} C40 is a network of the world's megacities committed to addressing climate changes and sharing technical expertise on best practices.³²

Resilience-enhancing projects are usually initiated and funded by cities and other local governments and often financed via loans or bonds, which offer good opportunities for private investment. Several cities – including Johannesburg, Gothenburg, Spokane and Tacoma – have already issued green bonds (see box).³³ New York is planning to invest over \$27 billion in green infrastructure, and there is a strong possibility that it will finance some of that through green bonds.³⁴ It can only be a matter of time before municipalities or other local governments issue bonds specifically to finance resilience projects.



Mott MacDonald and the Global Sustainability Institute estimate that within 20 years \$200bn of investment globally will be needed annually to combat losses from climate impacts.²⁴

What are green bonds?

Green bonds are similar to standard bonds, except that they are intended to fund projects with positive environmental or climate benefits.

| Type | Proceeds raised by bond sale are | Debt re-course | Example |
|--------------------------------------|---|--|---|
| Green “Use of Proceeds” Bond | Earmarked for green projects. | Standard/full re-course to the issuer; therefore same credit rating applies as to issuers other bonds. | EIB “Climate Awareness Bond” (backed by EIB). |
| Green “Use of Proceeds” Revenue Bond | Earmarked for green projects. | Revenue streams from the issuers through fees, taxes etc. are the collateral for the debt. | Hawaii State (backed by fee on electricity bills of the state utilities). |
| Green Project Bond | Ring-fenced for the specific underlying green project(s). | Re-course is only to the project’s assets and balance sheet. | Alta Wind Holdings LLC (backed by the Alta Wind project). |
| Green Securitized Bond | Either 1) earmarked for green project or 2) go directly into the underlying green projects. | Re-course is to a group of projects that have been grouped together (i.e. covered bond or other structures). | 1) Northland Power (backed by solar farms) or 2) Solar City (backed by residential solar leases). |

Explaining Green Bonds. (2016). Retrieved from the Climate Bonds Initiative website, <https://www.climatebonds.net/market/explaining-green-bonds>

4.2 Introducing impact bonds

Not all resilience projects can be funded by local governments, which are often constrained by limited budgets and competing priorities. Moreover, they are not the only institutions to gain from an increase in resilience, and theoretically it should be possible for resilience projects to draw on all potential beneficiaries for funding.

It is now widely accepted that investing in resilience can produce significant economic returns. For example, it has been estimated that retrofitting buildings against cyclone damage in Queensland produces benefit-to-cost ratios of up to 14 times, while in Kenya and Ethiopia advance investment in resilience provides significantly more value for money than post-disaster humanitarian aid.^{35,36} However, it is not always simple to convert economic returns into financial returns on an investment.

For example, one approach to controlling flooding is by changing land management practices. If upland areas are appropriately managed, for example by increasing vegetation and allowing streams and rivers to run naturally, the rate of run-off is reduced,

thereby lowering the risk of downstream flooding.³⁷ Beneficiaries of this type of resilience could include residents and businesses in the downstream areas, along with the owners, operators and users of infrastructure that may otherwise be at risk from flooding. The returns from resilience could therefore be spread over a wide range of beneficiaries, including secondary beneficiaries who benefit from the resilience of others. There is currently a disconnect between the beneficiaries of resilience and those involved in creating, enhancing or supporting it.

Furthermore, the benefits of resilience usually only emerge over the medium to long term, so eventual beneficiaries may have no involvement or incentive to engage in the short term. This is a typical phenomenon in a complex adaptive system where actions are often not directly linked to their effects in terms of time, distance and agency. For example, residents and businesses in downstream areas can benefit from land-management practices occurring upstream, which may be both physically distant and occur years before the flood-risk event occurs.

Funding and financing large projects

Large projects share many similarities in terms of funding and financing, whether they involve major construction, developing new services or frameworks (such as for land management) or even developing software. Their financial structure of a large project is usually based on an initial capital outlay, followed by a continuing revenue stream over the lifetime of the project results – the new infrastructure or framework. Such projects usually require financing: the provision of capital to fund the initial outlay.

If financing is provided by private investors, those investors will expect a financial return on their investment, through continuing income paid from the revenue stream – the

funding. For a construction project such as an office building, the initial outlay consists of the building costs, while the revenue stream derives from the rents received from tenants.

For an investment to be viable, there must be an external source of revenue – the benefits provided by the project must be monetised. In the case of an office building, the monetisation occurs because there are businesses prepared to pay for the benefit of having an office. Although many different types of financial structures can be used to achieve investor returns, financial structures alone cannot create the monetary return.

This separation of cause and effect can make it difficult to convert the economic returns of resilience into monetary returns on an investment. In the flooding example, who will pay the upland farmers to manage their land in the long-term interests of their downstream neighbours, rather than in their own short-term interests (which might favour intensive grazing or arable cultivation)?

Some innovative solutions to address the provision of financial returns on investments in resilience are being developed. As resilience becomes a more pressing concern, this process is only likely to develop further. For instance, the G20 has established a Green Finance Study Group to explore how the financial system can mobilise private green investment, and investing for resilience will undoubtedly be part of that picture.³⁸ The Global Adaptation and Resilience Working Group (GARl) has been set up under the auspices of the UN to mobilise private sector investment in climate adaptation and resilience.³⁹

One solution that is often proposed is the use of impact bonds, or payment by results. Impact bonds are becoming increasingly common in the field of social finance. They are mechanisms through which private investors fund a project intended improve the social outcomes of a publicly funded service, such as literacy or health, and receive returns based on the results achieved.⁴⁰

Similar bonds are being introduced in the area of resilience. Forest Resilience Impact Bonds are being developed to fund forest restoration and management in the western USA, with the aim of minimising the risk of wildfires and increasing water yield.⁴¹ These bonds will provide a mixture of debt and equity. Independent

evaluators will determine the actual benefits derived by restoring the forest. The United States Forest Service will pay a fee based on the evaluated cost savings of fighting forest fires; water and electricity utilities will pay an annual fee based on the benefits estimated by the evaluators, or will pay competitive prices for the additional water volumes or improved water quality. A proposal for Municipal Adaptation Bonds, which would provide a framework for governments to monetise avoided costs from extreme weather events, in order to boost climate adaptation infrastructure investments, was a finalist in the 2015 Finance for Resilience (FiRe 2015) competition.⁴²

However, investments such as these may not be attractive to property insurers, as their returns may be highly correlated with the risks they underwrite. A forest fire resulting in a lower return on a Forest Resilience Impact Bond could also lead to higher claims payments for the insurer, thus increasing its overall risk exposure. However, they could be attractive to investors that are not exposed to property risks, such as life insurers. It is also possible that the insurance industry could play a crucial role in helping the issuers of impact bonds to design, issue and assess such instruments.

A widely applicable system of resilience rating would facilitate the introduction of more general resilience bonds, with returns linked to the level of resilience achieved.

4.3 Spreading the cost and benefits across the beneficiaries of resilience

As resilience typically has many beneficiaries, one way to fund improvements is for all to co-operate collectively. For instance, UK water infrastructure has many direct and indirect stakeholders (see figure 2). A 2014 report by the Cambridge Institute for Sustainability Leadership (CISL) Natural Capital Leaders Platform considered funding mechanisms that could support the building of reservoirs to increase winter storage capacities in the East of England.⁴³ The catchment area faces increasing water demand while suffering from decreasing availability. This is due to population increases and climate change. The new reservoirs would provide farmers with resilience to long-term droughts. Two funding mechanisms the report considers involve charging farmers (and other industrial users) for the water they draw. The charges would be based on consumption, but also include a baseline water usage guarantee. This provides investors with a secure income stream. The guarantee could be supported by retailers, in part, through longer term purchasing contracts with the farmers. The retailers (and possibly farmers) could use commercial insurance to protect guaranteed payments.



Figure 2: Collaboration between beneficiaries of resilience improvements to winter water storage capacities in the East of England, adapted from Sink or Swim: A Multi-Sector Collaboration on WaterAsset Investment.⁴³

The Forest Resilience Bonds discussed above will be funded from fees paid by the US Forestry Service and electricity and water utilities. It is possible that schemes elsewhere might use guaranteed minimum payments to provide a level of guarantee to investors. Special purpose insurance covers could provide some backing for these guarantees.

4.4 Encouraging private investment in infrastructure projects

Most private infrastructure investment is via loans, although equity investment is also possible. Infrastructure debt instruments are typically long dated, with an average life of 15–20 years, and may be traded as loans or bonds, which are generally illiquid. They are difficult to source, and ongoing management complex.⁴⁴ Traditional forms of infrastructure investment are therefore unsuitable for all investors, especially insurers whose liabilities are reasonably short term and who value liquidity in order to settle claims promptly. Moreover, there may be regulatory disadvantages for insurers. For example, the capital charges under Solvency II could be onerous in some circumstances.⁴⁵

A recent Allianz report identified the gap between the surplus of savings in aging societies, massive investment in infrastructure required and the need to unclog the public sector investment logjam by mobilising private savings. It notes that central governments are not acting, and that cities and municipalities will have to drive change.²⁸ However, urban investment projects aimed at supporting resilience are (in institutional investment terms) small and diverse. There are few potential investors with the resources to identify and assess them. The report proposes that national governments should establish centralised one-stop shops – Green Cities Platforms – to package, market and sell urban infrastructure investments to the private sector. These platforms could utilise the skills and expertise of private investors. For these platforms to be effective, they would have to be supported both by government and by drawing on the expertise of institutional investors.

The problems addressed by the proposed platforms are by no means limited to urban infrastructure projects, but apply to many resilience projects. The expertise of the insurance industry, which covers both institutional investment and risk management, would be especially valuable in supporting a broader base of investors who could invest in resilience.

5. Promoting societal resilience more generally

Individuals, households and businesses all benefit from enhanced levels of local and regional resilience, but can also take action at an individual level. However, the actions that they take may require investment, and in this section we consider how insurers can support that investment, both directly and indirectly.

It is possible to invest directly in corporate resilience: corporates can issue bonds specifically to fund resilience improvements (which could be green bonds) although in general, resilient corporates provide the same investment opportunities as any others. Currently, there are few opportunities to invest directly in household resilience, although there are several ways in which insurance could help to enhance risk reduction and recovery.

5.1 Reducing premiums

One of the major challenges limiting investment in resilience by individuals and companies is that those benefitting from enhanced levels of resilience often place little financial value on it. There are several reasons for this. For instance, people often underestimate the probability of adverse outcomes occurring, and tend to value short-term returns more highly than long-term returns. Resilience also often goes unnoticed as the absence of a problem not previously encountered is not often noteworthy. More certain long-term benefits attributed to enhanced resilience, such as aligning economic benefits with more predictable cost savings, would therefore help to incentivise households and corporates to invest in order to improve their own levels of resilience, as well as helping to provide investment returns for projects delivering more collective climate resilience (see section 4).

One of the few ways in which increased resilience can result in immediate, short-term benefits is through reduced insurance premiums. For example, Avalon, NJ, a small city in the USA, has put extensive resilience measures in place, and consequently has been able to inform its residents of a 25 per cent discount on their flood insurance premiums through the National Flood Insurance Program.⁴⁶ This may be the precursor to many similar stories, where local governments use insurance savings for their residents in order to (partially) justify public spending.

Improving individual resilience

Ways corporates can improve their resilience include:

- Relocate facilities to avoid risks such as flooding or forest fires;
- Diversify the locations of suppliers;
- Diversify the transport links in supply chains;
- Construct new resilient facilities;
- Retrofit existing facilities; and
- Introduce new technologies or processes to reduce reliance on scarce or expensive resources such as water

Household resilience can be improved by:

- Designing resilience into new build homes;
- Avoiding building new homes in high-risk areas;
- Relocating homes away from high-risk areas; and
- Retrofitting existing homes.

Insurance policies can thus be a good way to encourage resilience, and indeed do so in many instances. However, the incentives provided by insurance do not necessarily foster resilience, and can even discourage it, as policyholders believe that their resilience has already been properly managed. There are therefore important opportunities to better align insurance with a reduction in risk and an increase in resilience.

A widely used resilience rating system applicable to both individual properties and businesses could support more informed decision-making around resilience. It could be used in setting requirements for new building developments and in designing new facilities.

5.2 Promoting resilient reinstatement

Most insurance policies indemnify the policyholder against loss. The objective is that, if an adverse event occurs, the policyholder should be restored to the position they would have been in had the event not occurred. For example, if a car is damaged in an accident, it is either repaired or the policyholder compensated for its pre-accident value. There are some exceptions to this: for example, some household contents insurance policies are written on a 'new for old' basis.

By focusing on the short rather than the long term, simple reinstatement as an indemnity basis does little to encourage policyholders to investment in resilience (see also section 2.3). If a property is damaged in a windstorm because its roof is poorly constructed, restoring it to its original condition will not lessen the likelihood of it being damaged in the next storm. Resilient reinstatement – in this case involving upgrading the roof to withstand future damage – may well cost more in the short term: it has been estimated that, for UK flood claims, resilient reinstatement could cost over 40 per cent more than traditional, simple reinstatement – albeit with wide variation.¹⁶ However, it could well offer better value to the policyholder over the long term due to reduced future claims, which would feed through to lower premiums.

One problem with resilient reinstatement is that policyholders may not want their property to change. For example, a property with tiled floors and electrical sockets raised above floor level is more resilient to flooding, but is less attractive to many homeowners than one with fitted carpets and electrical sockets out of sight.

Another challenge with resilient reinstatement is that it is likely to be perceived as more expensive by policyholders. In the short term, an insurance policy providing simple reinstatement is likely to be cheaper than one providing resilient reinstatement, as repair costs will be lower. However, other things being equal, the future premiums would not change, as likely future repair costs stay the same. The same is not true with resilient reinstatement. After a claim, the property would be better able to withstand future events, so expected repair costs would decrease, leading to lower insurance premiums. It is thus by no means simple for policyholders to compare the costs of the two approaches – resilient reinstatement could well be cheaper in the long term, but this would depend on the likelihood of a claim. However, resilient reinstatement policies could be significantly cheaper for properties that are already resilient, as there would be little or no extra costs over simple reinstatement. A wide adoption of resilient reinstatement could thus do much to encourage improved resilience.

The widespread adoption of indemnity bases that include resilient reinstatement would support increased resilience in two ways: by encouraging property owners to improve their property's resilience in order to benefit from lower premium rates, and by providing improved resilience in the aftermath of claims. The existence of a generally accepted resilience rating system for properties would support the ability of policyholders to assess the benefits of investing in resilience. Insurers' expertise in underwriting property insurance would provide valuable input into the development of such a system.



5.3 Promoting multi-year insurance policies

It has often been observed that property owners fail to invest in resilience measures as they do not believe a risky event like a flood or hurricane will affect them, and because they focus only on the expected benefits over a few years, instead of over the expected life of the property. This behaviour is reinforced if the value of the property does not reflect the investment. Furthermore, as insurance is currently a short-term contract (most policies are for 12 months), there is little incentive for policyholders to choose an option that is more expensive in the immediate future but is likely to result in longer term savings, as they have little confidence the savings will actually emerge (as insurers might change their approach).

One solution would be the introduction of multi-year insurance policies tied to the property, rather than one-year insurance policies tied to the property owner. The property value would then include the price of the insurance, and a resilient property would be worth more because of its lower running costs linked to lower insurance premiums.^{47,48}

Multi-year policies could also help address the problem of aligning incentives between different stakeholders. For example, if a hotel is developed by one consortium and transferred to another after completion, which then contracts its operation and management to yet another, there is little incentive at the design phase to provide resilience its due weight, as the ultimate beneficiaries have no involvement at that stage. One solution could be a design-build-insure project, in which continued insurance for weather-related risks, over a significant part of the operating lifetime of the building, is integrated into the construction costs. With this financial structure, the interests of the constructors and long-term operators of the building are aligned: both parties benefit from improved resilience, through reduced insurance premiums and less disruption to operations.

Although there is some evidence to suggest that multi-year policies could be attractive to policyholders, they do limit flexibility for both policyholders and insurers.⁴⁹ From the policyholders' perspective, a multi-year policy presents the risk of being locked in to a higher rate than would be available in the market in the future. A wide range of multi-year products available from a variety of insurers would provide price comparisons, enabling policyholders to make more informed decisions. The situation might then be similar to the UK mortgage market, where mortgages with fixed rates for a period of a few years are common.

Multi-year policies may also increase the risk to insurers because of the long-term guarantees.⁵⁰ Some of this risk could be mitigated through variable premiums, linked to one or more relevant indexes, such as a climate change index and appropriate

indexes for inflation. The Actuaries Climate Index is being developed to help measure the prevalence of climate-related extreme events, and might be suitable for this purpose.⁵¹

A multi-year policy would also have some continued underwriting requirement. In return for guaranteeing coverage on predetermined terms, the insurer would likely require the property to be maintained to a specified resilience rating, possibly with regular certification of some sort (in the same way that some home-owners' policies require regular servicing of burglar alarms).

Multi-year property insurance policies could help to foster resilience by providing long-term incentives to policyholders who invest in resilience, which has a long-term payoff. A resilience rating system for property would assist in their use, by providing clear standards for ongoing maintenance. Design-build-insure projects in conjunction with multi-year policies could help to align the interests of short-term and long-term project participants.



5.4 Incentivising resilience through pooled profits

Mutuality has a long history in the insurance industry. One of the earliest insurers in London, the Hand in Hand Fire and Life Insurance Society was founded in London in 1696 as a mutual, and many others have been established in Britain and elsewhere since then.⁵² The concept of mutuality is that members of the mutual association share both profits and losses, and it is one that has been widely used in banking, insurance, and other fields.

Insurance and advice

FM Global is a mutual industrial and commercial property insurer that emphasises the importance of resilience. It states that its goal is to “implement the precise, research-driven measures needed to withstand a disruption, and react quickly, efficiently, and effectively should one occur”. As well as providing engineering advice to its policyholders, it also provides advice to policyholders’ suppliers and their suppliers in turn, in order to strengthen the supply chain. In its marketing materials, it consistently focuses on its engineering expertise and its seamless claims process.⁵³

Mutuality need not operate across all parts of an insurer – for example, in the UK many non-mutual life insurers operate investment funds in which participating policyholders share in the investment returns. These ‘with-profits’ funds are different from unit-linked policies, in which the insurance payouts are directly linked to the values of the underlying investments. It would be possible to adapt this concept to profit-sharing pools for property insurance, in which the participating policyholders share in the insurance profits. As insurance premiums are based on an estimate of the expected costs of claims, if claims are lower than expected, the pool would make more profit (or less loss), and vice versa. In a profit-sharing pool, it is only claims from members of the pool that affect that pool’s profit or loss, and the members benefit from their own and their fellow members’ good claims experience. There are several mechanisms for distributing profits, including future premium discounts and cash bonuses. There are also various formulae that can be used – for example, the claims might be averaged over several years, or the bonus declared sometime after the period to which it relates, allowing time for all claims to emerge and be settled. The insurer operating the pool would also participate in the pool’s experience through a specified proportion of the profit or loss.

Profit-sharing pools thus differ from no claims bonuses, which depend only on the claims experience of individual policyholders. In these pools, all members benefit to some extent when any member’s risk is reduced. They may therefore be particularly effective when the members have some natural connection with each other, and the pool acts to reinforce the peer pressure provided by the other connection. In addition, if policyholders know that there are rigorous criteria for participating in the pool, which they themselves have met, they are likely to have a long-term commitment to it, and an appetite to invest in their resilience.

Profit-sharing pools can provide some comfort to their policyholders that any reduction in premium due to increased resilience will continue, as they align the interests of the insurer and the policyholders to a greater extent than non-participating policies. They therefore help to bridge the gap in timescales between 12-month insurance policies and the long-term payback period of investing in resilience.

Whatever the rationale for a mutual profit-sharing pool, whether it is associated with some external group or exists purely on its own terms, it may well make expenditure on increased resilience easier to accept, as long as premiums in the pool are no more expensive (or even cheaper) than premiums generally available in the market. Provision of resilience advice to pool members is likely to be seen as a worthwhile expense for the pool to bear, as it will contribute to better claims experience overall. Transparent entry criteria for the pool, which could be expressed in terms of resilience ratings, would increase commitment.

5.5 Providing resilience services

Increasingly, many insurance policies offer more than straight financial protection or simple reinstatement. For instance, car insurance in the UK often includes the provision of a courtesy car if the use of a vehicle is lost through theft or an accident.⁵⁴ The insurance policy thus underwrites transportation needs, rather than simply offering compensation for the vehicle.

This is all part of a trend towards service provision. In many areas of operations business is increasingly buying services rather than physical or software products. The service that is provided is specified through a service-level agreement (SLA). Examples include:

- IT and telecommunications support;
- IT disaster recovery;
- Cloud computing;
- Call centre provision; and
- Facilities management.

Many UK homeowners buy 'peace of mind' maintenance contracts, covering boilers and plumbing. These contracts vary in scope, but usually cover at least an annual boiler service and repairs in the event of a breakdown. More expensive policies cover central heating repairs, unblocking drains and electrical repairs. They tend to exclude some maintenance tasks (such as removing sludge or scale) and some fittings (such as showers).⁵⁵

A possible development would be the emergence of a 'resilience service', which would draw on aspects of facilities management, disaster recovery, 'build and operate' contracts, and insurance. It would include upgrading the property covered by the service to improve its resilience, regular maintenance, recovery and repairs, and financial compensation. Providers of resilience services would also have incentives to improve the resilience of the broader environment of the property. These providers might be insurers, or might be other service providers that include insurance as a (possibly small) part of the overall service. The seeds of resilience services can be seen in the risk management advice and assistance already provided by insurers and brokers. Resilience services would possibly be attractive to SMEs and larger corporates that are accustomed to outsourcing parts of their operations.

Resilience service-level agreements could be based on providing a level of resilience linked to a resilience rating system: clients could decide the level of resilience for which they were prepared to pay. A corporate with a resilience service from a respected supplier would be able to use the service to boost its overall resilience rating.

5.6 Providing expertise

It is not only through investment and insurance that insurers can support local and national governments to enhance their resilience. A big driver will be planning processes that involve a broad range of stakeholders and that accommodate both environmental and financial factors. In many regions local government and industry lack the skills and knowledge to fully understand the implications of proposed policies and their interactions with existing policies and customs.⁵⁶ The insurance industry has much to offer in this area, through its expertise in risk management and broad involvement with industry.

The Rockefeller Foundation has identified the need to consider cities holistically as systems, rather than in sectoral silos, highlighting how corporates may interact with a wide range of city departments, from law-enforcement agencies to public utilities. They therefore have the potential to act as brokers, co-ordinating a broad range of government players in urban resilience discussions.⁵⁷ With their expertise in risk management, insurers and insurance brokers would be especially suited to this role.

Insurers and others in the insurance industry can support national, urban and local resilience through their skills and expertise. They can participate in long-term stakeholder partnerships and contribute to policymaking through consultation. More concretely, they can provide skilled staff on secondment to government departments and agencies to help bridge the gap of language and approach between the public and private sectors. A widely accepted resilience rating system could facilitate more informed planning and policy decisions.

5.7 Using CSR and ESG programmes

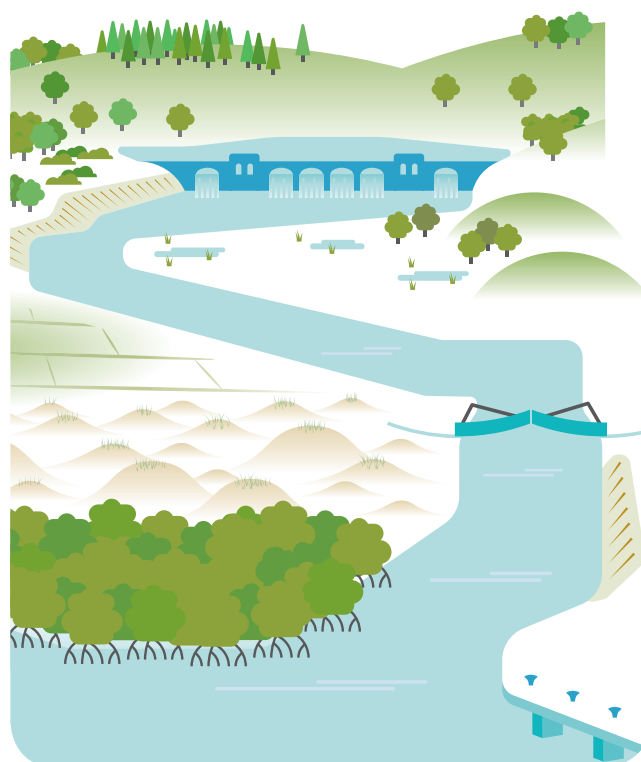
It will probably never be possible to provide sufficient financial returns on all investments in increased resilience to make them attractive to insurers and other institutional investors. Insurers have a long track record of contributing to such projects as part of their ongoing corporate social responsibility (CSR) programmes. For instance, Santam contributes to the Living Lands project in Port Elizabeth, South Africa, by providing risk expertise, and Tokio Marine has been involved in mangrove planting activities across the Asia-Pacific region since 1999.^{58,59} It is likely that CSR programmes will increasingly target resilience as it becomes a more visible issue.

In Australia, Suncorp has developed a programme “Protecting the North” intended to increase resilience in the face of the cyclones affecting Queensland.⁶⁰ Suncorp has sponsored research into the economic benefits of retrofitting houses and other measures to increase resilience, and has developed insurance products with explicit premium reductions for buildings with good resilience characteristics.⁶¹ It also provides financing for building enhancements to support resilience. It is thus integrating its CSR and underwriting activities in a single programme in support of enhanced resilience.

Insurers have many stakeholders in addition to their policyholders. Many of them have shareholders, and all operate in local communities. Increasingly, stakeholders in general and shareholders in particular are showing a greater interest in the overall strategies of organisations.

For example, the “Aiming for A” investor coalition is currently engaging with the ten largest UK-listed extractives and utilities companies to encourage them to take more ambitious actions to mitigate climate change.⁶² Other organisations such as ClientEarth and Urgenda are using legal cases against corporates and governments to put pressure on them to take environmental issues into account in their strategies.^{63,64} As insurers are such significant investors, it is likely that shareholders and other stakeholders, either unilaterally or acting in coalition, will be increasingly interested in how they are using their investments to support society as a whole.

Insurers can address resilience through existing CSR activities in many ways. Doing so can support their underwriting activities. Investing in resilience projects through CSR programmes enables them to bypass the constraints of their investment portfolios while reaping many of the benefits of resilience investing – but the volumes of such investment will inevitably be lower. Partnerships with other stakeholders might fall under the CSR umbrella, which is also a natural way of supporting research into resilience and consumer education. Resilience ratings could be useful for education and communication.



6. Conclusion

This study emerged in response to the exacerbation of the protection gap by the growing societal exposure to climate risks, which also compounds the negative impacts of climate change on the health and wellbeing of people and their economies and, by close association, insurance. Climate resilience is thus an important mechanism for helping to close the protection gap and reduce the negative impacts of climate risks.

Insurance has a crucial role to play in helping to promote climate resilience, both as a financial risk-transfer mechanism and in providing key expertise for assessing, managing and communicating risk exposure. There have been increasing calls for the insurance industry to become even more proactive in supporting the enhancement of society's physical resilience to climate risks and thereby maintaining the future insurability of assets. There has been particular focus on the industry's investment activities and, with over \$30 trillion of financial assets, its broader influence in the financial markets.



There has been particular focus on the industry's investment activities and, with over \$30 trillion of financial assets, its broader influence in the financial markets.

While much has been written about the role insurers' asset management activities can play in mitigating greenhouse gas emissions, far less attention has been paid to climate resilience. This report therefore provides an overview of the many opportunities that currently exist for insurance to leverage both the asset management and underwriting sides of its business in ways that could promote societal resilience to climate risk.

The report argues that insurers are not the natural investors in resilience many external commentators often perceive them to be. This is mainly due to the lack of a direct correlation between lower risk and higher profits: there is a complex relationship between increased resilience, lower premium income, underwriting profits, strict solvency regulations and the need to avoid investments in areas where an insurer is also exposed to underwriting risk. To increase the perceived value that investments in resilience can have, insurers must identify ways to quantify and integrate the long-term and systemic benefits resilience can have within their portfolios.

The report also finds that the insurance industry has significant potential to support investments in climate resilience across the financial markets and beyond. This includes using its unique expertise, capabilities and data to support other stakeholders in promoting resilient investment opportunities such as green bonds and impact bonds, and helping to spread the cost and benefits of resilience more broadly across all beneficiaries, in terms of both geography and time.

Through multi-year policies, resilient reinstatement and the promotion of mutual risk pools, insurers can enhance the capacity of individuals and businesses to start investing in resilience as well. All these activities would be further enhanced with the creation of a universal rating system that would allow climate resilience to be considered, benchmarked and communicated more widely across many different areas of decision-making, including asset management, policymaking, and risk management. Insurers, with their data, extensive networks and engagement in so many areas of economic activity are well placed to help lead and co-ordinate the development of such tools.

The insurance industry, with its tremendous capabilities and reach, can play a crucial role in promoting resilience as a key consideration in investment decisions right across the financial markets and society more broadly. In this way, new opportunities for commercialising many parts of its value chain exist as the industry continues to support the societal transition to a zero carbon, climate-resilient future.

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