



IAIS

INTERNATIONAL ASSOCIATION OF
INSURANCE SUPERVISORS



SUSTAINABLE
INSURANCE
FORUM

Issues Paper on Climate Change Risks to the Insurance Sector

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About the Sustainable Insurance Forum (SIF)

The Sustainable Insurance Forum (SIF) is a network of leading insurance supervisors and regulators working together to strengthen their understanding of, and responses to sustainability issues for the business of insurance. Launched in December 2016, the SIF serves as a global platform for international collaboration by insurance regulators and supervisors on sustainability issues. The SIF is convened by UN Environment.

More information on the SIF is available at: www.sustainableinsuranceforum.org.

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The International Association of Insurance Supervisors (IAIS) is a voluntary membership organisation of insurance supervisors and regulators from more than 200 jurisdictions. The mission of the IAIS is to promote effective and globally consistent supervision of the insurance industry in order to develop and maintain fair, safe and stable insurance markets for the benefit and protection of policyholders and to contribute to global financial stability.

Established in 1994, the IAIS is the international standard setting body responsible for developing principles, standards and other supporting material for the supervision of the insurance sector and assisting in their implementation. The IAIS also provides a forum for Members to share their experiences and understanding of insurance supervision and insurance markets.

The IAIS coordinates its work with other international financial policymakers and associations of supervisors or regulators, and assists in shaping financial systems globally. In particular, the IAIS is a member of the Financial Stability Board (FSB), member of the Standards Advisory Council of the International Accounting Standards Board (IASB), and partner in the Access to Insurance Initiative (A2ii). In recognition of its collective expertise, the IAIS also is routinely called upon by the G20 leaders and other international standard setting bodies for input on insurance issues as well as on issues related to the regulation and supervision of the global financial sector.

Issue Papers provide background on particular topics, describe current practices, actual examples or case studies pertaining to a particular topic and/or identify related regulatory and supervisory issues and challenges. Issues Papers are primarily descriptive and not meant to create expectations on how supervisors should implement supervisory material. Issues Papers often form part of the preparatory work for developing standards and may contain recommendations for future work by the IAIS.

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Contents

Acronyms.....	7
1 Introduction	9
2 The Climate Risk Landscape	11
2.1 Examples of Climate Impacts.....	11
3 How Climate Change may affect the Insurance Sector	14
3.1 Understanding Climate Risks.....	14
3.2 Examples of Climate Risks across Insurance Business, Strategy, and Operations	17
3.2.1 Underwriting Activities.....	18
3.2.2 Investment Activities	20
4 Industry responses to climate risks	22
4.1 Observed industry practices.....	22
4.2 Strategies for climate resilience	23
5 Relevance for Insurance Supervisors.....	25
6 Applicability of Insurance Core Principles to Climate Change	29
6.1 ICPs of relevance to climate change risks.....	29
7 Supervisory Approaches to Climate Change Risks	36
7.1 Assessing Climate Change as an Emerging Risk	36
7.1.1 Mandates and Objectives	36
7.1.2 Initial Assessment.....	37
7.1.3 Signalling Expectations.....	37
7.2 Responding to Climate Change risks through Supervisory Practice.....	37
7.2.1 Risk Frameworks	37
7.2.2 Information and Data gathering.....	38
7.2.3 Engagement strategies and Examination Tools	38
7.2.4 Examining current exposures: Stress Testing & Exposure Assessment.....	39
7.2.5 Exploring future risk: Scenario Analysis & Alignment	41
7.3 Collaboration and Cooperation.....	42
7.3.1 Convening	42
7.3.2 Engagement with other public authorities.....	43
7.3.3 International Engagement.....	43
8 Observed Practices: Case Studies.....	44
8.1 Australia: Australian Prudential Regulation Authority	44
8.1.1 Motivation and Rationale	44

8.1.2	Approach and Methodology	45
8.1.3	Key Findings	45
8.1.4	Lessons: Key Challenges and areas for improvement	45
8.1.5	Impacts on Supervisory Practice	46
8.1.6	Next Steps	46
8.2	Brazil: Superintendência de Seguros Privados (SUSEP)	47
8.2.1	Motivation and rationale	47
8.2.2	Approach(es) and Methodology(ies)	47
8.2.3	Key Findings	47
8.2.4	Lessons: Key challenges, areas for improvement	48
8.2.5	Impacts on supervisory practice	48
8.2.6	Next steps	48
8.3	France: Autorité de Contrôle Prudentiel et de Résolution (ACPR)	48
8.3.1	Motivation and Rationale	48
8.3.2	Approach and Methodology	49
8.3.3	Key Findings	50
8.3.4	Lessons: Key Challenges and areas for improvement	51
8.3.5	Impacts on Supervisory Practice	52
8.3.6	Next Steps	53
8.4	Italy: Istituto per la Vigilanza Sulle Assicurazioni (IVASS)	53
8.4.1	Approach and Methodology	53
8.4.2	Key Findings	53
8.4.3	Lessons: Key Challenges and Areas for Improvement	53
8.4.4	Next Steps	54
8.5	Netherlands: De Nederlandsche Bank (DNB)	54
8.5.1	Motivation and Rationale	54
8.5.2	Approach and Methodology	54
8.5.3	Key Findings	56
8.5.4	Lessons: Key Challenges and areas for improvement	57
8.5.5	Impacts on Supervisory Practice	58
8.5.6	Next Steps	58
8.6	Sweden: Finansinspektionen	58
8.6.1	Motivation and Rationale	58
8.6.2	Approach and Methodology	59

8.6.3	Key Findings	59
8.6.4	Lessons: Key Challenges and Areas for Improvement	60
8.6.5	Impacts on Supervisory Practice	60
8.6.6	Next Steps	60
8.7	UK: Bank of England Prudential Regulation Authority	60
8.7.1	Motivation and Rationale	60
8.7.2	Approach and Methodology	61
8.7.3	Key Findings	62
8.7.4	Lessons: Key Challenges and areas for improvement	62
8.7.5	Impacts on Supervisory Practice	62
8.7.6	Next Steps	63
8.8	USA: National Association of Insurance Commissioners (NAIC)	63
8.8.1	Motivation and Rationale	63
8.8.2	Approach and Methodology	64
8.8.3	Key Findings	64
8.8.4	Lessons: Key Challenges and areas for improvement	64
8.8.5	Impacts on Supervisory Practice	64
8.8.6	Next Steps	65
8.9	USA – California: California Department of Insurance	65
8.9.1	Motivation and Rationale	65
8.9.2	Approach and Methodology	65
8.9.3	Key Findings	66
8.9.4	Lessons: Key Challenges and areas for improvement	67
8.9.5	Impacts on Supervisory Practice	67
8.9.6	Next Steps	68
8.10	USA - Washington State: Office of the Insurance Commissioner (OIC)	68
8.10.1	Motivation and Rationale	68
8.10.2	Approach and Methodology	68
8.10.3	Key Findings	69
8.10.4	Lessons: Key Challenges and areas for improvement	69
8.10.5	Impacts on Supervisory Practice	70
8.10.6	Next Steps	70
9	Conclusions	71
	Annex: Recommendations of the FSB TCFD	73

Acronyms

ACAPS	Autorité de Contrôle des Assurances et de la Prévoyance Sociale (Morocco)
ACPR	Autorité de Contrôle Prudentiel et de Résolution (France)
ASSAL	Asociación de Supervisores de Seguros de América Latina
APRA	Australian Prudential Regulation Authority
BIS	Bank for International Settlements
BNDES	Brazilian Development Bank
BoE	Bank of England
CDI	California Department of Insurance
CVM	Brazilian Securities Commission
COP	Conference of the Parties
CRCI	Climate Risk Carbon Initiative
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DNB	De Nederlandsche Bank (Netherlands)
ERM	Enterprise Risk Management
ESG	Environment, Social and Governance
FI	Finansinspektionen (Sweden)
FSB	Financial Stability Board
GFSG	Green Finance Study Group
GHG	Greenhouse Gas
IAIS	International Association of Insurance Supervisors
ICP	Insurance Core Principle
IADB	Inter-American Development Bank
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IVASS	Istituto per la Vigilanza Sulle Assicurazioni (Italy)
NAIC	National Association of Insurance Commissioners (US)
OIC	Washington State Office of the Insurance Commissioner
ORSA	Own Risk Solvency Assessment
OSFI	Office of the Superintendent of Financial Institutions (Canada)
PPM	Parts Per Million
PPP	Public-Private Partnerships

PRA	Bank of England Prudential Regulation Authority
PSI	Principles for Sustainable Insurance
SIF	Sustainable Insurance Forum
SME	Small and medium enterprises
SUSEP	Superintendência de Seguros Privados (Brazil)
TCFD	Task Force on Climate-related Financial Disclosures
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

1. Climate change – the warming of the world’s climate system, including its atmosphere, oceans, and land surfaces – is advancing around the world. Climate change is recognised by the world’s governments, the private sector, and civil society as a top global threat, which is having impacts today on human, environmental, and economic systems – including, for instance, through an increasing frequency and severity of natural catastrophes and extreme weather events. Society’s responses to climate change – including new policies, market dynamics, technological innovation, and social change – may have wide-ranging impacts on the structure and function of the global economy.

2. In recent years, there has been increasing recognition at the international level that climate change will also affect the financial system, including insurers.

- In 2015, the world’s governments signed the Paris Agreement on Climate Change at the 21st Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC), which sets the pathway for the reductions of Greenhouse Gas (GHG) emissions to limit climate change to two degrees of warming by the end of the century. Article 2.1(c) of the Paris Agreement specifically sets out a goal of “making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.”¹ Since 2015, several new initiatives have been launched to harness the expertise of the insurance industry to address climate challenges.
- In 2015, following a request from G20 Finance Ministers, the Financial Stability Board (FSB) launched an industry-led Task Force on Climate-related Financial Disclosures (TCFD). The TCFD released its final recommendations in June 2017, setting a coherent framework for the identification, assessment, management and disclosure of climate risks and opportunities across sectors, with specific guidance for application by financial institutions – including insurers as both underwriters and asset owners.
- In 2016, under its G20 Presidency, China established the Green Finance Study Group (GFSG) to develop options on how to enhance the ability of the financial system to mobilise private capital for green investment.² At the 2016 Hangzhou Summit, G20 heads of state for the first time recognised the need to “scale up green finance” and endorsed a set of options to achieve this goal—with information elements, such as product standards, established as a core aspect of frameworks to promote the development of markets for green assets (such as green bonds).
- In 2017, under the German G20 Presidency, the GFSG concentrated its efforts on the information agenda with two specific research tracks on Environmental Risk Assessment and Data.
- In March, 2018, the European Commission presented its Action Plan on Sustainable Finance,³ underlining the importance of involving the finance industry in addressing climate change and specifically involving both the European supervisory authority for insurance EIOPA as well as national supervisors in follow up actions.

3. Since 2015, an increasing number of governments, central banks, regulators and financial sector stakeholders are working to drive climate risks and other sustainability factors into the core of the financial system function, through different measures and actions.^{4,5,6} Action on climate change is also a core aspect of many national-level policy processes relating to sustainable finance. Several countries, including Argentina, China, Indonesia, Italy,

Mongolia, Morocco, Nigeria, Singapore, South Africa, and most recently Canada, have undertaken or initiated strategic policy processes and roadmaps for sustainable finance, with climate risks often a central priority.⁷

4. These and other developments have prompted insurance supervisors to begin examining the relevance of climate change for insurance supervision, both individually and collaboratively through the Sustainable Insurance Forum (SIF).

5. The SIF was launched in December 2016 as a global platform for international collaboration by insurance regulators and supervisors on sustainability issues, with a special focus on climate change.⁸ During 2017, the SIF undertook several joint activities relating to climate risks, including:

- Delivery of a coordinated submission to the TCFD consultation, followed by the release of a joint statement in July 2017 supporting the recommendations and highlighting how supervisors can support uptake.⁹
- A survey of supervisors to share knowledge and compare experience from their efforts to address climate risks. The survey covers activities across firm-level supervision and system-level stress testing, examining approaches, methodologies, data inputs, key challenges, impacts on practice, and next steps.
- High-level policy engagement with the IAIS on climate risk issues, setting the groundwork for collaboration with the Executive Committee and IAIS Secretariat into 2018.

6. At the second meeting of the SIF in July 2017, members requested the SIF Secretariat to develop a guidance document on climate change and insurance supervision. At the third meeting of the SIF, held alongside the IAIS annual meetings and conference in Kuala Lumpur, Malaysia, the SIF and the IAIS agreed to advance this document jointly as an Issues Paper.

7. The objectives of this Issues Paper are to raise awareness for insurers and supervisors of the challenges presented by climate change, including current and contemplated supervisory approaches for addressing these risks.

8. As an Issues Paper, it provides an overview of how climate change is currently affecting and may affect the insurance sector now and in the future, provides examples of current material risks and impacts across underwriting and investment activities, and describes how these risks and impacts may be of relevance for the supervision and regulation of the sector. It explores potential and contemplated supervisory responses, and reviews observed practices in different jurisdictions. In doing so, it identifies gaps and emerging areas which need to be resolved to allow for effective supervision. Finally, the paper offers preliminary insights from practice, and initial conclusions relating to the supervision of climate change risks to the insurance sector.

9. The Paper is intended to be primarily descriptive and is not meant to create supervisory expectations. Nevertheless, the Paper may shed light on the need for additional, more specific joint material from the IAIS and the SIF to support supervisors in their efforts to better understand and address climate change risks.

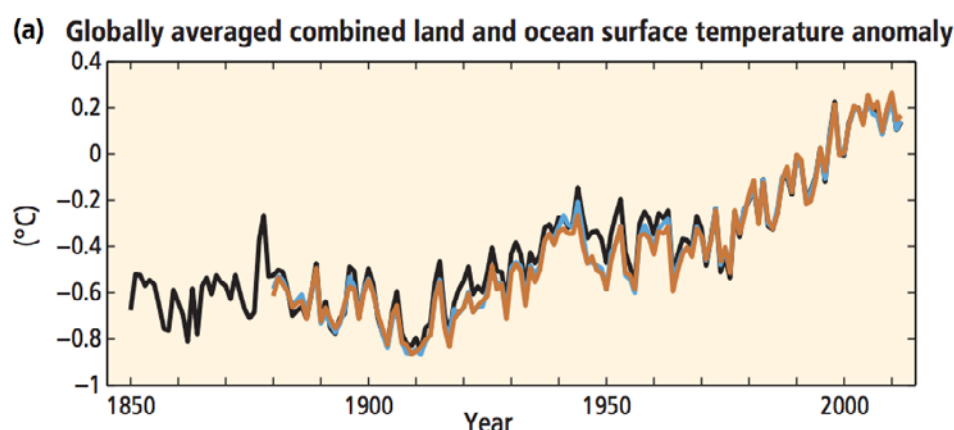
2 The Climate Risk Landscape

10. Warming of the climate system is unequivocal, with recent climate changes causing widespread impacts on human and natural systems.¹⁰ The scientific link between increasing carbon emissions and warming temperatures is irrefutable. The Intergovernmental Panel on Climate Change (IPCC) has declared that human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases have driven atmospheric concentrations to their highest levels in human history:¹¹

- Concentrations of CO₂ have increased by over 40% from approximately 280PPM to over 400PPM since the preindustrial period, accompanied by an approx.1-degree Celsius rise in global annual mean temperature.¹²
- Over the last decade, most emissions have come from energy, industry, and transport sectors, with other major emitting sectors including agriculture and land use.¹³
- While some evidence suggests that global emissions growth has plateaued since 2014, 2016 was the first full year in which atmospheric CO₂ concentration stayed above the 400PPM milestone.^{14,15}

11. Each of the last three decades have been successively warmer at the Earth's surface than any preceding decade since 1850 (Figure 1). Most warming has occurred in the past 35 years, with 16 of the 17 warmest years on record occurring since 2001.¹⁶ 2017 was the second warmest year on record since 1880, and the warmest without an El Nino event.¹⁷

Figure 1: Tracking Global Warming, 1850-2014



Source: IPCC AR5 SPM 2014

2.1 Examples of Climate Impacts

12. Climate change is having widespread effects on environmental systems, and exacerbating negative impacts upon stocks and flows of natural capital, upon which society and the economy rely. Key indicators of this shift include:

- **Natural Catastrophes and Extreme Weather Events:** As documented by the IPCC, there is strong scientific evidence to suggest that climate change is having an influence on the frequency, severity, and distribution of natural catastrophes and extreme

weather events. In recent years, several notable studies have explored this question in detail:

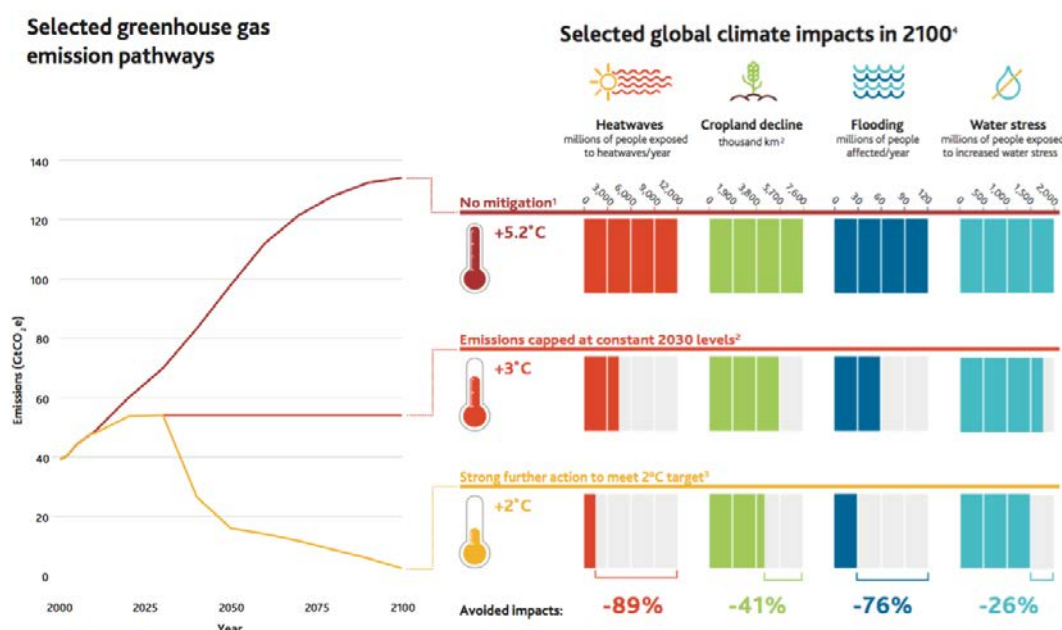
- Research by the World Meteorological Organization has concluded that 80% of natural disasters between 2005 and 2015 were in some way climate-related;¹⁸
- A recent meta-analysis of 59 studies in English-language scientific journals published between 2016-2017 found that 70% of studies concluded that climate change has increased the risk of a given extreme event, such as heat, drought, rainfall, wildfires, and storms;¹⁹
- Analysis by MunichRe has identified a long-term trend in an increase in the number of natural catastrophes around the globe, predominantly attributable to weather-related events like storms and floods.²⁰ As there has been no relevant increase in geophysical events such as earthquakes, tsunamis, and volcanic eruptions, there is some justification in assuming that changes in the atmosphere, and global warming in particular, play a relevant role.
- There is debate within the scientific community on the possibility to accurately attribute specific natural catastrophe events to climate change. Certain types of events – such as extreme heat, flooding, or wildfire – can be more clearly linked with increased temperatures, as confirmed by the IPCC.²¹ There is some evidence to suggest that the probability of very high impact events, such as tropical cyclones, is closely correlated with temperature increases – with one recent study estimating that the proportion of Category 4 and 5 hurricanes has increased at a rate of approx. 25–30 % per °C of global warming.²² Similarly, there is evidence that major cyclones are migrating “polewards” into increasingly densely populated areas (ie New York City) as a result of climate change.²³ However, there is still a high degree of uncertainty regarding the current and future impacts of climate change of specific natural perils in specific geographic areas. While scientifically-durable methods to attribute the impact of climate change on natural disasters are increasing in sophistication,²⁴ multiple methodological and data issues remain.²⁵ Nonetheless, there is a broad understanding that climate trends are likely to on balance result in more frequent natural disasters – which has been recognised as a critical threat to economic growth by major institutions such as the International Monetary Fund (IMF).²⁶
- **Sea Level Rise:** Recent sea level rise projections range from 0.2 meters to 2.0 meters by 2100.²⁷ Arctic sea ice is now declining at a rate of 13.3 percent per decade, with the last 10 years consecutively representing the lowest 10 average September ice extents since 1979.²⁸ Although only 2 percent of the world’s land lies at or below 10 meters of elevation, these areas contain 10 percent of the world’s human population – meaning that over 630 million people are directly threatened by sea level rise.²⁹ The impacts are already being felt: roughly 20cm of sea-level rise since the 1950s increased Superstorm Sandy’s ground-up surge losses by 30% in New York alone, contributing to tens of billions of US dollars in damage.³⁰
- **Biodiversity:** Climate change is exacerbating negative trends on terrestrial and marine biodiversity. Under current trends, climate change could threaten up to 1 in 6 species with extinction.^{31,32} This is especially problematic where high biodiversity value

supports economic activity, such as tourism. A recent study estimates that climate change may result in 99% of the world's reefs experiencing annual bleaching in 2043.³³

- **Displacement:** Since 2008, an average of 26.4 million people have been displaced from their homes by natural disasters – equivalent to one person every second.³⁴ 2016 saw 24.2 million new displacements due to natural disasters, primarily storms and extreme weather events.³⁵
- **Communicable disease:** Temperature rises (associated with current rates of carbon emission) of just 2–3 degrees Celsius could increase the number of people who are vulnerable to malaria by up to 5%, representing several hundred million people.³⁶

13. Going forward, climate change is set to pose mounting human and environmental costs by the end of the century – even under scenarios reflecting mitigation and adaptation efforts (Figure 2). Critically, exposure to climate risks is being predominately driven by individual and collective social choices, which are putting people and assets in harm's way. Analysis by supervisors in Australia suggests that population expansion and urban development trends in high-risk areas “almost guarantees” that the cost of climate-related natural catastrophe events and associated claims will keep rising, irrespective of other factors.³⁷

Figure 2: Emissions Scenarios and Climate Impacts in 2100



Source: Bank of England, 2017, based on analysis by the UK Met Office and AVOID2 programme

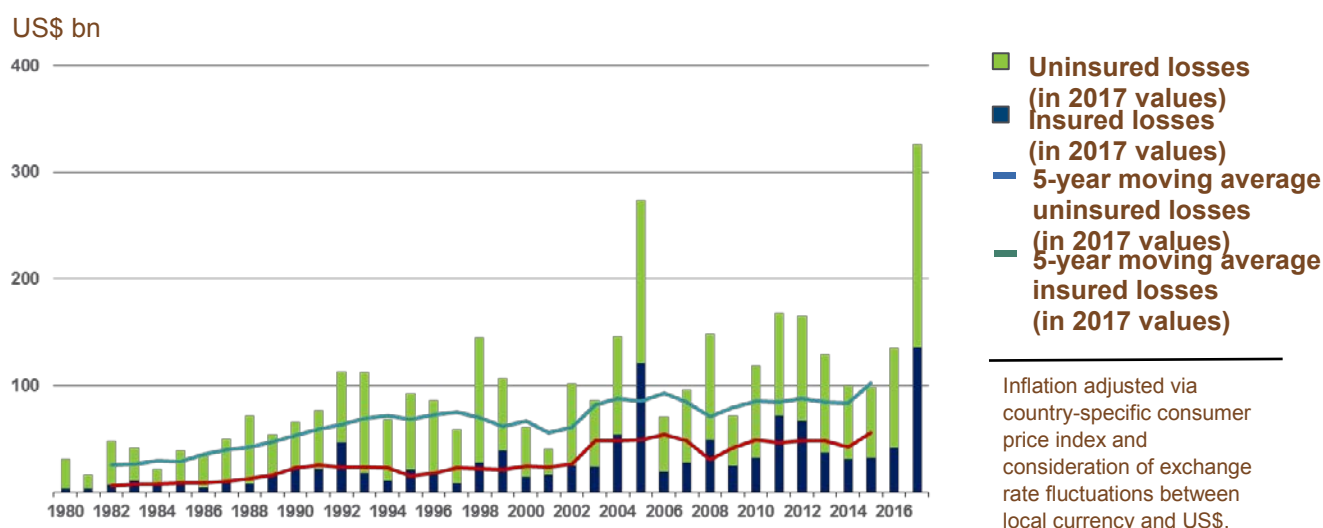
3 How Climate Change may affect the Insurance Sector

3.1 Understanding Climate Risks

14. Climate factors affecting insurers can be grouped into two main categories of risks:

- **Physical risks**, arising from increased damage and losses from physical phenomena associated with both climate trends (ie changing weather patterns, sea level rise) and events (ie natural disasters, extreme weather). It is important to recognise that insurers may be well-versed in understanding the dynamics of such extreme events, and may be able to adjust exposures through annual contract re-pricing. However, the potential for physical climate risks may change in non-linear ways, such as a coincidence of previous un-correlated events, resulting in unexpectedly high claims burdens. Insured losses from climate-related natural catastrophes reached record levels in 2017 (Box 1). Beyond insured losses from physical climate damages, climate trends and shocks can pose economic disruptions affecting insurers, the economy, and the wider financial system. The insurance “protection gap” for weather related losses remains significant, with roughly 70% of losses uninsured (Figure 3) – resulting in significant burden on households, businesses, and governments. At the macro-economic level, uninsured losses from physical risks may affect resource availability and economic productivity across sectors, the profitability of firms and individual assets, pose supply chain disruptions, and ultimately impact insurance market demand. Uninsured losses arising from physical risks may have cascading impacts across the financial system, including on investment companies and banks.³⁸ Similarly, the availability of insurance – or risk of uninsurability due to high physical risk profiles – may have significant impacts on the performance of credit and investment across the economy (including, for instance, mortgage lending).³⁹

Figure 3: The Insurance Protection Gap for Weather-related losses



Source: MunichRe NatCatSERVICE, 2018

Box 1: The cost of natural disasters

Total global economic losses from natural disasters between 2005-2015 were more than US\$1.3trn, with total direct losses in the range of US\$2.5trn since 2000. The series of major hurricanes and other natural disasters in 2017 made it the year of highest insured losses ever, at US\$138bn.⁴⁰ Overall economic losses from natural disasters in 2017 amounted to US\$340bn – the second highest annual figure ever. 83% of the losses were concentrated in North America – with US losses amounting for roughly 50%.⁴¹ According to Aon Benfield, the total economic losses from hurricanes in 2017 were nearly five times the average of the preceding 16 years, losses from wildfire were four-times higher, and losses from other severe storms were 60% higher.⁴² In California, insured losses from wildfires reached US\$13bn,⁴³ stemming from damage to 21,000 homes and 2,800 businesses.⁴⁴

- **Transition risks**, arising from disruptions and shifts associated with the transition to a low-carbon economy, which may affect the value of assets or the costs of doing business for firms. Transition risks may be motivated by policy changes, market dynamics, technological innovation, or reputational factors. Key examples of transition risks that have been recognised by public authorities and central banks include policy changes and regulatory reforms which affect carbon-intensive sectors, including energy, transport, and industry. Policy and regulatory measures may affect specific classes of financial assets relevant for insurer investment (such as real estate portfolios), in addition to those affecting capital markets as a whole (see section 3.2.2 below). Social movements and civil society activism – such as that aiming to motivate divestment from and cessation of underwriting to the coal sector – may pose a risk of reputational damage to firms, if appropriate risk mitigation strategies (and communication actions) are not implemented. Transition factors may also impact the types of insurance products and services demanded from firms – including where new technologies, products and services may disrupt conventional industrial organisation, business models, and affiliated risk cover needs. For instance, some types of renewable energy technologies (such as solar power) are already cheaper than conventional generational technologies in certain markets – and recent analysis by IRENA has suggested that renewable energy will be consistently cheaper than fossil fuels by 2020.⁴⁵ While such changes may create opportunities for insurers, they may also create risk – especially in the case of sudden policy changes which affect risk profiles of insured assets, or significantly constrain market growth.

15. In addition to the two main types of risks above, certain insurers, public authorities, and other stakeholders have suggested that liability risks may originate from climate change, including the physical and transition risks described above.

- **Liability risks** include the risk of climate-related claims under liability policies, as well as direct claims against insurers for failing to manage climate risks. Research by UN Environment has found that climate-related litigation has increased significantly around the world, including over action – or inaction – relating to climate mitigation and adaptation efforts.⁴⁶ Liability risks could arise from management and boards of insurers not fully considering or responding to the impacts of climate change, or appropriate disclosure of current and future risks (including through damages and tort litigation). There may also be exposure to under D&O, PI, and third-party environmental liability policies. While the debate around legal precedent in this domain is ongoing, and of a

protracted nature, there has been a significant increase in major lawsuits being filed with respect to climate change over the last two years, which may be of import to the evolution of the liability risk domain for insurers. Most recently, in January 2018, the City of New York announced lawsuits against five major oil companies, seeking to collect billions of dollars to fund municipal efforts to cope with climate impacts.⁴⁷ Legal organisation Client Earth reports that several reinsurers have already been seeking legal advice on their exposure to long-tail claims under commercial general liability policies in connection with the climate litigation in the US state of California.⁴⁸

16. Importantly, these different types of risks are relevant across underwriting and investment activities of insurers (Table 1).

Table 1: Potential manifestations of physical, transition, and liability risks across underwriting and investment activities

	Underwriting	Investment
<i>Physical Risks</i>	- Pricing risks arising from changing risk profiles to insured assets and property (non-life), changing mortality profiles and demographic trends (life and health) - Claims risk arising from confluence of unexpected confluence of extreme events (ie multiple category 4 or 5 hurricanes) - Strategic/Market Risks arising from changing market dynamics (ie uninsurability of property)	- Risks arising from impacts of physical climate events and trends on assets, firms, and sectors, affecting profitability and cost of business, leading to impacts on financial assets and portfolios (ie debt, equity)
<i>Transition Risks</i>	- Strategic/Market Risks arising from contraction of market demand in certain sectors (ie coal, oil, marine transport) - Strategic/Market Risks arising from market trends, technological innovation, and policy changes related to climate change (ie carbon pricing, energy efficiency regulations), affecting products	- Risks arising from market, policy, technological, and social changes, affecting profitability and cost of business of firms and sectors (ie energy, industry, transport, agriculture), leading to impacts on financial assets and portfolios (ie debt, equity)

	and services demanded by consumers	
<i>Liability Risks</i>	- Liability risks arising from insurers liable on the basis of insurance provided (ie tort or negligence claims) - Liability risks stemming from Directors & Officers policies	- Risks arising from litigation (ie class action) relating to the consideration of climate change in investment decision-making, or inadequate disclosure of climate risks

3.2 Examples of Climate Risks across Insurance Business, Strategy, and Operations

17. Physical and transition risks may pose different strategic, operational, and reputational risks to insurers across underwriting and investment business. While certain climate-related risk factors are long-term in nature, some are already having material impacts. Key examples include:

- **Underwriting Risk:** As described in the previous sections, climate change is already affecting the frequency and concentration of high impact natural catastrophes around the world, leading to increases in weather-related insurance claims. For instance, the Lloyd's market reports to have paid out US\$5.8bn in major claims, most of which were climate-related.⁴⁹ The claims burden disasters in 2017 has had material financial impacts for non-life insurers, with industry Return on Equity dropping from 11% in 2016 to -4% in 2017.⁵⁰
- **Market Risk:** From a pricing risk perspective, insurers' capacity to write insurance business may be constrained by increasing physical risks to insured property and assets, if risk-based pricing rises beyond demand elasticity and customer willingness to pay. There is evidence that domestic property in high risk areas is being rendered uninsurable due to high exposure to physical risks, such as wildfires, storms and sea level rise. In the United States, US\$600bn of property within one mile of the coast is covered under the National Flood Insurance Programme, much of which will not be viable in coming decades, absent intensive adaptation investments. Market contractions stemming from physical risks likely to further exacerbate barriers for consumers to access insurance. Transition risks may significantly change the products and services desired from insurers, and an inability to appropriately design products relevant to changing needs could significantly affect market share (as well as create a strategic risk to overall business viability).
- **Investment Risk:** The profitability of insurer investment portfolios may be affected if invested in sectors or assets which may be especially at risk from either physical or transition-related factors (see section 3.1). This could, at the extreme, constrain insurers' capacity to pay future claims. Clearly, the impacts of climate risks at portfolio level will be influenced by concentration of holdings in specific firms or sectors, diversification and hedging strategies, and the strength of efforts to actively manage and monitor exposures. While insurers may be somewhat insulated from the effects of

climate factors due to investment behaviour, only a few firms are actively seeking to explore how portfolios may be affected by climate change now and into the future.

- **Strategic Risk:** Physical or transition-related climate events, trends, or scenarios may present strategic challenges to insurers, which could inhibit or prevent an insurer from achieving its strategic objectives. Examples may include competitiveness impacts resulting from an inappropriate strategy relating to physical climate risk mitigation, poor management of future plans, or failure to respond to transition factors affecting the industry landscape.
- **Operational Risk:** Physical climate impacts may affect insurer's own assets (including property, equipment, IT systems, and human resources), leading to increased operating costs, inhibited claims management capacity, or potentially stoppages of operations.
- **Reputational Risk:** In recent years, insurance underwriting or investment in sectors perceived as contributing to climate change has emerged as a civil society issue, exemplified by social movements calling for divestment from fossil fuels and the cessation of underwriting of coal-fired power infrastructure.^{51,52}

18. There is emerging consensus that climate change may have a wide range of impacts across corporate sectors – and that climate risk factors may have important effects on the capacities of financial firms, including insurers, to conduct business. This is most clearly exemplified by the statements of major ratings agencies with respect to climate change risk⁵³ - including Moody's, which recently concluded that climate change has a net negative credit impact on P&C and reinsurance sectors.⁵⁴

19. While it may be difficult to reliably assess the potential future aggregate impacts of climate change trends on the insurance market as a whole (in part due to persistently soft market conditions, and high policyholder surplus in some markets),^{55,56} there is increasing recognition by insurers that climate change is likely to have critical impacts on the sector. According to the CEO of AXA, "more than four degrees Celsius of warming this century would make the world uninsurable".⁵⁷

20. Clearly, climate risks may have different impacts on insurers, depending on their core underwriting business areas, investment allocation strategies, size, speciality, geographic reach, and domicile. Over the long term, it is clear climate change is likely to have implications for all types of insurers, either through risk management, risk transfer, or investment channels, or through impacts on the broader macroeconomy.

Box 2: Novel impacts of warming weather – the experience in Australia

In certain jurisdictions, climate factors are beginning to have novel impacts across business lines – including increases in high risk behaviour. A major insurer in Australia studying the impact of climate change on its business has come across an interesting discovery. The insurer had pinpointed a correlation between heatwaves in Western Sydney and an increase in alcohol consumption; leading to a spike in break-in activity during those periods, and ultimately resulting in a higher number of homeowner insurance claims.

3.2.1 Underwriting Activities

21. Climate change risks may manifest in different ways across different insurance business lines.

22. **General insurers** are most likely to have underwriting liabilities exposed to physical risks, and as such have greater experience in identifying, pricing, and managing such risks. Increasing uptake of insurance cover for climate-related natural catastrophes and extreme weather (such as domestic flood insurance) could lead to higher premium revenue over the shorter term (as long as risks remain insurable), but could also lead to significant increases in weather-related claims. Large insurers may be insulated from the accumulation of such risks due to annual repricing, geographical diversification, and the availability of reinsurance capacity. However, future climate impacts may be non-linear and increasingly correlated – with multi-annual recurrence of “1-in-100” year events. Knowledge gaps and uncertainties around climate trends in catastrophe models may create the risk of a major catastrophic event (or confluence of multiple events) not being appropriately considered in rate setting and reserving. From a business model viability perspective, general insurance providers may be faced with a unique combination of physical and transition risks affecting demand for insurance products and services. Such changes may create pervasive risks for specialist providers, which may be reliant on underwriting specific economic activities – like shipping. 30% of global seaborne trade in 2016 by volume was in oil and gas,⁵⁸ a market which could contract significantly under an aggressive low-carbon transition scenario.

23. **Life and health insurers** are in many cases just beginning to explore the impacts of climate factors on their underwriting portfolios. The potential impacts of climate change on mortality are becoming a priority focus for actuarial associations, who are exploring the matter in relationship to insurance, annuity and pension programmes.^{59,60} Key here are heat related health issues associated with extremes in weather events, especially where excessive heat may compound pre-existing health conditions or vulnerabilities (eg elderly populations).

24. **Agricultural insurers**, while well-versed in addressing extreme weather, may be affected by climate risks in unexpected and non-linear ways. For instance, businesses in certain geo-climatic zones may no longer be able to grow desired crops, while rising ocean temperatures may have significant impacts on the productivity of fish farming.

25. **Reinsurers** are often deeply versed in the management of complex systemic risks such as climate change. Due to their exposure across the insurance system and at international levels, reinsurers may inherently be more resilient to climate factors due to geographic diversification. However, as the severity and frequency of significant natural disasters increases, the availability and cost of reinsurance cover for weather-related risks may become prohibitive for smaller insurers in certain markets – potentially leading to a reinsurance gap.

Box 3: Reinsurance Cover for Environmental Risks - the experience from Canada

The Canadian GI market is comprised of many small insurers and is heavily dependent on the international reinsurance market to provide coverage for major natural catastrophes. Total payout for weather-related claims in Canada has hovered at about Can\$1bn per year over the last decade, until 2017 when the Fort McMurray wildfire brought the total liabilities to about Can\$4.5bn. A significant amount of this was reinsured internationally, and although Canadian liabilities did not present an issue to large reinsurers, they were also faced with large claims due to significant activity in the Caribbean region in 2017.

Supervisors in Canada see potential for a reinsurance gap to emerge for weather-related losses if costs rise significantly or reinsurers stop or restrict reinsuring some of these natural catastrophes. The Office of the Superintendent of Financial Institutions (OSFI) has advised direct insurers to consider whether their reinsurers’ business is concentrated in

these areas, and if so, whether there is potential for loss of reinsurance coverage. To the extent such a risk exists, OSFI expects direct insurers to identify alternatives to ensure they can meet their liabilities to policyholders. OSFI is undertaking a broad review of the regulatory framework for reinsurance to ensure that it remains up-to-date and appropriate.

3.2.2 *Investment Activities*

26. Investment activities of insurers may be impacted by both physical and transition risks arising from climate change, which may have a significant impact on the valuation of financial assets. If not adequately considered across sectors, disruption to financial markets stemming from climate risk could affect reserving decisions, capacity satisfy liabilities, and ultimately impact solvency. To date, the key focus on climate change within the investment landscape has been from a transition risk perspective – including the potential for policy changes and technological innovation to result in asset stranding in high-carbon sectors, such as upstream and downstream fossil fuel sectors (oil, gas, coal) and thermal electricity generation. Research suggests that the implementation of a 2°C transition pathway could reduce the revenues of the upstream fossil fuel industry globally by a cumulative US\$33trn by 2040,⁶¹ and could lead to significant macroeconomic implications for certain countries.⁶² Several leading central banks, governments, and financial industry associations are seeking to better understand how investment portfolios may be affected by climate risks, starting with assessments of overall capital exposure across asset classes (see section 8). In 2017, the Lloyd’s market released a report examining actual and potential examples of how stranded assets caused by societal and technological responses to climate change could affect assets and liabilities in the insurance and reinsurance sector.⁶³

27. Some insurers may be comparatively insulated to climate-related risks in capital markets due to allocation towards long-dated debt instruments. Moody’s has concluded that P&C and reinsurance portfolios may be generally less exposed to climate risks due to low asset leverage and high diversification.⁶⁴ There is evidence to suggest that the value and stability of comparatively lower-risk securities could be affected by climate factors:

- **Sovereign Debt:** There is increasing evidence to suggest that physical risk factors such as extreme weather, may affect the credit ratings of sovereigns, through direct losses to infrastructure, as well as impacts on economic activity. Standard & Poor’s have forecasted that tropical cyclones could potentially lead to downgrades of up to two notches in vulnerable countries.⁶⁵ In recent years, several major agencies have identified the role of environmental factors in contributing to the conditions leading to a credit downgrade. In a report detailing its methodology for assessing the physical risks of climate change to sovereign ratings, Moody’s concludes that climate change is already exerting “some influence” on the credit ratings of sovereign nations highly susceptible to its effects – but that near-term implications may be limited.⁶⁶ Ratings agencies are just beginning to explore the impacts of transition risks on sovereign debt – which could have more wide-ranging impacts across developing vs. developed economies.
- **Municipal Debt:** Ratings agencies have also highlighted the potential for climate change to affect the credit quality of municipal bonds, resulting from “sharp, immediate and observable impacts on an issuer’s infrastructure, economy and revenue base, and environment”.⁶⁷
- **Real Estate:** Policy measures and regulatory requirements relating to the environmental performance of building stock, including energy efficiency regulations,

may have impacts on the value of real estate portfolios. In the Netherlands, by 2023, all commercial property will be required have at least a level C energy label – or be taken out of use. Analysis by De Nederlandsche Bank (DNB) has found that 19% of insurer investments related to commercial real estate in the Netherlands involve collateral with lower-range energy labels (ie from D – mediocre – to G – poor) – which could represent a potentially significant financial risk if energy efficiency is not improved, or the assets cannot be liquidated.⁶⁸ The value of real estate portfolios may also be affected by physical risks, if properties are located in high-risk areas.

4 Industry responses to climate risks

4.1 Observed industry practices

28. In its role as risk manager, risk carrier and investor, the global insurance sector plays a cornerstone role in the management of climate-related risks and opportunities for individuals, households, firms, other financial institutions, and public authorities. Building on three decades of catastrophe risk modelling, risk pricing, research and underwriting, the insurance industry offers a unique skillset in helping governments and other stakeholders, to build financial resilience to physical risks of climate change and close the natural catastrophe protection gap.

29. The global movement on disaster risk reduction and transfer which started in the early 2000s has resulted in a diverse landscape of public-private partnerships (PPPs) aiming to reduce the social, economic, and fiscal impacts of physical climate risks. Governments are increasingly making use of risk-based approaches to disaster and climate-risk management, often with the help of the insurance sector. The risk intelligence of the insurance sector has helped governments and public authorities evaluate the costs and benefits of ex ante vs. ex post disaster risk financing, contributing to growing levels of public and private investments in measures to reduce existing and prevent new risks, such as pro-active risk financing and various risk transfer measures, combined with various climate adaptation efforts.⁶⁹

30. Currently, many insurers are actively seeking to update their product offerings, risk management processes, and governance processes relating to climate change risks, including through using predictive methods and enhanced risk modelling. Some leading insurers have implemented integrated frameworks to consider the impacts of environmental hazards – including climate change – across lines of business. Other firms are actively seeking to strengthen catastrophe models to better consider the wide-ranging impacts of climate change on weather, natural hazards, and other phenomena. Several insurance sector coalitions – such as the UN Principles for Sustainable Insurance (PSI), the Geneva Association, and the Insurance Development Forum – have developed frameworks that insurers can adopt to tackle different aspects of the climate risk challenge. A recent study by the Geneva Association summarises key industry trends and recent developments with respect to climate change.⁷⁰

31. On the whole, advances in recent years suggest that certain types of insurers – such as large diversified general insurers, and global reinsurers – may be well-positioned to play a role in managing the physical risks posed by climate change. Initial analysis by some supervisors, including the Bank of England, has suggested firms in certain markets may be reasonably well-equipped to deal with current levels of physical risks. However, there is less understanding about how the insurance sector will respond to transition risks – both in terms of risks to investment portfolios, and impacts on underwriting business models.

32. Looking at current investment practices within insurers, several developments and issues emerge with respect to climate change. An increasing number of insurers are seeking to consider some aspect of climate change or sustainability priorities across their investment decision-making. However, the depth of such commitments, and impacts of actions, may vary significantly across firms and between jurisdictions. A 2016 analysis found that nearly 60% of the 116 insurers surveyed recognise climate risk as an issue; however two fifths of these insurers are taking no action to adjust their portfolios.⁷¹ A recent survey of 80 of the world's largest insurers (with combined Assets under Management (AUM) of US\$15trn) found that on average, only 1% of total internal AUM are allocated to low-carbon investments.⁷²

33. Supervisors and other stakeholders have recognised a “cognitive dissonance” in how insurers approach climate risks between underwriting and investment activities⁷³ – in that the sector-leading risk modelling and pricing capacities of the underwriting side of the business are not leveraged to their full potential on the investment side. In certain cases, capital reallocation to low-carbon or “sustainable” investments may be constrained by the lack of appropriate investment options – creating an inability to invest in more robust climate risk assessment capacity. Finally, the focus of the investment debate has been squarely on transition risk issues – with only very recent attention being placed on forward-looking assessment of physical risks.⁷⁴

34. Looking forward, it is becoming clear that firms may face difficulty adapting to the rapid pace of policy and regulatory change relating to sustainable investment in certain jurisdictions. This is especially the case in the European Union, where efforts are underway to define a “taxonomy” of sustainable finance assets and instruments.⁷⁵ As this environment continues to evolve, more research will be required in order to develop a robust view of the risk and return performance of sustainable assets, firms, and sectors – including where companies may be involved in a wide array of activities across an industry value chain (ie engaged in both fossil fuel extraction and deployment of green energy innovations).

4.2 Strategies for climate resilience

35. The complex, interrelated, non-linear, and dynamic challenges presented by climate risks require a strategic response across business lines and levels of management within insurers, and a degree of alignment between relevant stakeholders along the insurance value chain. At a general level, efforts to achieve climate resilience are likely to require the following elements:

- Coherent governance: Climate risks to be addressed at relevant levels within an insurer, including at board level, through appropriate governance, strategic, and operational frameworks and policies;
- Mainstreaming: Integrating climate risks across the mainstream risk management functions and internal controls of an insurer, including for example the strengthening of technical risk assessment capacities (ie catastrophe models) to integrate climate change factors;
- Integrated approaches: Considering climate risks across lines of insurance businesses and operations, including across underwriting and investment activities, to leverage insights from both sides of the business, and create a holistic strategy considering both assets and liabilities;
- Skill-building: Building the skills and capabilities of practitioners with respect to climate risk issues, to ensure that they are able to utilise relevant climate-related risk information in their everyday activities;
- Educating consumers: Taking steps to educate their customers about climate risks, raise awareness of options to help mitigate risks and build resilience, and increase transparency on the significance of climate risks in risk-based pricing;
- Monitoring: Introducing measurement systems to ensure that efforts listed above are being effectively implemented across business functions, and achieving stated objectives.

36. Within the financial system, there is emerging consensus on best practices for addressing climate risks – building from initial mapping of risks, to approaches and techniques for risk assessment and mitigation, and disclosure of risks to shareholders. The recommendations and supplemental guidance of the FSB TCFD set a global voluntary framework for the identification, assessment, management, and public disclosure of climate-related risks and opportunities in mainstream financial filings.

37. The TCFD's recommendations are structured around four thematic areas that are core elements of how organisations operate – governance, strategy, risk management, and metrics and targets. The four overarching recommendations are supported by key climate-related financial disclosures that build out the framework with information that will help investors and others understand how reporting organisations assess climate-related issues. In addition, the FSB TCFD highlight the importance of forward-looking assessments of risk, including scenario analysis, as a central component of efforts by insurers and other firms incorporate the potential effects of climate change into their planning processes and public disclosures.

38. Please refer to the annex for a consolidated summary of the supplementary guidance across the main recommended disclosures for insurers as underwriters (insurers) and investors (asset owners).

5 Relevance for Insurance Supervisors

39. In recent years, there has been growing recognition by public authorities that climate change is a material prudential issue for the financial sector – in terms of the risks it poses to financial assets, institutions, and markets.⁷⁶ A recent survey across the G20 has found that many countries have implemented policy and regulatory measures to address climate change risks to national financial systems.⁷⁷

40. Stemming from their responsibility to provide oversight of new and emerging risks affecting regulated entities, insurance supervisors have a strategic interest in understanding how climate change may affect the safety and soundness of individual insurers, and insurance markets in aggregate. Supervisors' roles with respect to the protection of policyholders, and maintenance and provision of fair, equitable, and accessible insurance markets may also be impacted by climate change (Table 2).

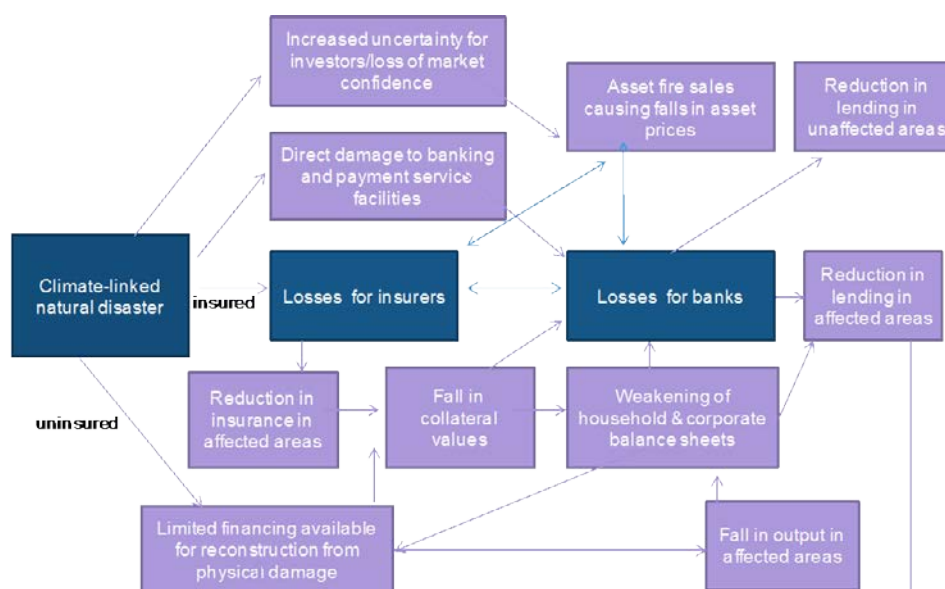
Table 2: Relevance of climate change for the core objectives of insurance supervisors

Core objective	Relevance of Climate Change	Potential Supervisory Responses
Microprudential solvency	Potential for physical, transition, and liability factors to pose risks to the safety and soundness of individual firms, affect the viability of business models, or otherwise result in unforeseen impacts through underwriting, investment, market, strategic, operational, reputational, or other channels.	• Supervisory engagement to assess the consideration of climate change as a strategic priority. • Examining potential financial risks arising from claims burden or investment exposure. • Assessments of portfolio exposure to carbon asset risk. • Undertaking survey exercises to gather quantitative and qualitative information relating to climate change risks and strategic responses. • Voluntary data calls, mandatory disclosure requirements.
Access and affordability of insurance for consumers, consumer protection, market conduct	Potential for climate change render assets uninsurable; transparency for consumers on climate change practices and strategies; delivering enabling conditions for insurance product development.	• Supervisory engagement to assess business decisions affecting availability of insurance coverage. • Supporting consumer awareness and literacy. • Engagement with other policymaking bodies. • Assessment of firm conduct on climate change issues

Macroprudential stability	Potential for physical, transition, and/or liability factors to have systemic implications for the insurance sector, and broader macro-economy.	- Reflecting climate change factors within event scenarios used for into system-level stress testing. - Undertaking forward-looking scenario analysis of underwriting and investment businesses. - Examination of alignment of insurance sector underwriting and investment activities with climate goals. - Engagement with other financial supervisory authorities.
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41. Supervisors have varying levels of familiarity with the current and potential future impacts of climate change. While climate change may not appear immediately relevant to the supervision of insurers in certain jurisdictions, the wide range of potential impacts on the economy, high degree of uncertainty associated with impact scale and time horizons, and the potentially systemic and transformative nature of such factors across the industry, compels a strategic response. In this respect, climate change is similar to other newly arising complex risks – such as cyber risk, recently examined by the BIS and the IAIS.⁷⁸

Figure 4: A transmission map from a natural disaster to financial sector losses and the macroeconomy



Source: Bank of England, 2016

42. Importantly, direct climate impacts on the insurance sector – such as high insured or uninsured losses resulting from climate-related natural disasters – may have indirect impacts on the rest of the financial system, with implications for supervision. Such second-order impacts may include the performance of loans and credit to households and SMEs, the profitability of investments, and resultant adjustments in credit risk profiles and availability of

investment capital (Figure 4). Most fundamentally, the potential future impacts of climate change – which are likely to be significant across economy and society – should be of interest to insurers, and insurers’ strategic responses and of great importance to supervisors, regulators, and other public bodies charged with ensuring the stability of the broader economy. Here, links are emerging between the activities of supervisors, and the responses and broader objectives of central banks with respect to climate change.⁷⁹

43. Supervisors should understand climate change from a core prudential perspective, exploring how physical, transition, and liability factors may affect existing risks to firms, pose new risks, and create influences affecting the growth and stability of insurance markets.

44. **Physical risks** – such as natural disasters – may be well understood by regulated entities, and by supervisors. However, a high degree of uncertainty around the scope, magnitude and timing of physical climate impacts can make physical risks difficult to adequately address. For supervisors, key priorities include:

- Examining how climate change may exacerbate physical risks already considered within supervisory activities, including engagement and stress testing (ie considering increasing frequency and severity of climate-related natural catastrophes);
- Exploring how physical factors may pose risks across different insurance businesses (ie life & health);
- Assessing the broader implications of physical factors for operational, strategic, and reputational risks facing insurers, including in terms of investment allocations;
- Considering how insured and uninsured losses from physical risks could have implications for other financial institutions, such as banks and investors.

45. **Transition risks** are less well understood by regulated entities, and by supervisors. For supervisors, key priorities include:

- Developing an understanding of the channels through which transition risks could affect underwriting and investment businesses of regulated entities. While transition risks are often considered from an investment standpoint, certain transition factors – such as technological innovation – are also likely to affect underwriting businesses, and the competitive landscape of insurance in the case of financial technology (“fintech”) as was reported in 2017 by the IAIS;⁸⁰
- Exploring how regulatory risks may arise from uncertainty or the efforts of governments globally to combat climate change through, for example, setting tighter emissions targets and/or changing subsidies and taxes;
- Examining whether or not transition risks could pose material impacts on investment portfolios, affecting the capacity of insurers to meet underwriting liabilities, for example by making use of stress testing tools or scenario analyses.

46. Finally, supervisors may seek to explore the potential for climate change to pose **liability risks** to insurers.

47. At a higher level, an important priority for supervisors is to understand how climate change affects the broader context in which insurers operate, and the range of stakeholder relationships that are necessary to build resilience to climate risks. The issues associated with climate change risks are complex and need to be tackled in an integrated fashion by various parties including governments, regulators, financial sector players, other sectors, and more generally by society as a whole. Public authorities – starting with governments – have a critical

role to play in developing appropriate frameworks for disaster risk management, advancing ex ante risk reduction efforts (such as considering climate change risk factors within planning and land use decisions), and working with industry to develop appropriate risk mitigation and risk transfer solutions. Here, insurance supervisors can play an important role in helping to ensure that risks can be effectively managed and mitigated where possible, including encouraging improved decision-making on the part of consumers and the creation of enabling environments for private firms to conduct business.

6 Applicability of Insurance Core Principles to Climate Change

48. The Insurance Core Principles (ICPs) set a global framework for the supervision of the insurance sector. While they do not address specific thematic risk issues, the ICPs provide the basis for supervisors to identify and respond to new and emerging risks facing the insurance sector – such as those arising from climate change. In this context, the ICPs set out a framework for supervisors to address the insurance sector with respect to climate risks, including those already material to the insurance sector (ie natural disasters), as well as those with indirect impacts that may not currently be understood as material due to knowledge gaps or high levels of uncertainty (ie transition risks). The ICPs can guide supervisory responses to these issues, including actions to enhance visibility around the governance of climate risks and strategies for responding to such risks, require the management of significant risks and implementation of appropriate internal controls, and promote resilience to climate risks in an efficient way, respecting issues of proportionality.

49. ICPs of relevance for the supervision of climate risk in the insurance sector may include:

- ICP 7 - Corporate Governance
- ICP 8 - Risk Management and Internal Controls
- ICP 15 - Investment
- ICP 16 - Enterprise Risk Management for Solvency Purposes
- ICP 19 - Conduct of Business
- ICP 20 - Public Disclosure

These ICPs are discussed in the following section.

50. Other ICPs may be relevant for the supervision of climate risk in the insurance sector, or for supervisory coordination and cooperation with respect to climate change.

51. Going forward, the IAIS may seek to reflect further on the relevance of climate change across other ICPs, and take steps to consider how climate change may factor within ongoing review processes of ICPs alongside other new and emerging risks.

6.1 ICPs of relevance to climate change risks

ICP 7 – Corporate Governance

52. ICP 7 requires insurers to establish and implement a corporate governance framework which provides for sound and prudent management and oversight of the insurer's business, and adequately recognises and protects the interests of policyholders. Standard 7.2 sets out the key high-level requirements relating to corporate culture, business objectives and strategies of the insurer, which may be important with respect to gathering an accurate reading of the insurer's strategic position with respect to climate risks. Specifically, as climate change may present important long-term risks and challenges, insurer's boards should consider climate factors in its activities to monitor, review, and set business objectives and strategies (Guidance 7.2.1). Closely linked to this is the need for the consideration of appropriate performance goals and measures to evaluate the implementation of objectives and strategies (Guidance 7.2.2), which should be able to reflect the wide range of potential impacts of climate change on long-term performance, viability, and interests of policyholders. Finally, the Board's

role in setting an appropriate “tone at the top” is relevant with respect to making clear why and how climate change presents a strategic issue for an insurer, and the values, norms and supporting policies necessary to ensure that climate risks are appropriately considered across the organisation in mainstream activities and decision-making. In addition, climate risks may be relevant to other provisions within ICP 7 (ie guidance under Standards 7.5, 7.7, etc.), relating to the Board’s oversight of risk controls and reporting (discussed in the sections below).

ICP 8 – Risk Management and Internal Controls

53. ICP 8 requires an insurer to have, as part of its overall corporate governance framework, effective systems of risk management and internal controls, including effective functions for risk management, compliance, actuarial matters and internal audit. Climate risks may have wide ranging impacts across underwriting and investment activities of an insurer, and as such, insurers’ risk management systems, controls, and functions must be able to identify, assess, and account for the impacts of climate change. Key here are a) the Risk Management Function and b) the Actuarial Function.

8.4 – Risk Management Function

54. The Risk Management Function is expected to establish, implement, and maintain appropriate mechanisms and activities to manage risks, as set out in Guidance 8.4.4. Functions of specific relevance in a climate change context may include mechanisms and activities to:

- assess, aggregate, monitor and help manage and otherwise address identified risks effectively; this includes assessing the insurer’s capacity to absorb risk with due regard to the nature, probability, duration, correlation and potential severity of risks;
- establish a forward-looking assessment of the risk profile;
- evaluate the internal and external risk environment on an on-going basis in order to identify and assess potential risks as early as possible. This may include looking at risks from different perspectives, such as by territory or by line of business;
- conduct regular stress testing and scenario analyses as defined in ICP 16.

8.5 – Actuarial Function

55. The Actuarial Function has a range of responsibilities through which it may inform an insurer regarding current and future impacts of new and emerging risks, as set out in Guidance 8.5.4. Many of the functions identified under this schedule may be relevant in a climate change context, including evaluation and advisory functions relating to:

- The insurer’s insurance liabilities, including policy provisions and aggregate claim liabilities, as well as determination of reserves for financial risks;
- Asset liability management with regards to the adequacy and the sufficiency of assets and future revenues to cover the insurer’s obligations to policyholders and capital requirements;
- The insurer’s investment policies and the valuation of assets;
- An insurer’s prospective solvency position by conducting capital adequacy assessments and stress tests under various scenarios, and measuring their relative impact on assets, liabilities, and actual and future capital levels;

- The adequacy and soundness of underwriting policies;
- The development, pricing and assessment of the adequacy of reinsurance arrangements;
- Product development and design, including the terms and conditions of insurance contracts and pricing, along with estimation of the capital required to underwrite the product;
- The sufficiency, accuracy and quality of data, the methods and the assumptions used in the calculation of technical provisions;
- The research, development, validation and use of internal models for internal actuarial or financial projections, or for solvency purposes as in the Own Risk Solvency Assessment (ORSA) (see section on ICP 16 below).

56. Supervisors may seek to engage with insurers on how Risk Management, Actuarial, and other functions are set up to consider climate change risks, what actions have been taken to address such risks, and how this information is applied across the organisation, including in investment decisions.

ICP 15 – Investment

57. ICP 15 sets requirements for solvency purposes on the investment activities of insurers in order to address the risks faced by insurers. Statements and guidance under this ICP clarify that:

- Regulatory investment requirements address the security, liquidity, and diversification of an insurer's investment portfolio as a whole (Statement 15.3);
- Supervisors require insurers to invest in a manner that is appropriate to the nature of insurers' liabilities (Statement 15.4);
- Supervisors require insurers to invest only in assets whose risks they can properly assess and manage (Statement 15.5).

58. There is increasing evidence to suggest that climate change risks (including transition risks) may have a range of complex and non-linear impacts on financial markets, which may affect the value of insurer investment portfolios (see section 3.2.2 of this document). In this respect, many of the Statements and Guidance set out under ICP 15 may be relevant when considering how climate risks may affect the strength of investment regulatory requirements.

59. Transition risks arising from climate change may have impacts on the security of investments (Guidance 15.3.7–14) in terms of risk of default of counterparties, and the risk that investments will lose value. Relevant here are provisions relating to the role of credit ratings agencies – which are now beginning to apply greater focus to the consideration of climate change factors in ratings decisions.

60. If physical climate events or transition risks were to result in a significant disruption to financial markets, or a rapid devaluation of financial assets linked to a given firm or sector, issues may arise if payments to policyholders or creditors are not able to be made as portfolio values fall (Guidance 15.3.15–21).

61. Due to its global nature and universal scope for impact across sectors, climate change may also be relevant when assessing the diversification of insurer investment portfolios (Guidance 15.3.22–26).

62. Guidance relating to the assessment of investment risks (Statement 15.5) are also of importance in a climate change context, as certain risk factors (ie policy, technology, or reputational risks) may be difficult to identify, measure, monitor, control and report (Guidance 15.5.1). The prospect of stranded assets – whereby significant devaluation or conversion to liabilities of financial assets result from climate-related factors – is of primary relevance when assessing the value at risk and potential losses (Guidance 15.5.2), and the balance of risks between underlying assets and financial investments (Guidance 15.5.3).

ICP 16 – Enterprise Risk Management (ERM) for Solvency Purposes

Climate risk as ERM factor

63. ICP 16 sets enterprise risk management (ERM) requirements for solvency purposes that require insurers to address all relevant and material risks. Statement 16.1 sets out guidance for insurers' ERM frameworks, with the need to consider underwriting risk, market risk, credit risk, operational risk, liquidity risk, legal risk, and reputational risk. Several supervisors have recognised that climate change is in and of itself not a unique risk factor facing insurers – and as such is likely to have effects across these mainstream categories (See section 7.2.1 of this document).

Climate risk and ORSA

64. Under ICP 16, the IAIS suggests that supervisors require firms to conduct ORSA or similar process as a way to evaluate current and future risks and solvency conditions. Integrating climate change considerations as part of ORSA guidance could be useful for supervisors seeking to encourage self-assessment of climate factors, and thereby enhance supervisor's view of a firm's capacity to withstand financial stress that may arise from new and emerging risks. Several supervisors have expressed their intention to utilising the ORSA structure to engage with firms on their consideration of climate change risks, setting expectations for how firms should undertake internal assessment (see section 8).

Climate risk and stress testing

65. Provisions set out in ICP 16 relating to stress testing and scenario analysis (ie Guidance 16.1.6–17) are intended to help supervisors guide activities undertaken by insurers to strengthen their view of exposure to future risks. These activities are especially relevant in a climate change context. Climate change is a long-term risk associated with high uncertainty regarding the timing, scope, and severity of potential impacts, which may manifest beyond the conventional time horizons used by firms and supervisors to assess risks.

66. The SIF has recognised the value of scenario analysis in its statement on in support of the Recommendations of the FSB TCFD, noting that “enhanced climate-related disclosure by insurers will support insurance supervisors in their efforts to ensure the protection of policyholders, the safety and soundness of insurers and the stability of the insurance sector as a whole. (...) Scenario analysis is a critical tool to understand how the insurance sector could be impacted by both physical climate impacts as well as the transition to a low-carbon and climate resilient economy”.⁸¹

67. Scenario analysis can also be useful to focus on the long-term alignment of investment portfolios with a low-carbon future, and the steps that insurers may take to address risks associated with this transition. The FSB TCFD has delivered a stand-alone report on the use of forward-looking scenario analysis,⁸² which could be a useful tool for supervisors seeking to build awareness and capacity of insurers in their market.

ICP 19 – Conduct of Business

68. ICP 19 sets requirements that insurers and intermediaries, in their conduct of insurance business, treat customers fairly – with provisions relating to fair treatment, product development and pre-contractual stage, policy servicing, and confidentiality. Climate change risk may relate to different aspects of insurers' conduct of business across the contracting and policy servicing life cycle. For instance, development of new products for environmental risk cover and pre-contractual engagement must be appropriately transparent so that customers can identify and select products that suit their needs. Deepening understanding of climate change risks may also be a relevant priority for supervisors in the context of other activities to build financial literacy relating to insurance products. In terms of policy servicing, a sudden or concentrated increase in weather-related claims due to climate factors may impact on an insurers' capacity to handle claims in a timely manner. Supervisors may also seek to engage with firms to ensure that they are appropriately considering climate factors in the context of market conduct and consumer protection objectives.

ICP 20 – Public Disclosure

69. ICP 20 requires insurers to disclose relevant, comprehensive and adequate information on a timely basis in order to give policyholders and market participants a clear view of their business activities, performance and financial position. The objective of ICP 20 is to enhance market discipline, and deepen understanding of the risks facing an insurer and how such risks are managed. New and emerging risks – including climate change – are of primary relevance to this objective.

70. Enhancing the availability and quality of climate-related information is now widely understood to be a foundational component of market and policy action to address climate-related risks in the financial system. According to research by UN Environment, roughly 30% of all national-level policy and regulatory measures on sustainable finance relate to disclosure, with climate change issues being a primary focus.

71. At the international level, the Recommendations and Guidance of the FSB TCFD set a global framework for the identification, assessment, management, and public disclosure of climate-related risks, with supplemental guidance for disclosure by insurers as underwriters and investors. Looking across the four thematic areas of Guidance, Strategy, Risk Management, and Metrics and Targets, the FSB TCFD provides a framework for the consideration of climate change risk, which are closely related to several ICPs (Table 3).

72. While the Recommendations and Guidance of the FSB TCFD are voluntary, supervisors may seek to engage with firms to encourage uptake of the TCFD framework as international best practice.

73. The Recommendations, supplemental guidance and supporting material of the TCFD (including the special report on scenario analysis) may be helpful for supervisors as an example of how the ICPs could be applied in a climate change context (see the annex). Going forward, supervisors may seek to adopt or make reference to various aspects of the TCFD framework in their interpretation of the various ICPs discussed above.

Table 3: Links between FSB TCFD Recommendations and IAIS ICPs

TCFD Thematic Areas	Recommended Disclosures	Link to IAIS ICPs
Governance: The organisation's governance around climate-related risks and opportunities	a) Describe the board's oversight of climate-related risks and opportunities. b) Describe management's role in assessing and managing climate-related risks and opportunities.	ICP 7 – Corporate Governance <i>7.3 – Structure and governance of the Board</i> <i>7.10 – Duties of Senior Management</i> ICP 20 – Public Disclosure
Strategy: The actual and potential impacts of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning	a) Describe the climate-related risks and opportunities the organisation has identified over the short, medium, and long term. b) Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning. c) Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	ICP 7 – Corporate Governance <i>7.2 – Corporate culture, business objectives and strategies</i> ICP 20 – Public Disclosure
Risk Management: The processes used by the organisation to identify, assess, and manage climate-related risks	a) Describe the organisation's processes for identifying and assessing climate-related risks. b) Describe the organisation's processes for managing climate-related risks. c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management.	ICP 8 – Risk Management and Internal Controls <i>8.1 – Systems for risk management and internal controls</i> <i>8.4 – Risk Management Function</i> ICP 16 – Enterprise Risk Management for Solvency Purposes <i>(Provisions relevant to stress testing and scenario analysis)</i> ICP 20 – Public Disclosure
Metrics and Targets: The metrics and targets used to	a) Disclose the metrics used by the organisation to assess climate-	ICP 8 – Risk Management and Internal Controls

assess and manage relevant climate-related risks and opportunities	related risks and opportunities in line with its strategy and risk management process. b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks. c) Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.	<i>8.5 – Actuarial Function</i> ICP 9 – Supervisory Review and Reporting <i>9.1 – Supervisory Powers</i> ICP 16 – Enterprise Risk Management for Solvency Purposes <i>(Provisions relevant to stress testing and scenario analysis)</i> ICP 20 – Public Disclosure
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7 Supervisory Approaches to Climate Change Risks

74. Members of the SIF have taken a range of actions to better understand physical and transition risks facing insurers' underwriting and investment businesses, and to strengthen mechanisms for ensuring safety, soundness and stability. Drawing on this body of experience, this section sets out current and contemplated supervisory approaches for addressing climate risks, providing a set of options for supervisors to consider in line with their mandates, statutory responsibilities, and strategic objectives.

75. The approaches described in this section are not intended to create supervisory expectations, or to be considered as guidance for supervisors. Many of the approaches described here relate to recent (or in certain cases ongoing) activities of supervisors, and as such are very new. Further reflection on this body of emerging practice – and appropriate evaluation of lessons learned – may be necessary.

7.1 Assessing Climate Change as an Emerging Risk

7.1.1 Mandates and Objectives

76. A first step for supervisors can be to identify the relevance of climate factors to their core supervisory mandates and objectives. The impetus for this initial action varies across jurisdictions, and may include legislation, requests from government, reconfiguration of institutional objectives, or independent action. A growing number of supervisors now consider climate factors as relevant to the core of their statutory obligations.

- De Nederlandsche Bank (DNB), Netherlands: "Supervisory authorities and policymakers have an important role in identifying and mitigating climate-related risks. A timely, clear and gradual transition is needed to limit transition risks to the financial sector (...) DNB intends to embed climate-related risks more firmly into the supervisory approach and will continue to develop and implement climate stress tests. Last but not least, DNB will continue to contribute to international exchange of knowledge about climate-related risks between supervisory authorities."⁸³
- Finansinspektionen (FI), Sweden: "Climate changes mean changes to the finance sector's external conditions. They therefore create new risks – and new business opportunities – for firms. Firms need to monitor and manage these risks; otherwise, quite simply, they are not doing their job. FI, in turn, must monitor what the firms are doing and not doing – otherwise FI is not doing its job. FI therefore needs to follow how climate risks and the firms' sustainability work affect the risks in the financial sector."⁸⁴
- Australian Prudential Regulation Authority (APRA), Australia: "As the prudential regulator, APRA has a clear duty to warn the institutions we regulate if we identify risks that could threaten the interests of Australia's financial beneficiaries or the overall stability of the system."⁸⁵

77. A lack of clarity relating to the boundaries of supervisory mandates, as well as other external factors, may constrain the capacity for action. At this stage, supervisors can manage the potential for political risks and perception of "overstepping" their role by carefully examining international practice and the emerging body of evidence detailing the materiality of climate related risks and opportunities facing insurers, and the financial sector more broadly.

7.1.2 Initial Assessment

78. Once the rationale for addressing climate change has been set, a helpful next step can be an examination of how climate change may impact the insurance sector. This can take the form of an initial “stock-take” of risks, exposures, and strategic responses to climate issues by firms in the local market. Such an exercise can be useful to explore the different channels through which climate change may affect insurers, as well as to assess levels of familiarity within the marketplace.

- In its 2015 assessment of climate risk to the UK insurance sector, the Bank of England Prudential Regulation Authority set out a framework for understanding the impacts of climate change on insurers, conducted a high-level analysis of sector vulnerabilities, and set out a supervisory and research agenda for further work (which is now being implemented).

79. Internal reviews by supervisors can be useful to assess levels of familiarity and awareness of climate change as an emerging risk, and the relevance of climate change issues to routine supervisory practices.

7.1.3 Signalling Expectations

80. Supervisors and regulators can seek to raise awareness of climate change as a new and emerging risk to the insurance sector through market signalling – including public statements. In Australia, APRA started a conversation on climate change with a high-level speech to the national insurance council, setting out the rationale for action, its intended next steps, and expectations from firms (see section 8.1). Initial signalling by supervisors often considers climate change as an emerging risk, with the objective of making firms aware of the implications for the resilience and viability of their business models. This can be a helpful step towards a longer-term goal of firms integrating supervisory expectations into action on short-term physical risks, and the consideration of transition risks (which are often longer-term). Key priority actions at this stage include:

- Developing a balanced position, respecting boundaries of supervisory mandates;
- Clarifying what firms should expect as part of supervision and regulation;
- Appropriate internal communication to ensure consistent messages.

7.2 Responding to Climate Change risks through Supervisory Practice

7.2.1 Risk Frameworks

81. A growing number of supervisors believe that physical and transition risks should be considered within the mainstream risk framework of insurers, due to the potential implications across underwriting, investment, operational, strategic, and reputational dimensions. The Bank of England has confirmed that “in many ways, climate change, and society’s responses to it, do not necessarily create new categories of financial risk but translate into existing categories, such as credit and market risk for banks and investors, or risks to underwriting and reserving for insurers”. APRA has undertaken a high-level assessment of climate factors across its cross-industry CPS 220 Risk Management prudential standard for insurance, banks, and superfunds, resulting in a “heat map” of potential risk areas (Figure 5). Once climate factors are considered against existing risk categories, the next step is to make tangible adjustments to engagement strategies and examination tools to respond to climate factors.

Figure 5: Assessment of climate change within APRA CPS 220 Risk Management Prudential Standard

CPS 220	Insurance			Banking	Super (Investments)
	GI	LI	PHI		
Credit Risk					
Market/Investment Risk					
Liquidity Risk					
Insurance Risk				N/A	
Operational Risk					
Strategic/Reputation Risk					

Source: APRA, 2017

7.2.2 Information and Data Gathering

82. Sector-level information requests and data gathering activities present another important channel for supervisors to deepen understanding of how climate factors may affect firms. Such efforts may include the provision or endorsement of voluntary disclosure efforts, surveys, or the implementation of new mandatory disclosure requirements. In Brazil, SUSEP has launched a survey process with regulated entities to obtain data and information about market practice on sustainability issues, with a focus on climate issues (see section 8.2).

83. One challenge for such disclosure initiatives, is that upon receipt of responses, regulators must validate the data before further analysis can be performed. Investment data from third party vendors are often used to perform this validation. As no such vendor covers all the investment market, supervisors would do well to use multiple data sources, potentially drawing on datasets available from universities or other non-profit bodies.

84. Some areas for improvement identified by supervisors include:

- Improved reporting materials, which clarify definitions, provide guidance on quantitative aspects (ie thresholds), and process dimensions (ie treatment of subsidiaries);
- Improved processes and methods to compile, sort, and analyse reported data;
- Mechanisms to overcome data inconsistency and gaps;
- Inclusion of newly developed disclosure techniques and metrics.

7.2.3 Engagement strategies and Examination Tools

85. An important mechanism for supervisors to increase their understanding of how climate risks may affect insurers is through the integration of climate-related issues in routine supervisory engagement and examination. In the US, the NAIC has integrated climate change factors into national-level supervisory standards through revisions to Financial Condition Examiners Handbook (see section 8.8).⁸⁶ In other jurisdictions, such as the UK, supervisors are considering how climate change may be considered within standardised supervisory tools, including ORSA (see section 8.7).

86. Supervisors can ask a range of questions to firms regarding their understanding of, responses to, and strategic perspectives on climate change risks and opportunities.⁸⁷ Such questions may pertain to a range of different issues, including:

- **Overall familiarity:** general understanding of climate change as a risk and an opportunity; key issues relevant to business; familiarity with recent developments (ie TCFD);
- **Governance, Strategy, and Business Model:** presence of governance structures relating to climate change issues; engagement of board and senior management; changes to its business strategy; risk thresholds or indicators; long-term impacts of climate change on competitive environment;
- **Underwriting:** impacts on underwriting risk (pricing, market, claims); treatment of climate change factors within risk modelling, exposure assessment and risk management; consideration of climate factors within product innovation and business development; potential for climate change to affect insurance pricing; treatment of climate-related claims; potential for market conduct issues;
- **Investment:** consideration of climate risks and opportunities within investment policies; impacts on market, credit, counterparty, and other investment risks; current and potential future impacts on investment portfolios; impacts on capital reserving decisions;
- **Other issues:** consideration of potential exposure to liability risks arising from climate change;
- **Skills, Capacities, and Culture:** organisational structures and delegation of responsibilities with respect to climate change issues; capacity building; relationship to corporate values;
- **Role of the supervisor:** Views on how supervisors should seek to assess exposures to climate-related risks to firms and the sector as a whole.

7.2.4 Examining current exposures: Stress Testing & Exposure Assessment

Stress Testing

87. Many insurance supervisors regularly perform stress tests to assess the resilience of the insurance sector to possible adverse developments. Supervisors test the industry's resilience to liability-shock events, enabling them to analyse the impact of certain scenarios to an insurer's available capital as well as helping to identify the key reinsurance counterparties and jurisdictions to which the general insurance sector could be exposed to. Stress tests can be split into a set of severe but conceivable scenarios and a capture of exposures which will allow analysis of the impact of potential losses by various sectors of the economy. At a firm-specific level, such testing can help inform an internal review processes as well as improve supervisors' view of a firm's risk management systems, as well as providing an insight into how well insurers manage their potential exposures to various liability shocks.

88. Insurance stress testing regimes in several jurisdictions currently consider weather-related natural disaster events like hurricanes and windstorms, which may be exacerbated by climate change. Several supervisors are now seeking to integrate climate change factors into the design of stress test scenarios, in order to better reflect the likelihood of a given climate-related event (see sections 8.5 and 8.7). The experience of natural catastrophes in 2017 has motivated some supervisors to recalibrate stress testing scenarios to reflect a greater

likelihood of correlated natural catastrophes.⁸⁸ Speaking at the International Climate Risk Conference for Supervisors in April 2018, Bank of England Governor Mark Carney remarked that “On climate, remember, past is not prologue. In the depressing spirit of Bayesian updating that the current climate change trajectory demands, when considering scenarios for 2019, that we include weather-related events that are more severe and clustered”.⁸⁹

89. A key challenge is how to define stress testing scenarios to best reflect an appropriate level of event severity, while providing a balanced view across insurers. For this reason, scenarios have to be broadly applicable, yet detailed enough that insurers would be likely to experience exposure to similar events. Other challenges relate to the balance of current vs future expected risk profiles – in order to best anticipate how climate change could exacerbate either the impacts or expected probability of extreme events.

90. It is difficult to reliably assess the return period for certain extreme weather events. Insurers may consider that such event risks could only emerge over the long-term, allowing for optionality to mitigate through repricing or transfer risk through financial channels (including reinsurance). More evidence/investigation is required to explore the potential for more extreme weather scenarios over short-term timeframes. For firm-level modelling, the industry – and supervisors – may be limited by the capabilities available from third-party modelling experts. This has an impact on the range of climate-related disaster scenarios which can be robustly described and assessed – meaning that many scenarios focus on windstorm and flood events, rather than more complex climate-related impacts relating to weather variability on ecosystem function (ie drought-related fires).

91. Some initial lessons from climate-related stress testing efforts relating to physical risk include:

- **Definition of scenarios:** It can be helpful to liaise with risk modelling firms, academics, and other information providers in order to define consistent scenarios and relevant event parameters (ie frequency, severity). It is important to ascertain how risk models may take climate change trends into account, as parameters may vary significantly;
- **Consider proportionality:** Supervisors should seek to apply proportional approaches, identifying the exposures of firms to various events (eg European windstorms, US hurricanes, UK flood, etc.), and focus the tests on events and territories with the most material impacts to firms in the jurisdiction;
- **Engage stakeholders:** In order to have more acceptance for the investigation, it is helpful to discuss the intended scenarios in an early stage with a (delegation of) the companies involved. Also, it can help to clarify intended follow up and expectations regarding the ability to withstand certain scenarios.

92. In a climate change context, stress tests are more readily relevant for the assessment of exposures to physical risks, as they explore the impacts of specific shock events. Transition risks may be encapsulated or amplified by shock events – such as unexpected drastic policy changes, or rapid changes in consumer sentiment (such as reactions to scandals); however, quantifying the financial impacts of such phenomena on investment portfolios is extremely complex, and involves high levels of uncertainty. In this respect, supervisors often consider current exposures to transition risks through proxy variables, such as holdings in fossil fuels.

Exposure Assessments

93. Several supervisors have sought to quantify the share of insurer investment portfolios that could be exposed to transition risks by examining capital allocations to specific high-

carbon sectors, and the typologies of financial assets insurers may hold (see section 8). Supervisors have encountered a number of common issues in designing and conducting exposure assessments, including:

- **Metrics and Boundary conditions:** One issue in developing exposure assessments is the boundary conditions for financial assets considered “high-carbon”. One possible strategy is to use revenue based metrics – ie examining the share of revenues derived from carbon-intensive activities of a given firm, project, and related financial assets (see section 8.5). Currently, there remains a wide degree of variability in how different models may consider the degree to which a given financial asset should be considered as high-carbon or not (ie in terms of emissions factors and other climate-relevant indicators), resulting in divergent conclusions from the same underlying data (ie portfolio allocations). Revenue thresholds provide a greater degree of consistency, and greater availability of data;
- **Asset classifications:** The variation between industry classification systems used by different financial institutions across different asset classes makes collating exposures across risk types and asset classes challenging at a system level. To overcome this, supervisors such as the DNB have put forward a standard set of classification codes for financial institutions to use.

94. In addition to building transparency around portfolio allocations, initial exposure assessments and other supervisory engagement around transition risks can help raise awareness around climate risks and opportunities within regulated entities, and also help increase buy-in from firms in other more complex or wide-ranging efforts. Undertaking an initial high-level assessment can be an important step towards engaging firms in more complex efforts to examine potential future risks to portfolios, including through scenario analysis.

7.2.5 Exploring future risk: Scenario Analysis & Alignment

95. In addition to evaluating current climate risks which may be material for insurers, supervisors are seeking to examine how insurers may be affected by climate risks in the future – including through the use of different climate scenarios, over longer timeframes than those used in conventional solvency assessments. As scenario analysis activities seek to explore trends rather than shocks – including, for instance, changes in the fuel mix of electricity generation – these methods are most relevant for exploring transition risks to investment portfolios. However, such tools could also be applied by insurers and supervisors to undertake forward-looking analysis of physical risk trends, or to assess alignment of underwriting strategies with a climate-resilient future.

Scenario analysis

96. A select group of insurance supervisors are undertaking forward-looking scenario analysis activities, to explore how insurer investment portfolios may be affected by different market, policy, technological, or social changes associated with the transition to a low-carbon future (see sections 8.5, 8.7, and 8.9). In 2018, the California Department of Insurance released the results of a forward-looking scenario analysis of insurer investment portfolios, arguably the most comprehensive analysis of future transition risks facing the insurance sector (see section 8.9).⁹⁰ The aggregate data provides information on the transition risks related to investments in oil, gas, thermal coal, and utilities which are held by insurers operating in California with over US\$100m in annual premiums. According to this data, in order for investments in utilities to be aligned with a 2 degrees scenario, there is significant need for coal-fired power capacity retirements.⁹¹ The data also show that the while trajectory for oil and

gas investments at sector level is currently aligned with a 2 degrees scenario over the next five years, not every portfolio is necessarily aligned with a 2 degrees pathway.

97. Forward-looking scenario analysis of climate risks is an emerging concept, and is likely to be a complex challenge for insurers (including in efforts to undertake climate-related disclosures in line with TCFD recommendations). Through conducting their own, system-level scenario analysis exercises, supervisors can complement their view of a firm's current and future climate risks – and also encourage firms to build up their own capacities to evaluate transition risks. Several supervisors report that the results of scenario analysis activities can be helpful to identify individual firms which may be at lower levels of sophistication with respect to climate change issues, and therefore help target the application of limited supervisory resources.

98. Scenario analysis of climate risks is an emerging field, and at early stage of development. Emerging issues encountered by supervisors in designing and conducting scenario analysis exercises include:

- **Inadequate data and methodological gaps:** The main challenges supervisors have faced in undertaking scenario analysis include difficulty in modelling the dynamics of certain asset classes (ie looking beyond corporate debt), and a lack of data and granularity of scenarios for other high-emission sectors;
- **Disjunctions in time horizons:** long-term risks and impacts may materialise beyond the horizon of financial risk models used by institutions, and beyond supervisory time horizons. Supervisors may seek to explore ways to undertake longer-term risk exploration.

Transparency on alignment with climate-related public policy objectives

99. In addition to scenario analysis, supervisors can seek qualitative information from firms to better understand how the expected capital allocations of insurer investment portfolios may contribute to public policy objectives relating to climate change. Governments around the world are implementing a diverse array of measures to raise private capital for long-term investments necessary to achieve the sustainability transition. While such action is usually the remit of other authorities, insurance supervisors can indeed play an important role in gathering information to help evaluate these efforts – including with respect to current and projected financial flows to low-carbon investments. In France, under Article 173 of the Energy Transition Law, insurers (as institutional investors) are required to disclose the contribution of investment portfolios to the international climate objectives of the Paris Agreement and the objectives of the French national energy transition strategy (see section 8.3). Transparency on capital allocation thus has merits beyond the measurement of transition risks by disclosing useful qualitative data.

7.3 Collaboration and Cooperation

7.3.1 Convening

100. Supervisors can utilise their influence to convene insurers, other financial institutions, and civil society stakeholders, to collaborate on climate change issues – such as understanding financing gaps associated with climate goals. In the Netherlands, DNB established a Platform on Sustainable Finance in 2016 (see section 8.5) with the aim to promote and encourage a dialogue on sustainable finance in the financial sector.

7.3.2 Engagement with other public authorities

101. Insurance supervisors can work with other financial supervisors, regulators, and government on climate change issues – including efforts to reduce exposure. Such activities may include:

- Integrating a network of supervisors and central banks. The Network for Greening the Financial System, gathers almost fifteen members, including the Bank of England, the European central bank and the People's Bank of China. This network aims at exchanging experiences, best practices and contribute to the better manage environmental and climate risks in the financial sector and encourage its contribution to the transition towards a sustainable economy.
- Integrating insurance into national roadmaps – and implementing targets into the sector. Following the launch of a national-level sustainable finance strategy announced as part of UNFCCC COP 22, Morocco's insurance regulator, Autorité de Contrôle des Assurances et de la Prévoyance Sociale (ACAPS), has brought together the market association and leading firms to develop an implementation strategy to integrate sustainability and climate issues into insurance market development, including targets for investments in climate-aligned assets;
- Applying insights and lessons from activities in the insurance sector to examination of how climate factors may affect other regulated entities, such as banks and investment firms. In the UK, the PRA is undertaking a review of how climate factors may affect the UK banking sector (see section 8.7);
- Engaging with public authorities working beyond the financial sector. Supervisors can play an important role in the development of integrated policy frameworks to manage environmental risk beyond the financial sector, such as national disaster risk management and climate adaptation planning.

7.3.3 International Engagement

102. Insurance supervisors can learn from experience in other jurisdictions, including through platforms such as the SIF, and by expressing their interests to address climate issues within the context of the IAIS.

8 Observed Practices: Case Studies

103. In 2017, the SIF conducted a survey process for supervisors to share knowledge and compare experience from their efforts to address climate risks. The survey covered activities across firm-level supervision and system-level stress testing, examining approaches, methodologies, data inputs, key challenges, impacts on practice, and next steps. As of January 2018, nine jurisdictions had responded to the survey:

- **Australia:** Australian Prudential Regulation Authority (APRA);
- **Brazil:** Superintendência de Seguros Privados (SUSEP);
- **France:** Autorité de Contrôle Prudentiel et de Résolution (ACPR) ;
- **Italy:** Istituto per la Vigilanza Sulle Assicurazioni (IVASS);
- **Netherlands:** De Nederlandsche Bank (DNB);
- **Sweden:** Finansinspektionen (FI);
- **UK:** Bank of England Prudential Regulation Authority (PRA);
- **USA – California:** California Department of Insurance (CDI), also describing activities undertaken by the US National Association of Insurance Commissioners (NAIC);
- **USA – Washington State:** Office of the Insurance Commissioner (OIC).

104. The results of the survey process are summarised as case studies in the following sections, in alphabetical order by jurisdiction. The case studies describe:

- Motivation and Rationale;
- Approach and Methodology;
- Key Findings;
- Lessons: Key Challenges and Areas for Improvement;
- Impacts on Supervisory Practice;
- Next Steps.

8.1 Australia: Australian Prudential Regulation Authority

8.1.1 *Motivation and Rationale*

105. The motivation for action on climate risk assessment, derived internally from APRA's Board, that decided the potential financial risks of climate change were too great and could not be ignored. Their mandate requires them to protect the interest of APRA beneficiaries by promoting financial system safety and stability. On a practical level, the supervisory mandate utilised to take action, has been cross-industry Prudential Standard CPS 220: Risk Management (APRA's general risk management requirements for regulated entities).

106. Three key external developments played a significant role in driving APRA's internal action:

- The launch of the FSB TCFD;
- The Paris Agreement on Climate Change; and

- Australian legal opinion on the legal duty of corporate Boards with respect to climate change.

8.1.2 Approach and Methodology

107. In February 2017, APRA Executive Board Member Geoff Summerhayes delivered a speech on climate change to the Insurance Council of Australia, setting out a new agenda for APRA's consideration of climate as a prudential risk.⁹² Subsequently, APRA has undertaken a number of steps to integrate climate factors across its supervisory approach, with both physical and transition risks being considered:

- An internal Climate Change working group has been created to consider these risks on a cross-industry basis, and is developing a cross-industry risk heat map and associated supervisory guidance. The heat map relies on APRA's existing cross-industry risk management framework as a starting point.
- Analysis is being undertaken to understand transitional risks and their significance for the long-term viability of the financial sector in Australia. Liability risk for Boards and trustees of Superannuation funds has also been identified as an area of focus that requires further analysis.
- APRA has advanced discussions with domestic and international regulators and advisory bodies to better understand financial risks related to climate change and the transition to a low carbon economy. On a national level, APRA has created an interagency initiative with Treasury, as well as fellow regulators Australian Securities and Investments Commission and the Reserve Bank of Australia, on the sustainability and financial risk dimensions of the economy related to climate change. APRA intends to focus on information-sharing and improving our understanding in this area.

108. APRA is not yet at a point where it is regularly gathering information from supervised entities. However, there are several regulated entities in Australia that voluntarily disclose their climate change adaptation plans/strategies, which have been used to gauge market response. In addition, APRA supervisors have begun to ask questions of regulated entities. Initially, these have related primarily to awareness. However, APRA has made it known that it will expect more sophisticated answers, especially from well-resourced and complex entities. External data sources have also been relied upon, such as publications produced by other international regulators, academics and think tanks such as the Actuaries Institute and the Climate Institute.

8.1.3 Key Findings

109. There are no conclusive results to report at present, as the analysis process is ongoing.

8.1.4 Lessons: Key Challenges and Areas for Improvement

110. There are several areas of ongoing challenges for APRA:

- Obtaining "buy-in" from the regulated entities. Careful communication has been required so as not to appear to be too prescriptive or raise any political eyebrows. Messages were fine tuned to ensure that they reflected the focus on financial risk management.
- Appropriate internal communication was important to ensure a consistent message/approach amongst APRA's regulators. To this end, APRA's senior executive presented an education session for all employees informing them of the emerging risks in this area and APRA's plans to manage them.

- Lack of access to the necessary data.
- Lack of education to market participants about long-term financial risks.

111. Addressing some of these issues requires a more formal reporting (and disclosure) regime, combined with adequate and targeted training. This should lead to a bigger emphasis on scenario testing – which in turn should produce the necessary data. Moreover, further areas to be improved include consistency in due diligence practices, better monitoring of existing climate-related exposures, and refinement of stress testing approaches.

112. APRA's advice to other regulators is to begin asking entities if they are aware of the issues and learn from those that are proactive in this space. It is important that discussions are framed not as moral arguments, but rather in the context of financial risks to the system. In this way, climate change should be measured and managed similar to other risks that threaten financial safety.

8.1.5 Impacts on Supervisory Practice

113. APRA considers climate risks within its current prudential framework. Under the Prudential Standard CPS 220 Risk Management, an APRA-regulated institution must maintain a Board-approved risk management strategy. Climate risk is not managed as a separate risk but managed under other key risks categories such as investments and operations. As part of the risk management process, APRA will expect entities to conduct stress tests, taking into account the effects of climate change on their portfolios, especially considering the 2 degree scenario agreed to in the Paris Climate Accord. Entities must be aware of the risks, both physical and transition, emanating from the climate change scenarios.

114. Regarding the initiatives described in section two, the impact of these activities is yet to be seen on APRA's broader supervisor and regulator strategies.

8.1.6 Next Steps

115. Conversations have begun, both internally and externally, on climate risks and the financial impact resulting from the changes. This has been accomplished via several speeches to industry, discussions amongst various industry related groups and international regulators. APRA's Working Group is working to form a climate change risk strategy and developing supervisory guidance for frontline supervisors to facilitate greater external/internal dialogue with industry. Moreover, APRA has explicitly made reference to climate change risk in its 2017–20 Corporate Plan.

116. Further discussions in this space will be pursued to better understand the risks emanating from climate changes, their impact on the financial system, and how these risks are being managed by the regulated entities including their current (and future) methodology for measuring and controlling these risks. APRA is planning a survey of regulated entities to gain a better understanding of emerging best practice, as well as an industry-wide review of climate-related disclosures.

117. APRA has embraced the important work that the SIF is doing and the opportunity this provides regulators like APRA and others to learn from each other's efforts. The SIF should seek to continue to support collaboration through information sharing on best practices and emerging risks.

8.2 Brazil: Superintendência de Seguros Privados (SUSEP)

8.2.1 Motivation and Rationale

118. In Brazil, insurers, led by their Confederation called CNseg, began to organise themselves with respect to sustainability issues before the regulator and the supervisor. Most Brazilian companies that are signatories of the Principles for Sustainable Insurance (PSI) began this movement in 2012, at the occasion of the remarkable Rio+20 UN Conference, held in Rio de Janeiro, that marked the launch of the Principles.

119. SUSEP, aligned itself with the momentum that the topic was gaining, especially after COP 21 in 2015, and took the decision in 2016 of supporting the PSI. SUSEP also joined the leading group that would initiate the SIF.

120. The rationale of the supervisor involvement was to align the Brazilian insurance market with the prudential and conduct of market supervision interests, bringing to the insurance industry awareness of the ESG risks to the entire life cycle (design of products and services, underwriting, assets and liability management and claim process) of the business. After the awareness step, it became very important for SUSEP to have this understanding transformed into concrete actions along the insurers' processes, which they believe cannot happen without investment in technology innovation.

8.2.2 Approach(es) and Methodology(ies)

121. SUSEP's first movement was becoming a supporter for the PSI. It happened in April 2016, during the Asociación de Supervisores de Seguros de América Latina (ASSAL) Conference, and it was a clear signal for the industry that the supervisor would enhance its supervisory approach to ESG aspects.

122. Secondly, the next step was to understand the state of the art of the sustainability issue in the Brazilian insurance industry, through an extensive questionnaire of 64 questions, in November 2016, especially related to the environmental dimension, before taking any kind of regulatory measure or even a guidance. Intentionally, the survey had a great range of questions, relating to all the aspects of the insurance business, as SUSEP aimed to comprehend the different maturity phases of the companies. The questions were organised by the following sections: Reports, Management and Strategy, Studies and Researches, Operational, Internal Processes, Capacity Building, Third Parties and Others.

8.2.3 Key Findings

123. In total, 127 insurers, local reinsurers, open pension entities and capitalisation companies, which correspond to 75% of the market supervised by SUSEP, participated in the survey.

124. From the answers received, it was concluded that, generally speaking, the supervised companies have not integrated the ESG risks into their core business activities, being limited to awareness initiatives towards their employees and energy, water and natural resources economy actions. Although these initiatives must not be disregarded, they do not reach the PSI goals and indicate that Brazilian companies are still in the initial maturity phase of sustainable development.

125. One of the results that was of great relevance was that reinsurers are a step ahead on these matters compared even with the companies that are PSI signatories. This is most probably, due to their international nature, but also the concrete engagement of the high-level administration to set specific targets and conduct research on this topic.

8.2.4 Lessons: Key Challenges, Areas for Improvement

126. An important lesson – and a key challenge – is the need for financial supervisory authorities, as well as the supervised companies, to be deeply engaged in efforts that incorporate ESG risks into their business, especially climate-related risks. This requires a profound change of mind-set within institutions. In order to attain this engagement, it is very important for supervisors to raise awareness of climate issues through provision of information, guidance, and capacity building.

127. Another important lesson is that pressure on climate issues will not come just from the regulatory bodies and governments but also from investors, shareholders, and consumers. For this reason, it would be very beneficial to the insurance market in Brazil to organise a system of self-regulation on the issue.

128. A third lesson stems from the importance of new technologies in facilitating change management on environmental issues – including the use of fintech in insurance (insurtech).

8.2.5 Impacts on Supervisory Practice

129. This is the first change that SUSEP is making to its regulatory framework. The report and main findings were published on SUSEP's institutional website in June 2017.⁹³

130. Since then, SUSEP has engaged in the Financial Innovation Lab,⁹⁴ a joint initiative of the Inter-American Development Bank (IADB), the Brazilian Association of Development Agencies, and the Brazilian Securities Commission (CVM). As a member of the Lab, in which also participate the closed pension entities supervisory authority (Previc), the Brazilian Development Bank (BNDES), the UK Consulate and many representatives of the private sector, SUSEP is engaged with the main supervisors of the Brazilian financial system (the Central Bank is an observer) to develop concrete responses to the climate change challenge. The Lab has a three year mandate and is organised into four working groups, of which SUSEP is participating in three (on Green Bonds, Green Finance and Fintech).

131. Another notable initiative is the inclusion of the sustainability approach to the work to be undertaken by the Task-Force Brazil-UK, which also includes the insurtech development, enhancement of insurance bond product, and others.

8.2.6 Next steps

132. Going forward, SUSEP intends to:

- Advance the Brazilian Insurtech hub (camara.e-net) to the Fintech working group of the Financial Innovation Lab; the idea is to develop a 'sandbox' for all of the supervised markets;
- Present some regulatory proposals to SUSEP's board regarding awareness of climate issues, disclosure in the companies' investment policies, and development of green insurance products;
- Stimulate the auto-regulation of the market supervised by SUSEP.

8.3 France: Autorité de Contrôle Prudentiel et de Résolution (ACPR)

8.3.1 Motivation and Rationale

133. The COP21 and the subsequent Paris Agreement have fostered among French agencies an intensive work programme to address and mitigate climate related risks. The 2015 Energy Transition Law has notably formalised the French low carbon strategy and

developed it for a large number of sectors. In particular, the financial sector has been the focus of article 173 which introduced a set of new reporting requirements for non-financial corporates and financial institutions with a dual objective: (i) to improve the quality of disclosed information in order to facilitate the integration of climate factors by financial actors; (ii) to strengthen the appropriation of climate issues by corporates and financial institutions. Besides, article 173 requires banks to consider the risks associated with climate change in their risk management framework and the government to report on the potential stress-test scenarios related to risks associated with climate change.

134. In this context, within its core mandate of ensuring the stability of the financial system, the ACPR is actively including climate-related risks in its day-to-day supervisory framework for both banks and insurers.

8.3.2 Approach and Methodology

8.3.2.1 Disclosure

135. The French Energy Transition law was passed in August 2015. The provisions of its Article 173, clarified by two Regulatory Decrees, modify both the content and modalities of information disclosure by insurers on climate-related risks:

- For smaller entities, with total assets below €500m (considered for the group or solo entities), the disclosure requirements include: a full description of their investment policy related to ESG issues; a description of information practices of individual investors/subscribers on this investment policy; information on a potential voluntary adherence to a specific code of conduct; a description of internal risk identification and management processes related to those issues.
- In addition to the requirements mentioned above, larger entities with total assets above €500m are notably requested to provide: a detailed description of applied criteria, of the information computed (financial, non-financial information, internal or external analysis, etc.), on methodology, assumptions and results, and on how these results are taken into account in investment policy. The institution should notably describe how its investment policy has been affected by the outcome of the analysis process, and how it will contribute to the overall objective of limiting global warming.

136. The French approach has allowed freedom in how investors can meet this new reporting requirement, and considers this flexibility as critical to inspiring a comprehensive approach to risk thinking among investors in terms of their alignment with high-level transition goals.

137. The assessment of the new disclosure framework regarding insurers' investment policy is currently being carried out by private observers.⁹⁵

8.3.2.2 Risk Identification

138. The ACPR uses the now customary risk typology, distinguishing between the two concepts of "climate change" itself and the "energy/low carbon transition". Of course, this distinction does not necessarily imply a dichotomy as the two dimensions are interconnected. From these two concepts, two classes of climate change-related risks are addressed:

- *physical risks* that result from the direct damages caused by climate events;

- *transition risks* that result from the adjustments made to implement the low-carbon transition, especially when these changes are abrupt and not adequately anticipated.

8.3.2.3 Stress testing

139. The fifth paragraph of the article 173 required the government to report about “regular stress-testing scenarios representative of climate related risks”. The report on “Assessing climate change-related risks in the banking sector” was published in February 2017. It covered three broad issues: i. a stock-take on French banks’ current practices with respect to managing climate change related risks; ii. a tentative cartography of these risks; and iii. first thoughts about what climate stress tests on the banking sector could look like.

140. The current lack of necessary data or shared methodologies led to the conclusion that further reflection is needed before envisioning the implementation of stress tests or even scenario-based analyses, which could be a more relevant approach, with respect to risks associated with climate change.

8.3.3 Key Findings

141. The ACPR recently led an analysis on the exposition of French insurers to climate change risks that was published in June 2018. Using data provided in prudential reporting at end 2016 on the investments held by French insurers after application of the look-through approach, this analysis presents the level of exposure of their portfolio to climate change risks, via an evaluation of the value of investments in countries vulnerable to physical risks and in sectors deemed sensitive to transition risks. Exposure of French insurers to transition risks seems significant: between €240bn and €450bn of assets (that is 10 to 20%) would be issued by entities from sectors exposed or potentially exposed to transition risks. Investment of insurers in securities issued in countries presenting a medium to strong physical risk are, however, almost neglectable.

142. As France has adopted a two-step approach, implementing the new disclosure requirements for banks first and then for insurers with a two-year delay, the currently available findings focus primarily on banks. Analysis for the insurance industry is underway but existing results on banks can also be informative in the insurance context.

8.3.3.1 Disclosure

143. The disclosure practices in the insurance industry will be assessed in another Government report due end 2018. In the meantime, private independent observers are monitoring the on-going disclosure process by insurers and other investors. According to their analysis, 51 out of 163 French Institutional Investors have already complied with Article 173 requirements (in July 2017). They represent 38% of investors and 88% of assets under management. Furthermore, two thirds of insurers have disclosed their climate-related risk exposure already. Those observers identified a sort of ripple effect, through a dissemination of good practices, from big investors to the rest of the financial community.

8.3.3.2 Risk identification

Physical risk

144. The above-mentioned report tentatively draws a mapping of risks for banks. The French banking sector’s exposure to physical risks – including the whole exposure on residential real estate – amounts 39% of total outstanding loans. This figure lowers to 12% if we factor in exposure in the nine industrial and commercial sectors only, which is a relatively

moderate level. Furthermore, exposures are concentrated in Western Europe and Northern America, regions with a relatively lower degree of vulnerability to physical risks. For instance, only 3% of corporate exposure is located in high-vulnerability area.

145. A more definite conclusion would require more granular data, notably to allow infra-regional analysis. In addition, the French insurance framework for natural disasters provides an important source of mitigation. The diversification of banks' and/or clients' activities may also significantly dampen final impacts of physical risks.

146. Regarding Insurance, some estimates of the future cost of climate-related risk were provided in the context of the COP21. Only one third of the increase in costs is arising from climate factors, as opposed to the overall increase of value of assets.

Transition risk

147. The exposure of French banks to the sectors most sensitive to the transition risks amounts to slightly less of 13% of total exposures. Looking at the geographic distribution, this exposure is mainly concentrated in Europe (62%, of which 27% in France).

8.3.3.3 Examples from Insurers

148. The French insurance industry, within the framework of professional associations, was organised to exchange key findings on climate risk evaluation and share best practices, notably on how to comply with legal disclosure requirements.

149. One insurer calculated potential minimal damages using the most optimistic COP21 scenario: the outcome would be a doubling of losses in 2050 (20% due to climate change itself and 80% due to an increase in vulnerabilities). Another firm mapped its portfolio to assess its climate-related risk exposure, by using a matrix approach: by sector of activity, by type of risk, and by time horizon.

150. In addition to evaluating physical and transition risks, one firm has also assessed its exposure to a "responsibility risk", that includes its carbon footprint, its contribution to achieving the collective goal of reducing carbon emissions, and its subsequent reputation risk for not complying enough. Many firms have been assisted by an external contractor to assess their carbon footprint.

8.3.4 Lessons: Key Challenges and Areas for Improvement

Improve data

151. The first assessment exercise evidenced issues regarding data availability and quality. The next assessments should certainly adopt a more granular approach, while handling also the lack of homogeneity in historical data (due notably to changes in coverage, reporting or insurance practices over time).

Develop comprehensiveness of climate-related risk assessment

152. The first climate risk exercises typically only partially cover insurers' portfolios. For instance, analyses on transition risk may have been limited to utilities and automotive sectors only. Alternatively, modelling of physical risk impact was limited to real estate and infrastructure financing. Second round effects are not yet addressed. Thus far, physical risk is often not assessed in bond portfolios.

Address connections between climate-related risks

153. Physical and transition risks are commonly viewed in isolation (ie as independent phenomena) out of their common climate-change context (which is a key source of correlation between these risks). An area for further work would be to explore and quantify interconnections between these two aspects.

Align firms' strategies on asset and liability sides

154. Insurers have to ensure consistency between their commercial strategy and exposure regarding climate-related risks on the one hand, and their investment policy on the other.

Assess interconnectedness between financial industries

155. One key element to address climate-related risks is to properly identify the final risk bearer. Further analysis on insurance protection, notably in the long-run, would be useful to improve risk identification. Further work is needed to assess in greater detail the potential effects of the following factors: the increase in insurance premium, or even market withdrawal by insurers, due to more frequent natural disasters; the overall impact on financial stability of recurrent natural catastrophes on insurers' balance sheets; the potential misalignment between, on the one hand, economic growth and growing concentration of activities and, on the other hand, the scope of insurance coverage. Understanding those interconnections is one of the main topics currently under examination within the ACPR. To this end, an event gathering insurer and banks was organised on November 30th.

Improve reporting

156. To increase the overall quality but also the simplicity of financial institutions reporting on their climate risk exposure, the key may be to envisage some reporting standards in order to facilitate comparability and widespread usage by firms. Besides, due to the above mentioned methodological uncertainties, firms face challenges in communicating unclear results to the market.

8.3.5 Impacts on Supervisory Practice

157. Playing an active role in climate risk mitigation is one of the key objectives of the Banque de France's and the ACPR's internal strategy for 2020. Climate-related risks are being gradually considered in the supervisory policy of the ACPR. The French approach has allowed freedom in how financial institutions can meet the new reporting requirements. The ACPR is currently reflecting on how to take due account of this softer approach in its supervision.

158. Furthermore, as part of its mandate to ensure financial stability, the ACPR runs various outreach activities with firms to raise awareness and understanding of climate risk issues in the financial community. Regular meetings are organised with the industry. In 2017, the ACPR gathered the main banks and the main insurers separately, before organising a joint event at the end of the year as mentioned above. The ACPR also organises research seminars on climate-related issues, individually or with other supervisors, opened to the industry and academics.

159. As the work on climate-related issues is multi-faceted, requiring both micro and macro-prudential approaches, the ACPR is engaged in an inter-agencies network, with the Banque de France (climate-related issues are coordinated within the broader context of the Financial Stability Cluster, established between the central bank and the supervisor), and the Treasury.

160. Also, the ACPR is participating in key international activities related to climate change, and is notably a founding member of the SIF.

8.3.6 Next Steps

161. Regarding both the banking and insurance sectors, the ACPR set-up a follow-up monitoring committee following the publication of the report on banks. The aim is to promote and accompany banks and insurers in developing tools to analyse climate change-related risks and then to allow sharing of best practices, including those coming from more academic areas. This process will continue into 2018 and might tentatively lead to more concrete proposals about ways to set-up scenario-based analysis of those risks, at least for banks.

8.4 Italy: Istituto per la Vigilanza Sulle Assicurazioni (IVASS)

8.4.1 Approach and Methodology

162. In 2016, as part of the quarterly monitoring of the insurance sector vulnerabilities, IVASS conducted a survey on climate change among a "vulnerabilities" sample composed of six individual companies and ten groups. The aim was to analyse the degree of preparedness and the strategies implemented by the companies/groups with reference to investment policies, risk management and mitigation, and the possible involvement of the policyholders.

8.4.2 Key Findings

163. Analysis showed that the leading players in the national insurance market - four groups actively engaged internationally as signatories of some of the main initiatives on environmental issues - boasted good/high standards and were equipped with clear policies at group level characterised by:

- Green-oriented investment strategies that integrate aspects related to ESG issues with more reputation-related aspects, not neglecting any opportunities for financial returns associated, for example, with long-term investments in sectors (such as renewable energy, clean technology, etc). Those strategies also include the updating of so-called Exclusion Lists, ie lists of issuers to be excluded from the basket of the companies in which to invest;
- Prudent underwriting practices with continuous risk monitoring and analysis of claims that take into account (for different geographical areas) also expert evaluations and the use of Nat-Cat models, in order to assess if and how the insurance services offered should or should not be updated to better take into consideration the impacts associated with weather events;
- Risk mitigation especially through reinsurance cover;
- Processes, internal rules and guidelines that take the form, for example, of newly created specialised structures within the risk management function;
- Reporting dedicated to the specific environmental aspect (environmental reporting guidelines);
- Commitment to raise policyholders' awareness to reduce climate change-related losses through consultancy services focusing on the corporate segment, which in some cases require customers (in order to provide coverage) to introduce strategies aimed at minimising the risk and the extent of damages caused by natural events.

8.4.3 Lessons: Key Challenges and Areas for Improvement

164. For the remaining companies/groups, the results of the investigation showed that considerable attention was paid to the issue of environmental protection from a behavioural point of view within companies, but less so concerning climate change and risk management in relation to investments.

8.4.4 Next Steps

165. IVASS is considering repeating the survey in the coming months, monitoring vulnerabilities in order to assess any progress made since 2016.

8.5 Netherlands: De Nederlandsche Bank (DNB)

8.5.1 Motivation and Rationale

166. Responsibility for the identification of risks to the financial system is held within the mandate of the DNB as a supervisory authority. DNB has embedded sustainability in its core tasks and operational management, working “not only with an eye for the economic dimension but also for social and ecological aspects”.⁹⁶ DNB first examined financial risks relating to climate change in 2014, in response to a request from Parliament. In 2016, DNB conducted a study of macro-economic and financial sector implications of the transition to a carbon-neutral economy in the report “Time for Transition”.⁹⁷

167. In 2017, DNB’s supervision and policy divisions independently initiated new work on climate change and the insurance sector, including:

- A new report examining how climate change may affect the Dutch financial sector, entitled “Waterproof? An exploration of climate-related risks for the Dutch financial sector”. In this report, released in October 2017, DNB examines two types of risk categories: 1. physical risks arising from climate-related damage such as storm, hail and flooding and 2. transition risks resulting from the transition to a carbon-neutral economy. Across these two categories, DNB explores four themes: the consequences of climate change for insurers, the impact of large-scale flooding on the financial sector, the risks arising from carbon intensive investments and the risks related to green finance;
- Stress Testing: DNB has integrated new climate scenarios into its stress test of the general insurance sector.

8.5.2 Approach and Methodology

8.5.2.1 Physical Risks

168. DNB’s activities relating to physical risks include:

- Within the “Waterproof?” report⁹⁸, investigating: 1. the impact of climate change on insurers’ liabilities; and 2. the impact of climate change on the assets of financial institutions, with a particular focus on flood risk in the Netherlands;
- A stress test on the general insurance sector, including two windstorm scenarios and one extreme weather scenario (based on hail and/or precipitation exposures).

“Waterproof?” Report

169. A variety of methodologies have been used to assess climate risk, drawing on both quantitative and qualitative data from multiple sources. These include:

- Structured interviews and questionnaires: DNB sent out a survey to its six largest insurers, which included a quantitative template asking for the shares of expected losses and reinsurance costs that are driven by climate-related factors. The survey also collected qualitative data by having structured interviews with various stakeholders, including insurers, brokers, modelling firms (RMS, AIR, Corelogic), supervisors and ministries;

- Modelling future premiums and capital requirements: To identify climate trends in future premiums and capital requirements, the analysis was based primarily on the 2014 climate scenarios of the Dutch meteorological institute (KNMI). These are in turn aligned with the work of the IPCC and give trends in four scenarios tailored to the Netherlands;
- Analysis of flood risk and financial impacts on assets of banks, insurers, and pension funds: In consideration of flood risk scenarios, the DNB based itself on the extensive National Flood Risk Analysis by the Dutch ministry of infrastructure and environment (VKN2) in cooperation with one of the engineering firms involved (Deltares). Two scenarios selected for the report which are in line with the standards for financial shocks in supervisory frameworks (eg Solvency II and Basel III). These involve breaching events with a probability in the order of magnitude of 1/200 and 1/1000 years.

Stress Test of General Insurance Sector

170. The stress test of general insurers is bottom-up, meaning the scenarios are defined by DNB but the participating institutions must investigate and report the (quantitative) impact of these scenarios. DNB has developed the scenarios and consulted them with the sector during a meeting. As a follow-up of this meeting, some clarifications have been added to the instructions and the explanations of the scenarios.

171. In terms of boundary conditions/proxies/assumptions, for the windstorm scenarios, the participating undertakings are asked to base their outcomes on certain predefined catastrophe scenarios of the RMS windstorm model, so the assumption is made that this model is a good approximation of the real loss amount for a windstorm event of a certain return period. For the extreme weather scenario, actual loss data of a severe recent precipitation loss is used as a proxy for a possible future event. DNB deemed these assumptions as acceptable because rather extreme scenarios are tested, so any estimation errors are unlikely to have an impact on the final conclusions regarding the ability to withstand the stress scenarios.

8.5.2.2 Transition risks

172. DNB activities relating to transition risks include:

- Within the “Waterproof?” report:⁹⁹ investigating climate risks to the financial sector: transition risk considerations include 1. the risks arising from carbon-intensive investments, and 2. the risks related to green finance. The analyses in the report build on work undertaken in 2016 on the carbon exposures of Dutch financial institutions, and included a data request into exposures of financial institutions;
- Facilitating dialogue between the financial sector, policy makers and supervisors on climate risks within the Platform for Sustainable Finance.¹⁰⁰

173. For its 2016, study DNB conducted a number of qualitative interviews and reached out to the largest insurance, investment and banking firms with a request to provide their exposures to several energy intensive sectors, such as fossil fuels. The 2016 exercise did not cover the full market, but rather the largest financial firms by market share. It also was limited to a number of energy intensive sectors. Furthermore, it did not incorporate second round effects from the exposure of one financial firm to another. Overall, it was an exposure collation exercise, which is a first step in any risk management process. Therefore, more substantial work has to be undertaken in order for viable conclusions to be drawn from it.

174. For the 2017 “Waterproof?” report, the DNB conducted a survey among the three largest banks, six insurers and six pension funds. Together, these institutions represent about 75% of the cumulative balance sheet total of the Dutch financial sector. They focused on exposures to those sectors that, together with the built environment, are responsible for the bulk of CO₂ emissions. These sectors include fossil fuel producers and suppliers as well as the following carbon-intensive sectors: energy generation, heavy industry (chemical, steel, mining, paper, cement), transport and agriculture.

175. The Sustainable Finance Platform was initiated by the DNB in 2016, and brings together DNB (chair), the Dutch Banking Association, the Dutch Association of Insurers, the Federation of the Dutch Pension Funds, the Dutch Fund and Asset Management Association, the Netherlands Authority for the Financial Markets, the Ministry of Finance, the Ministry of Economic Affairs and Climate Policy, and the think-tank Sustainable Finance Lab. The objective of the platform is to promote a dialogue on sustainable finance in the financial sector. Members meet twice annually to discuss new and ongoing sustainability projects within the Dutch financial sector. DNB acts as a facilitator of these meetings, which aim to develop cross-sectoral links, and, in doing so, prevent or overcome obstacles to sustainable funding and to collectively encourage sustainability practice.

8.5.3 Key Findings

176. The results of the DNB’s research have revealed profound climate impacts across the Netherlands’ financial landscape, involving both physical and transition risk factors. Many such factors are not merely a future burden, but a present and increasing reality.

8.5.3.1 Physical Risks

177. Insurer liabilities: More than 95% of all non-life insurance policies are issued in the Netherlands. Based on the KNMI scenarios, the number of climate-related claims for insurers is set to increase in the future, and may even double by 2085. In 2016, for homeowner’s insurance policies, the climate-related claims burden as a proportion of premiums is estimated to be 13%. In 2085, for a 3.5-degree increase scenario, this number is estimated to increase by 25-131%. For a 1.5-degree scenario, the increase is estimated at 10-52%.¹⁰¹

178. Flood Risk: About 60% of the land mass in the Netherlands is susceptible to flooding, with 26% of it actually lying below sea level and 34% only being at risk of riverine flooding. In a worst-case scenario, with multiple breaches in defences on the west coast, causing significant parts of the Randstad conurbation to flood, estimated economic losses could rise as high as €120bn. However, the likelihood of such a scenario materialising is very small. In the two scenarios tested, total economic losses are estimated to be between €20-60bn, ie ranging between 15% and 50% of the damage estimated in a worst-case scenario.

8.5.3.2 Transition Risks

179. DNB’s 2017 survey on transition risks revealed that about 75% of institutions perceive the energy transition as a relevant risk to their own balance sheet, and that they are building up expertise on this subject. The survey also shows that Dutch financial institutions have significant exposures to sectors with increased transition risks. For banks, 11% of their balance sheet is tied to carbon-intensive sectors. The corresponding percentage for pension funds is 12.4%. Exposures for insurers seem to be less substantial at 4.5%. Compared to the end of 2015, the total exposure volume increased slightly. This is partially due to a 23% increase in bank loans to fossil fuel producers combined with slightly contracting bank balance sheets. A possible explanation is that the oil and gas market recovered in 2016 from an oil

price low in 2015. This led to an increase in new loans and to better utilisation of existing credit facilities. Pension funds' exposures to the fossil fuel sector went up €6bn, but remained roughly the same in terms of the balance sheet percentage.

180. Pension funds and insurers are mainly exposed through shares, bonds and commodities, which makes them vulnerable to market fluctuations. Pension funds have the largest exposures, as they primarily invest in shares and commodities, which run a higher risk of sudden write-downs compared to bonds. A survey among 28 financial institutions revealed that almost all were of the opinion that transition risks are not fully priced in at the moment, which means there is a risk of sudden downward shocks in the event of new measures or technological developments.

8.5.4 Lessons: Key Challenges and Areas for Improvement

181. DNB's efforts to assess climate change financial risk, like much of the international community, is still establishing effective groundwork for the future. As such, typical issues range from effective stakeholder engagement, to data acquisition and compatibility, and to establishing stress test scenario parameters.

8.5.4.1 Physical Risks

182. Key challenges encountered during the analysis of physical risks undertaken for the "Waterproof?" report include:

- Identifying the relevant aspects of climate change that may impact financial institutions;
- Obtaining views from different stakeholders, with respect to a discipline (weather, climate and climate change) in which the supervisor historically has little expertise; and
- Connecting different data sources to estimate the impact of flood damage on the balance sheets of financial institutions.

183. Key challenges encountered during the general insurance stress testing exercise include:

- Definition of the stress scenarios;
- Deciding on the severity of the scenarios; and
- Finding the right balance between the required efforts of the companies involved and the information required to assess the stress resistance.

184. DNB reports that while some insurers are already modelling natural catastrophe risk, data gaps and uncertainties surrounding climate trends (both in terms of expected and unexpected losses) prove to be a barrier for modelling firms to explicitly include climate trends in their analysis.

185. For financial institutions in general, on the asset side, there is a lack of granular geographical data linked to their investments/loans in order to make estimations of their exposure to physical risk. In relation to stress testing, although very severe weather conditions are tested, companies could argue that these risks could only emerge in the next decades and that they would have enough time to change their current mitigation measures (reinsurance). The gap here is the fact that it is not possible to reliably assess the return period for certain extreme weather events.

8.5.4.2 Transition Risks

186. Availability of data remains an issue. The variation between industry classification systems used by different financial institutions across different asset classes, makes collating

exposures across risk types and asset classes challenging at a system level. To overcome this, DNB had to put forward a standard set of classification codes for financial institutions. Further work on developing more sophisticated approaches to estimating transition risk exposure, for example quantitative scenario analysis, is required at the firm and national level. Better access to financial exposure data per sector, asset class and country, would help spur these types of analyses.

187. DNB considers a study into carbon intensive exposures by financial institutions as a good first step into the topic. It can raise awareness of the issue at both national and international level, within and outside the financial sector. A next step could be to further examine the quantification of risks and take them into account in supervisory practices.

8.5.5 Impacts on Supervisory Practice

188. The “*Waterproof?*” report presents several recommendations, both to the financial sector, to the supervisor and to policy makers. Recommendations for the supervisor include:

- Embedding climate-related risks more firmly into the supervisory approach: climate risks will be incorporated in DNB’s assessment frameworks and will also be addressed in interviews with supervised institutions. DNB will furthermore continue to work on the development of climate stress tests;
- Building the knowledge base and promoting international exchange of best practices: DNB is chairing the national Sustainable Finance Platform. At a global level, we endeavour to develop internationally acknowledged best practices to help supervisory authorities in addressing climate-related risks. To achieve this DNB actively participates in various international fora, including the SIF.

8.5.6 Next Steps

189. DNB has pointed out sustainability as one of its three focus areas in its Supervisory Strategy 2018-22¹⁰² as DNB aims to ‘foster a forward-looking and sustainable sector’. As part of this, DNB wants to embed sustainability more strongly in its supervisory tasks and promote an international exchange of best practices, as both recommended in “*Waterproof?*”. DNB intends to take the following steps in 2018 to embed climate-related risks more firmly into our approach to supervision: 1. start developing an assessment framework for climate-related risks and address these risks in interviews with supervised institutions and 2. developing a stress test for transition risks, which focuses on the impact of an energy transition on the sector as a whole. Earlier in 2018, on 6 April, DNB organised a Conference on Climate Risk and Supervision together with the Bank of England and Banque de France.

8.6 Sweden: Finansinspektionen (FI)

8.6.1 Motivation and Rationale

190. Since 2015, the Swedish Government has requested FI to perform activities related to sustainability issues affecting the financial sector. In order to approach the task effectively, FI has so far chosen to limit the scope of the sustainability work to climate-related risks. This is motivated, among other things, by the importance of climate-related issues and their direct and concrete consequences on the economy. In 2017, the Government requested FI to analyse the possibilities within its remit to contribute to promoting sustainable development through the financial system and to take actions to ensure that sustainability issues and climate-related risks are considered in financial companies’ business models and risk management, and hence become an integrated part of financial supervision and regulation.

191. Climate change means changes to the financial sector's external conditions. They therefore create new risks – but also new business opportunities – for firms. Firms need to monitor and manage these risks. FI, in turn, needs to follow how climate-related issues affect the risks in the financial sector. The relevance varies between companies, eg depending on products and geographic distribution activities. Also, specific national factors have to be taken into consideration. One that can be mentioned is that Sweden is not expected to be affected by increased numbers or more intense storms due to climate change. Relating to risk management, monitoring the development of scenario analysis is of interest as it has potential to capture the “slow burning” and complex nature of climate-related risks.

8.6.2 Approach and Methodology

192. Considering that climate-related issues is a natural development of FI's remit to promote financial stability, good consumer protection and well-functioning markets. Climate-related risks, and sustainability risks in general are risks that must be considered and placed correctly in the risk assessment that both the insurers and FI conduct.

193. A first step towards integrating climate-related issues into the supervision of insurers was taken in 2017, when FI made an inventory of potential supervisory activities, given the climate-related risks companies are exposed to. These activities are to be conducted starting 2018.

194. FI also started to explore the field of climate-related scenario analysis in 2017 by initiating a dialogue with insurers and banks. Some of the questions discussed were:

- What experience of scenario analysis do the companies have?
- What risks and issues can be addressed through scenario analysis and what is the relevant time horizon?
- What are the main difficulties when it comes to scenario analysis?
- Is there a need of coordination or cooperation within this area – within the insurance industry, and between the insurance industry and FI?

8.6.3 Key Findings

195. As FI is in a starting stage of integrating climate-related issues into the supervision of insurers, it is of importance that activities conducted at this stage enable FI to develop its understanding of the climate-related risks that affect financial companies in general, and insurers in particular. Hence, an important purpose of the activities planned is to map and better understand how insurers identify, manage and measure climate-related risks. It is also important to get a broader understanding of similarities and differences in risk exposure and risk management between different parts of the financial sector, and how this affects the supervision.

196. An important activity planned for 2018 is to review how financial companies integrate climate-related risks in their corporate governance. This will give FI a better understanding of how the insurance sector identifies and manages climate-related risks and opportunities, and feed into FI's work going forward.

197. The general picture from the dialogue on scenario analysis is that several companies have started some activity, but the work is still at an early stage. Several companies point to the difficulties related to developing relevant scenarios, not the least due to the complexity of climate-related issues. In general, industry representatives react positively to FI taking the initiative to discuss issues related to scenario analysis. For example, the representatives

consider it valuable if FI would act as a link between, on the one hand, companies and, on the other hand, the international regulatory and supervisory world and the research community.

8.6.4 Lessons: Key Challenges and Areas for Improvement

198. Climate-related issues are placing new demands on supervision and expertise, and work in this area needs to develop. In this initial stage FI is focusing on developing a structured process for managing climate-related issues and building knowledge within the authority – to be able to address relevant issues and assess the risks associated to them.

8.6.5 Impacts on Supervisory Practice

199. Sustainability risks and, in particular, risks related to climate change are linked to and are part of structural changes in the economy. But this does not mean that they will appear only in a more or less distant future. Their “slow-burning” character, affecting economies more and more visibly over time, also means that new information and new insights will evolve over time and new technologies will be developed to handle them. Hence, supervisory authorities need to be flexible and prepared to change policies, measures, and actions when necessary.

200. When it comes to scenario analysis, FI believes that the development of a common framework should be advanced at an international level and experience points to the need for internationally established measures and methods. Against this background, FI is engaged in the international work within this area and intends to actively contribute to this work moving forward.

201. Within the EU, the task of taking part in the development of a framework for scenario analysis would be relevant for the European Supervisory Authorities (ESAs) and the European Systemic Risk Board (ESRB) to take on. The ESRB already plays a key role in the current stress testing exercises, and should therefore be well placed to also take part in the development of such a framework. Together with Banque de France, FI has made a proposal to the ESRB during 2017 to reactivate its work on climate-related issues, with a view to future contributions related to eg scenario analysis.

8.6.6 Next Steps

202. Climate change is a truly global issue that requires global response. Therefore, FI will continue to be actively involved in international discussions when developing its supervisory framework, policies and activities to manage climate-related issues.

8.7 UK: Bank of England Prudential Regulation Authority

8.7.1 Motivation and Rationale

203. In 2012 a coalition of investors, civil society organisations, and universities wrote to the BoE, to request an investigation concerning the impact of environmentally damaging investments as systemic risks to the UK Financial system and economic growth. This was rapidly followed in 2013, when the Department for Environment, Food and Rural Affairs (DEFRA) under the UK Climate Change Act 2008, invited the PRA to submit a climate change adaption report during the second round of adaption reporting. The PRA accepted this the following year, and focussed their response on insurance. The resultant report was published in September 2015, accompanied by the Governor’s climate change speech at Lloyd’s of London.¹⁰³ During and since these catalytic events, the PRA has continued to address climate-related risks through a variety of supervisory activities, research, dialogue, domestic and international engagement.¹⁰⁴ This case study considers the PRA’s climate change assessment work to date in 2017.

8.7.2 Approach and Methodology

8.7.2.1 Physical Risk: General Insurance Stress Testing (GIST) 2017

204. The PRA's GIST initiative covers the largest general insurers, tests the industry's resilience to liability-shock events and enables the PRA to analyse the impact of certain scenarios to a firm's available capital, as well as helping them identify the key reinsurer counterparties and jurisdictions to which the UK general insurance sector could be exposed. At a firm-specific level, this test will inform the internal model review process and the PRA's view of a firm's risk management systems and will provide insight into how well firms manage their potential exposures to various liability shocks.

- The first section of the exercise involved four natural catastrophe scenarios and one economic downturn scenario. The physical model parameters such as: the event footprint/location; and the event severity – such as wind speed, water depth etc, were decided in consultation with model developers. The model scenarios cover;
- Severe winter season with two severe windstorms across the South East of the UK and Northern Europe combined with two UK floods;
- Pacific North-West earthquake of magnitude 9 on the Richter Scale and associated tsunami (USA-Canada);
- Earthquake of magnitude 8 along the San Andreas Fault in the region of Los Angeles followed by a second event of magnitude 7;
- Series of three US hurricanes of category 3 and 4 across the Caribbean, Gulf of Mexico, and making landfall in continental USA;
- Asset shock and economic downturn and reserving deterioration based on increased claims inflation.
- Firms are also asked to quantify the expected impact on underwriting losses associated with the economic downturn.

205. The second section captures the exposure of general insurers to sectors of the UK economy. For both sections firms are required to provide their Solvency Capital Requirement (SCR) and Own Funds at the beginning of the year 2017 and the projected available Own Funds on a best estimate basis together with the estimated SCR at the end of the year. Then, for each stress scenario, firms should quantify the impact on Own Funds at the end of 2017 including management actions and market adjustments as well as the direct impact of the stress. This information is gathered in a spreadsheet which was sent to the firms as part of the exercise to record their findings.

8.7.2.2 Transition Risk: Assessment of carbon exposure of UK insurers' asset portfolios and alignment with 2D scenario

206. This activity revolves around interrogating the investment portfolio of regulated insurers, assessing the ownership of different asset types and the underlying physical assets, to gain an understanding of the nature, size and concentrations of transition risk in UK insurers' portfolios. Using an R-model, the granular asset data of financial institutions (such as equity and corporate bonds) is matched with asset level data in high-emission sectors (are fossil fuel, power and transportation) and then mapped against the International Energy Agency (IEA) 450 scenario. This enables the PRA to analyse how aligned (or misaligned) the firm's portfolio is with the 2-degree scenario and what the potential areas of risk are. The aim is to be able to use the analysis to inform the firms on the relative level of (mis-)alignment and potential areas of risk concentration.

8.7.3 Key Findings

207. The analysis of the stress test results is expected to be published in 2018. However, the PRA expects the scenario will provide insight into the impact of climate risk on the UK insurance industry. For example, the analysis will indicate the % capital eroded by the losses, on an aggregated basis. It will also illuminate the impact of climate risk on individual's firms. For example, the analysis will indicate the % capital eroded by the losses for each firm or syndicate, identifying firms most exposed to this particular scenario, and associated management actions anticipated by the firm. Finally, another example of output will be the mapping of reinsurers, and identification of potential concentrations. The analysis will indicate total reinsurance recoveries, associated firms and jurisdictions, and potential spiral effects.

208. The Transition Risk Study is also in process. The results will provide a scenario-based view on what share of individual portfolios could be at risk from an abrupt transition. In particular for each portfolio obtained, results on what share of them are exposed to high-carbon sectors and how much this differs from a 2 degrees portfolio. These results are then aggregated to see how the totality of firms examined perform against a 2 degrees benchmark.

8.7.4 Lessons: Key Challenges and Areas for Improvement

209. Key areas for improvement include:

- Information and disclosure;
- Improved analytical techniques to support the integration of environmental risks;
- Clarifying responsibilities to assess and manage environmental risks;
- Promoting responsible investment and standards for "green investment".

210. Regarding stress testing, the key challenge was to define a scenario which would be consistent across all firms. For this reason, the scenarios had to be detailed enough so that firms would run the same events. In addition, these events test climate risk as it is today, they do not yet anticipate what the climate will be like in a few years' time. With the Asset Portfolio Alignment Scenario, the main challenges faced were in modelling some of the asset classes considered and a lack of data and granularity of scenarios for other high-emission sectors.

211. Firms in the industry are also limited by the capabilities provided to them by modelling companies which means that, for now, they can only model windstorm and flood events. They are also able to calibrate event severity and frequencies; however, these would have to be justified by science and, since event frequency is associated with large inherent uncertainty, it is very challenging to define a relevant scenario.

212. When approaching stress testing projects, other supervisors would do well to liaise with model developers in order to define consistent scenarios and liaise with academics to define relevant event parameters (frequency, severity). Apply a proportional approach, identifying the exposures of firms to various events (eg European windstorms, US hurricanes, UK floods, etc), and focus the tests on events and territories with the most material impacts to the specific firm.

8.7.5 Impacts on Supervisory Practice

213. While these results are still pending, the findings of the earlier Climate Change Adaptation Report were shared with PRA-regulated insurers, and they are expected to consider the risks identified. In addition, the work carried out on capacity building is aimed at ensuring that supervisors are aware of sustainability issues affecting the industry and are knowledgeable about how to manage them. This will be achieved through the provision of

practical materials such as supervisory toolkits as well as considering sustainability factors within existing toolkits and models such as the ORSA. Specialised training for supervisors on climate-related risks is also an idea which is being considered.

214. The PRA has also been involved in International and UK initiatives in order to address the systemic risk posed by climate change such as:

- Co-chairing the G20 Green Finance Study Group with the People's Bank of China;
- Closely following the work of the FSB's TCFD;
- Becoming a founding member of the SIF; and
- Supporting G20 activities at UK level by convening a joint regulatory forum (BoE, FCA, TPR, FRC).

8.7.6 Next Steps

215. It is evident that climate change is becoming increasingly relevant to financial regulation. For this reason, the PRA's approach will focus on promoting resilience to climate change and supporting an orderly financial sector transition to a lower carbon economy. The PRA will do this through a combination of international collaboration, research, dialogue and supervision.

216. The PRA has recently expanded its assessment to include the banking sector, which clearly plays a different role within the financial sector, and which will face different challenges and opportunities as a result. The assessment follows a similar approach as the insurance work. Although, this work is at an early stage it brings already relevant insights. It is observed that by starting the dialogue with firms, via a survey and meetings, this encourages banks to think about their strategic approach to climate-related risk. The PRA is also liaising with other UK financial regulators, including the Financial Reporting Council, Financial Conduct Authority and The Pensions Regulator.

217. The PRA is supportive of continuing the sharing of best practice as this emerges. Moreover, it encourages the SIF's development of analytical frameworks and tools for risk analysis, and its work to overcome barriers around data and information.

8.8 USA: National Association of Insurance Commissioners (NAIC)¹⁰⁵

8.8.1 Motivation and Rationale

218. Within the United States, among state insurance regulators, there are a variety of views on climate change. While some States have taken certain approaches, such as those described in sections 8.9 and 8.10, other States differ on the regulatory approach to manage and mitigate catastrophe risks. The NAIC has undertaken work related to climate risk as described below, but there is not an official NAIC policy on this issue nor has the NAIC endorsed any particular approach taken by individual States or the IAIS.

219. The NAIC Climate Risk Disclosure Survey was created in 2009–10, to determine whether insurers were incorporating climate change into their risk management and investment strategies. This was primarily in response to "The Potential Impact of Climate Change on Insurance Regulation" white paper published by NAIC in 2008.¹⁰⁶ It is a multi-state, joint regulatory action including states such as New York, Washington, Connecticut, New Mexico, and Minnesota. The administration for the Survey is led by the California Department of Insurance.

8.8.2 Approach and Methodology

220. As of 2016 the Survey is comprised of eight qualitative questions regarding insurers' responses to climate change.¹⁰⁷ The survey was modelled on the CDP (formerly the Carbon Disclosure Project) voluntary questionnaire, and cross references its questions.

221. Survey questions ask for summaries of current or anticipated risks that climate change poses to the company, explanations of the ways that these risks could affect the insurer's business, and identification of the geographical areas affected by these risks.

222. Insurers are not required to submit quantitative information but may do so without implying materiality. They are encouraged to provide quantitative information where it offers additional clarity on trends in the intensity or attenuation of natural hazards, insured losses, investment portfolio composition, policyholder risk reduction or improvements in computer modelling.

223. Insurers are encouraged to provide forward-looking information that will indicate the risks and opportunities insurers may face in the future; when provided, insurers may disclaim any responsibility for the accuracy of such forward-looking information. Forward looking information is assumed to have some degree of uncertainty; if provided, insurers are asked to offer explanation on the degree and sources of uncertainty as well as assumptions employed.

224. Information is provided by firms that are subject to the Initiative on a mandatory and public basis in the participating state jurisdictions. This is decided on a threshold of US\$100m in direct written premiums in the previous financial year. Insurers writing less than US\$100m may complete the survey voluntarily.

8.8.3 Key Findings

225. The participating states use the results of the survey for a variety of supervisory purposes. Additionally, Ceres (a non-profit organisation not associated with the NAIC) analyses survey results and each year prepares reports highlighting trends and ranks companies based on their responses to climate change.¹⁰⁸

8.8.4 Lessons: Key Challenges and Areas for Improvement

226. As climate science progresses (ie when there is greater agreement between observed data and models or when there is integration of catastrophe and climate models), insurers should be able to provide quantitative information with less uncertainty. This will enable and more effective and unified approach amongst insurers and regulators.

227. Subject to agreement by participating states, newly developed disclosure techniques that are ready for practical use, will be included in the survey project. These will address relevant and non-redundant disclosures that are necessary based on newly developed climate-related financial disclosure regimes. Furthermore, disclosure guidance materials will be updated.

8.8.5 Impacts on Supervisory Practice

228. Certain US state insurance departments, including California, have used the NAIC Survey as a basis for further action. In California, the combination of the NAIC survey with Climate Risk Carbon Initiative enable the California Department of Insurance (CDI) to compile a more holistic view of insurer's perspectives, actions, and exposures to climate risk.

229. In addition, the CDI uses its routine financial examinations, its review of ORSA reports by insurers, and the new Form F filings required under the NAIC Model Holding Company Act (pertaining to Enterprise Risk Reporting) to obtain information about insurers' identification of

and responses to climate risk. The CDI learns from this data as it undertakes individual financial examinations of insurers considering the risks they face.

8.8.6 Next Steps

230. The NAIC Climate Risk Disclosure Survey continues on an annual basis with the participating states. Additionally, the NAIC has a Climate Change and Global Warming Working Group that is tasked with the following:

- Review the enterprise risk management efforts by carriers and how they may be affected by climate change and global warming;
- Investigate and receive information regarding the use of modelling by carriers and their reinsurers concerning climate change and global warming;
- Review the impact of climate change and global warming on insurers through presentations by interested parties;
- Investigate sustainability issues and solutions related to the insurance industry;
- Review innovative insurer solutions to climate change, including new insurance products through presentations by interested parties.

8.9 USA – California: California Department of Insurance

8.9.1 Motivation and Rationale

231. In January 2016, recognising the potential financial risks to insurer investments in thermal coal, oil, gas and utilities that rely on coal, oil and gas, California Insurance Commissioner Dave Jones launched the Climate Risk Carbon Initiative (CRCI). The CRCI has two main components:

- A request that California-licensed insurers voluntarily divest from thermal coal enterprises, applicable to all California-licensed insurers (CDI Thermal Coal Divestment Request); and
- Required financial disclosures by insurers of their investments in fossil fuel (thermal coal, oil, gas, and utilities) enterprises through a survey or “data call”, which is applicable to California-licensed insurers with 2015 direct written premiums equal to or greater than US\$100m nationwide (“CDI Fossil Fuel Data Call”).

232. Commissioner Jones considers his decision to ask insurers to divest from thermal coal, and to require insurers to disclose investments in the carbon economy, to arise from his statutory responsibility to make sure that insurers address potential financial risks in the reserves they hold to pay future claims. Commissioner Jones perceives a significant risk that fossil fuel use will become increasingly restricted and reduced, which in turn presents a risk to the value of oil, gas and coal and utilities investments. Commissioner Jones considers it important that financial institutions, including insurers, recognise and address potentially significant climate risks facing their investments in coal, oil and gas and utilities.

8.9.2 Approach and Methodology

233. The CRCI is focused on transition risks, and is comprised of: 1. a voluntary call for action, and 2. the introduction of a new public disclosure requirement.

8.9.2.1 Boundary conditions and Thresholds

234. For the purposes of the CDI Thermal Coal Divestment Request, thermal coal investments were defined as investments in companies that generate 30% or more of their revenue from ownership, exploration, mining, or refining of thermal coal, and from utilities that

generate 30% or more of the energy they produce using thermal coal. “Thermal coal” was defined as lignite, bituminous coal with an ash percentage greater than 35%, and anthracite. The Initiative applied to all California-licensed insurers regardless of premium size.

235. For the Fossil Fuel Data Call, oil and gas investments are defined as direct investments, including publicly and privately traded securities that generate 50% or more of their revenues from oil and gas. Investments into utilities included investments in utilities that generate 30% or more of their electricity from thermal coal or utilities that generate 50% or more of their electricity from fossil fuels, which included thermal coal, oil and natural gas. The Initiative applied to California-licensed insurers with 2015 direct written premiums equal to or greater than US\$100m nationwide.

236. The CDI selected the 30% coal and 50% oil thresholds after reviewing a number of disclosure metrics. After a review of greenhouse gas emission models, it was concluded that at this time there remains a wide degree of variability in modelling results across models for the same assets. Revenue thresholds were chosen as the metric for disclosure because of the greater degree of consistency and certainty and availability of data with regard to revenues. The Department also determined that two European insurers: AXA Group and Allianz, use revenue based thresholds for determining what carbon assets to divest due to climate related financial risk. Specifically, AXA policy states that AXA will divest and stop investing in “mining companies and electric utilities deriving 50% of their turnover from coal”. In November 2015, Allianz committed to “stop financing coal-based business models by divesting equity stakes in coal-based business models as 1. mining companies deriving 30% or more of their revenues from mining thermal coal, or 2. electric utilities deriving 30% or more their generated electricity from thermal coal”.

8.9.2.2 Data specification

237. The Climate Risk Carbon Initiative differs in that it is the first initiative that requires quantitative investment-level disclosure of fossil fuel holdings by insurers. Level of detail required for responses included: investment identification (such as CUSIP), name/ description, actual cost, fair value, book/adjusted carrying value, acquired date, stated contractual maturity date, fossil fuel type sector (thermal coal, oil and gas, corporate owned utility, municipally owned utility, or other), and percentage and amount of annual revenue enterprise derives per fossil fuel type. Most other disclosure regimes are limited to qualitative disclosures and many of them focus on carbon emissions.

8.9.3 Key Findings

238. When announced and implemented, the Thermal Coal Divestment Request and Fossil Fuel Data Call were the first of their kind in the United States. Because of this fact, and since 2016 was the inaugural year for the Climate Risk Carbon Initiative, the Department did not have predetermined expectations of the exposure to fossil fuel investments of subject insurers. The results have provided valuable insight that will constitute a benchmark to compare future insurers’ fossil fuel investment exposure and a platform for related analyses.

239. Key results of from the 2016 divestment request and data call include:

- Insurers surveyed have US\$528bn in fossil fuel related investments which includes investments in coal, oil and gas and utilities that rely on coal, oil and gas to generate electricity;
- Insurers reported US\$10.5bn in investments in thermal coal enterprises;

- Insurers have divested more than US\$4bn from thermal coal and fossil fuel investments;
- Insurers have committed to disposing of an additional US\$1.2bn to US\$1.4bn in thermal coal investments;
- 303 insurers reported have already analysed the risk of carbon investments in their investment portfolio;
- 81 insurers have committed to analyse the risk of carbon investments in their portfolio in the following 12 months;
- 670 insurers reported having divested some or all of their coal holdings, or had no coal to divest;
- 325 insurers acknowledged that they would refrain from making future investments in thermal coal.

8.9.4 Lessons: Key Challenges and Areas for Improvement

240. While some industry resistance was initially encountered, the Initiative resulted in 100% participation. The project would benefit from a number of broader nationwide actions, including:

- Authoritative guidance on climate related financial reporting;
- The existence of uniform public reporting of revenues and power generation mixes by all enterprises, would facilitate the reporting and analysis of fossil fuel holdings of insurers. If regulatory agencies such as the U.S. Securities Exchange Commission (SEC) required standardised reporting of revenue breakdown by all enterprises, and of power generation mixes for utility enterprises, the Department would be better positioned to obtain a clearer picture of insurers fossil fuel exposure based on previously stated thresholds. Regulators of fossil fuel industries – such as utility regulators – could be encouraged to do more to ensure that utilities release information on their energy mix;
- This Initiative requires identification of fossil fuel assets and whether they meet certain thresholds. Upon receipt of responses, the Department has to validate the data before further analysis can be performed. Investment data from third party vendors are used to perform this validation. Because, in the United States, no such vendor “covers” all the investment market, the regulator would do well to use multiple data sources from third party providers.

241. Internally, the CRCI is also working to improve multiple factors:

- Improved processes and methods to compile, sort, and analyse reported data;
- Mechanisms to overcome data-related challenges;
- Inclusion of newly developed disclosure techniques and metrics that are ready for practical use.

8.9.5 Impacts on Supervisory Practice

242. The majority of companies the CDI surveyed either have no thermal coal holdings, have divested those holdings, or have committed to divest from thermal coal, which is a positive result. The initiative has provided a much better understanding of the degree of insurer investments in fossil fuels generally, and more detailed information about each companies'

level of investment in carbon. The Department will continue to monitor developments in climate risk and the global economy in an effort to identify and possibly integrate best practices.

243. Supervisors would do well to firmly implement climate-related financial disclosure initiatives in conformity with their jurisdictional mandates. They should make good use of recommendations by the TCFD and other similar disclosure regimes and should also contribute to dialogue regarding the development of disclosure standards.

8.9.6 Next Steps

244. In 2018, the CDI updated its methodology for evaluating fossil fuel investments by incorporating the TCFD recommendations. In particular, the CDI has incorporated scenario analysis into its efforts by engaging 2 Degrees Investing Initiative to conduct this analysis for insurers operating in California with over \$100m in annual premiums. In addition to publishing aggregate data, individual insurer reports are being sent to the top 100 insurers (by size of their investment portfolio) operating in California with over \$100m in annual premiums. This represents over 80 percent of the assets that were analysed. Additionally, building on Commissioner Dave Jones' directive to divest from holdings of thermal coal, reports will be sent to insurers outside of the top 100 whose exposure to thermal coal production or coal-fired electricity capacity is beyond the 95% percentile of exposure for all insurers in these technologies. Finally, insurers that are not in either group can request a copy of their individual insurer reports. These reports will explain the methodology and data that was used in the analysis, where the individual insurer ranks among its peers and which securities are negatively impacting their investment portfolios. The results of the scenario analysis further show that thermal coal presents long-term financial risks despite any short-term fluctuations in market price.

8.10 USA – Washington State: Office of the Insurance Commissioner (OIC)

8.10.1 Motivation and Rationale

245. In 2016, insured losses from natural disasters in the United States totalled almost US\$24bn. Residents of Washington State have been impacted by natural disasters such as floods, landslides, wildfires, and earthquakes and continue to be at risk for these and other natural disasters. On March 22 2014, a major landslide occurred 4 miles east of Oso, Washington. A portion of unstable hill collapsed, sending mud and debris to the south across the North Fork of the Stillaguamish River, engulfing a rural neighbourhood and covering an area of approximately 1 square mile. Forth-three people were killed and 49 homes and other structures destroyed.

246. In 2015, the state's wildfire season was the largest in state history, burning more than one million acres and costing more than US\$253m dollars. In 2016, almost two hundred ninety-four thousand acres burned in the state and there were more than four hundred thirty national flood insurance program (NFIP) claims filed, totalling over US\$7m dollars.

247. As Washington State's Insurance Commissioner, and Chair of the NAIC Climate Change and Global Warming Working Group, Commissioner Kreidler has expressed the need to better prepare the state for disasters and put in place strategies to mitigate the impact of disasters that are occurring more frequently and with increased impacts.

8.10.2 Approach and Methodology

248. To better prepare on a national and state level, the OIC is pursuing efforts to:

- Urge participation of other states in the annual NAIC Climate Risk Disclosure Survey requiring insurers report on risks faced from climate change and steps taken in response;
- Continue to raise the profile of climate change and disaster resiliency and risk mitigation through the annual NAIC survey as well as the OIC's biennial climate and resiliency summit;
- Urge participation of the insurance industry in the state's building code council. Washington State establishes its building code requirements based upon the International Building Code (IBC). The state code is revised and updated every three years;
- Partner with the Washington State Governor's office and other state agencies to identify resiliency needs and implement those related to insurance. In 2017, the OIC partnered with the Governor Inslee's Resilient Washington Subcabinet effort. The OIC led the task force to identify earthquake insurance. The Resilient Washington work led the OIC to identify opportunities for legislation;
- Assess the need for improving earthquake insurance affordability, mitigation efforts, and take up rate in the state through initiating a data call to insurers and issuing a report on findings.

249. Now, the OIC is moving forward with legislation to support insurer's efforts in risk mitigation by allowing homeowner's insurers to provide goods and services intended to reduce either the probability of loss, or the extent of loss, or both, from a covered event. In addition, the OIC will create a work group that will review disaster mitigation and preparation projects in other states and those currently being done in this state and make recommendations for how this state's efforts to mitigate the impacts of natural disasters can be expanded and coordinated and whether or not an ongoing disaster resiliency program should be created.

8.10.3 Key Findings

250. According to FEMA (Federal Emergency Management Agency), there is no more important factor in reducing a community's risk from an earthquake than the adoption and enforcement of up-to-date building codes and retrofitting older buildings is considered critical in building resiliency.

- Federal, state, county and city governments regulate growth and development via laws;
- Municipal land-use laws begin with planning and results in regulation, including zoning;
- Zoning regulates and restricts property use by a local government and is the most common form of land-use regulation. Zoning helps separate districts by use;
- Washington State's Growth Management Act (GMA) requires state and local governments create land use methods to prevent uncoordinated and unplanned growth.

251. In the 2017 partnering with the Governor Inslee's Resilient Washington Subcabinet effort, the OIC led the task force to identify earthquake insurance options and recommended the following action: improving consumer earthquake preparedness through increased earthquake insurance education and take up rate, mitigation efforts, financial incentives and improved affordability. An outcome of the Resilient Washington work identified a need for review of earthquake insurance in the state.

8.10.4 Lessons: Key Challenges and Areas for Improvement

252. Key challenges identified by the OIC in its work include:

- Obtaining support from insurers to participate in resiliency and risk mitigation efforts;
- Passing legislation;
- Staff and resource limitations.

8.10.5 Impacts on Supervisory Practice

253. Key impacts on supervisory practice identified by the OIC include:

- Taking action to identify methods of improving consumer earthquake preparedness through increased earthquake insurance education and take up rate, mitigation efforts, financial incentives and improved affordability;
- Moving forward on legislation;
- Practices for rate and form filings will be implemented for risk mitigation legislation;
- Implementation of a possible ongoing disaster resiliency program will be considered.

8.10.6 Next Steps

254. The report on findings of the 2017 earthquake insurance data call will be issued January 2018. Actions will result from report. Legislation on risk mitigation and disaster resiliency is planned for passage in spring 2018. Finally, Commissioner Kreidler is hosting the biennial Resiliency Summit in October 2018.

9 Conclusions

255. Climate risks present significant material challenges for the insurance sector, which are likely to grow over time. Insurers play a critical role in the resilience of households, firms, and corporate sectors to physical climate risks, which will become even more important in the future as impacts begin to manifest with greater intensity. Through their underwriting and investment activities, insurers are also exposed to the broad range of physical and transition risks that may arise from climate change. This may affect their capacity to write insurance business and pay claims. The availability of insurance will hold important implications for the evolution, speed, and smoothness of the low-carbon transition – posing important strategic challenges for business models. Finally, insurers are critical to the resilience of the broader financial sector to climate impacts. All of these factors create an urgent imperative to consider the resilience of insurers to climate risks.

256. Certain insurers are actively seeking to build their resilience to climate change, and to contribute to broader resilience of households, businesses, and governments to climate risks, through risk mitigation, risk transfer and investment activities. Other insurers are not actively seeking to enhance their resilience to climate change, and may face challenges in doing so, in part due to the complexity of such an undertaking. Because of the dynamic, complex, and global impacts of climate change across the economy and society, it is likely that all insurance businesses will be directly or indirectly affected by climate risks over the long term. In this context, it is imperative that all insurers consider their exposure to climate risks, regardless of size, specialty, domicile, or geographic reach, and seek to build resilience to such risks where appropriate.

257. There is an increasing consensus across the financial sector that the potential systemic impacts of climate change require a similarly systemic global response, exemplified by work at the international level by the G20 and the FSB. These developments create a strategic imperative for the IAIS and its members to consider the supervisory dimensions of climate change.

258. Many insurance supervisors have recognised the importance of their role in addressing climate risks, in line with their mandates to ensure the safety and soundness of firms and the insurance sector as a whole. However, there is a diversity of views, priorities, and strategies among members of the SIF – many of which are more advanced on the climate risk challenge. Similarly, there is a broad range of experience and familiarity with climate risk issues across the membership of the IAIS. As many of these efforts are still new, information sharing and cooperation – including with other financial regulators – can be beneficial.

259. It is evident that climate risks warrant ongoing and intensifying scrutiny by supervisors. While the ICPs do not explicitly address climate change, the terms of the principle statements and accompanying standards and guidance encompass many dimensions of the issues presented by climate risks. In this respect, the ICPs provide a general basis for the identification, assessment, and supervision of climate risks within the insurance sector.

260. Going forward, insurance supervisors should seek to increase their understanding of climate risk, and develop supervisory capabilities to be able to accurately evaluate the insurance sector's actions to achieve climate resilience, across underwriting and investment activities. The IAIS will seek to monitor initiatives and issues related to climate risk as they continue to evolve, including with the support of the SIF. Additional supporting material from the IAIS and the SIF on best practices for addressing climate risk issues in line with the ICPs may be helpful for supervisors and insurers. In this regard, there is merit in considering

whether and how this Issues Paper can be followed-up by one or more Application Papers to further explore these topics.

Annex: Recommendations of the FSB TCFD

Table A1.1: Governance

Recommended Disclosure	Guidance for all sectors	Supplemental Guidance for Insurers and Asset Owners
a) Describe the board's oversight of climate-related risks and opportunities.	In describing the board's oversight of climate-related issues, organisations should consider including a discussion of the following: – processes and frequency by which the board and/or board committees (eg audit, risk, or other committees) are informed about climate-related issues, – whether the board and/or board committees consider climate-related issues when reviewing and guiding strategy, major plans of action, risk management policies, annual budgets, and business plans as well as setting the organisation's performance objectives, monitoring implementation and performance, and overseeing major capital expenditures, acquisitions, and divestitures, and – how the board monitors and oversees progress against goals and targets for addressing climate-related issues.	
b) Describe management's role in assessing and managing climate-related risks and opportunities.	In describing management's role related to the assessment and management of climate-related issues, organisations should consider including the following information: – whether the organisation has assigned climate-related responsibilities to management-level positions or committees; and, if so, whether such management positions or committees report to the board or a committee of the board and whether those responsibilities include assessing and/or managing climate-related issues, – a description of the associated organisational structure(s), – processes by which management is informed about climate-related issues, and – how management (through specific positions and/or management committees) monitors climate-related issues.	

Table A1.2: Strategy

Recommended Disclosure	Guidance for all sectors	Supplemental Guidance for Insurers and Asset Owners
a) Describe the climate- related risks and opportunities the organisation has identified over the short, medium, and long term.	Organisations should provide the following information: – a description of what they consider to be the relevant short-, medium-, and long-term horizons, taking into consideration the useful life of the organisation's assets or infrastructure and the fact that climate-related issues often manifest themselves over the medium and longer terms, – specific climate-related issues for each time horizon (short, medium, and long term) that could have a material financial impact on the organisation and distinguish whether the climate-related risks are transition or physical risks, and – a description of the process(es) used to determine which risks and opportunities could have a material financial impact on the organisation. Organisations should consider providing a description of their risks and opportunities by sector and/or geography, as appropriate. In describing climate-related issues, organisations should refer to Tables A1 and A2 (pp. 72-73).	
b) Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning.	Building on recommended disclosure (a), organisations should discuss how identified climate-related issues have affected their businesses, strategy, and financial planning. Organisations should consider including the impact on their businesses and strategy in the following areas: Products and services – Supply chain and/or value chain – Adaptation and mitigation activities – Investment in research and development – Operations (including types of operations and location of facilities) Organisations should describe how climate-related issues serve as an input to their financial planning process, the time period(s) used, and how these risks and opportunities are prioritised. Organisations'	Insurers should describe the potential impacts of climate-related risks and opportunities, as well as provide supporting quantitative information where available, on their core businesses, products, and services, including: – information at the business division, sector, or geography levels; – how the potential impacts influence client, cedent, or broker selection; and – whether specific climate-related products or competencies are under development, such as insurance of green infrastructure, specialty climate- related risk advisory services, and climate-related client engagement.

	disclosures should reflect a holistic picture of the interdependencies among the factors that affect their ability to create value over time. Organisations should also consider including in their disclosures the impact on financial planning in the following areas: – Operating costs and revenues – Capital expenditures and capital allocation – Acquisitions or divestments – Access to capital If climate-related scenarios were used to inform the organisation's strategy and financial planning, such scenarios should be described.	Asset owners should describe how climate-related risks and opportunities are factored into relevant investment strategies. This could be described from the perspective of the total fund or investment strategy or individual investment strategies for various asset classes.
c) Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	Organisations should describe how resilient their strategies are to climate-related risks and opportunities, taking into consideration a transition to a lower-carbon economy consistent with a 2°C or lower scenario and, where relevant to the organisation, scenarios consistent with increased physical climate-related risks. Organisations should consider discussing: – where they believe their strategies may be affected by climate-related risks and opportunities; – how their strategies might change to address such potential risks and opportunities; and – the climate-related scenarios and associated time horizon(s) considered. Refer to section D in the Task Force's report for information on applying scenarios to forward-looking analysis.	Insurers that perform climate-related scenario analysis on their underwriting activities should provide the following information: – description of the climate-related scenarios used, including the critical input parameters, assumptions and considerations, and analytical choices. In addition to a 2°C scenario, insurers with substantial exposure to weather-related perils should consider using a greater than 2°C scenario to account for physical effects of climate change and – time frames used for the climate-related scenarios, including short-, medium-, and long-term milestones. Asset owners that perform scenario analysis should consider providing a discussion of how climate-related scenarios are used, such as to inform investments in specific assets.

Table A1.3: Risk Management

Recommended Disclosure	Guidance for all sectors	Supplemental Guidance for Insurers and Asset Owners
a) Describe the organisation's processes for identifying and assessing climate-related risks.	Organisations should describe their risk management processes for identifying and assessing climate-related risks. An important aspect of this description is how organisations determine the relative significance of climate-related risks in relation to other risks. Organisations should describe whether they consider existing and emerging regulatory requirements related to climate change (eg limits on emissions) as well as other relevant factors considered. Organisations should also consider disclosing the following: – processes for assessing the potential size and scope of identified climate-related risks and – definitions of risk terminology used or references to existing risk classification frameworks used.	Insurers should describe the processes for identifying and assessing climate-related risks on re-/insurance portfolios by geography, business division, or product segments, including the following risks: – physical risks from changing frequencies and intensities of weather-related perils, – transition risks resulting from a reduction in insurable interest due to a decline in value, changing energy costs, or implementation of carbon regulation, and – liability risks that could intensify due to a possible increase in litigation. Asset owners should describe, where appropriate, engagement activity with investee companies to encourage better disclosure and practices related to climate-related risks to improve data availability and asset owners' ability to assess climate-related risks.
b) Describe the organisation's processes for managing climate-related risks.	Organisations should describe their processes for managing climate-related risks, including how they make decisions to mitigate, transfer, accept, or control those risks. In addition, organisations should describe their processes for prioritising climate-related risks, including how materiality determinations are made within their organisations. In describing their processes for managing climate-related risks, organisations should address the risks included in Tables A1 and A2 (pp. 72-73), as appropriate.	Insurers should describe key tools or instruments, such as risk models, used to manage climate-related risks in relation to product development and pricing. Insurers should also describe the range of climate-related events considered and how the risks generated by the rising propensity and severity of such events are managed. Asset owners should describe how they consider the positioning of their total portfolio with respect to the transition to a lower-carbon energy supply, production, and

		use. This could include explaining how asset owners actively manage their portfolios' positioning in relation to this transition.
c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management.	Organisations should describe how their processes for identifying, assessing, and managing climate-related risks are integrated into their overall risk management.	

Table A1.4: Metrics and Targets

Recommended Disclosure	Guidance for all sectors	Supplemental Guidance for Insurers and Asset Owners
a) Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.	Organisations should provide the key metrics used to measure and manage climate-related risks and opportunities, as described in Tables A1 and A2 (pp. 72-73). Organisations should consider including metrics on climate-related risks associated with water, energy, land use, and waste management where relevant and applicable. Where climate-related issues are material, organisations should consider describing whether and how related performance metrics are incorporated into remuneration policies. Where relevant, organisations should provide their internal carbon prices as well as climate-related opportunity metrics such as revenue from products and services designed for a lower-carbon economy. Metrics should be provided for historical periods to allow for trend analysis. In addition, where not apparent, organisations should provide a description of the methodologies used to calculate or estimate climate-related metrics.	Insurers should provide aggregated risk exposure to weather-related catastrophes of their property business (ie, annual aggregated expected losses from weather-related catastrophes) by relevant jurisdiction. Asset owners should describe metrics used to assess climate-related risks and opportunities in each fund or investment strategy. Where relevant, asset owners should also describe how these metrics have changed over time. Where appropriate, asset owners should provide metrics considered in investment decisions and monitoring.
b) Disclose Scope 1, Scope 2, and, if	Organisations should provide their Scope 1 and Scope 2 GHG emissions and, if	Asset owners should provide the weighted average carbon intensity, where data are

appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	appropriate, Scope 3 GHG emissions and the related risks. GHG emissions should be calculated in line with the GHG Protocol methodology to allow for aggregation and comparability across organisations and jurisdictions. As appropriate, organisations should consider providing related, generally accepted industry-specific GHG efficiency ratios. GHG emissions and associated metrics should be provided for historical periods to allow for trend analysis. In addition, where not apparent, organisations should provide a description of the methodologies used to calculate or estimate the metrics.	available or can be reasonably estimated, for each fund or investment strategy. In addition, asset owners should provide other metrics they believe are useful for decision making along with a description of the methodology used. See Table 2 (p. 43) for common carbon footprinting and exposure metrics, including weighted average carbon intensity.
c) Describe the targets used by the organisation to manage climate- related risks and opportunities and performance against targets.	Organisations should describe their key climate-related targets such as those related to GHG emissions, water usage, energy usage, etc., in line with anticipated regulatory requirements or market constraints or other goals. Other goals may include efficiency or financial goals, financial loss tolerances, avoided GHG emissions through the entire product life cycle, or net revenue goals for products and services designed for a lower- carbon economy. In describing their targets, organisations should consider including the following: – whether the target is absolute or intensity based, – time frames over which the target applies, – base year from which progress is measured, and – key performance indicators used to assess progress against targets. Where not apparent, organisations should provide a description of the methodologies used to calculate targets and measures.	

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