

Climate Change:

Why Financial Institutions should take note

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Whatever one's individual views are on the topic of climate change caused by excessive carbon dioxide emission into the earth's atmosphere there is no question that this risk and the reaction to it will affect the lives of everyone and have a material impact on the operation of corporations going forward. As the paper illustrates that impact is happening already.

The fundamental categories of risk impact are comprehensive across most operations of financial services companies. The paper discusses the following:

- *Impact on Customers.*
- *Impact on Employees and their families.*
- *Impact on Assets and Production Facilities.*
- *Impact on Financial Reporting.*
- *An organization's contribution to the problem or to the solution.*

The risk of climate change and the public policy reaction to this risk is a relatively new risk category whose impact on the organization will continue to grow. Global Risk Institute will be providing research on this risk category as an ongoing part of our support of the financial services industry.

CLIMATE CHANGE AND ENVIRONMENTAL RISK

Climate change is one of the most significant environmental, economic and social challenges of our time.

In their latest report, the Intergovernmental Panel on Climate Change (IPCC), the leading international organization for climate change assessment, states that the

"Warming of the climate system is unequivocal... the atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen."^[1]

The IPCC report details the anthropogenic roots of climate change and its widespread impact on food production, health and other segments of the economy. In addition, the report links climate change to an increase in extreme weather events including flooding, cyclones, and wildfires, all of which impose large human and financial tolls. It follows that climate change impacts a wide range of natural and human systems and poses great risk to the livelihoods and economic health of those who rely on them. In order to mitigate these risks and avoid the most severe effects of climate change governments must work to achieve resilient, low carbon societies and economies.

As a key economic pillar, the financial services industry plays an integral role in all market sectors, making it inherently susceptible to climate change

related risks. Consequently, the industry has a large stake in understanding and mitigating these risks and assessing how climate change will alter existing risks and risk relationships. Over the past year, global financial leaders have become increasingly adamant that financial institutions must develop and implement long-term business strategies, risk management processes and proper reporting frameworks that explicitly consider climate change.

Mark Carney, governor of the Bank of England, recently stated in a speech at Lloyd's of London that

"The combination of the weight of scientific evidence and the dynamics of the financial system suggest that, in the fullness of time, climate change will threaten financial resilience and longer-term prosperity. While there is still time to act, the window of opportunity is finite and shrinking."^[2]

The subsequent 2015 United Nations Climate Change Conference (COP21) saw 195 countries adopt the first-ever universal, legally binding global climate deal and witnessed the Carney-backed launch of the Task Force on Climate-Related Financial Disclosures (TCFD). The TCFD is a group of corporate leaders that are charged with developing a set of guidelines for companies to report their climate-related risk exposure to investors, lenders, insurers, and other stakeholders.^[3] This is a crucial step forward in providing the transparency required for financial institutions to measure and respond to their exposure to climate change risk.

As climate change continues in subsequent decades, managing and mitigating the risk associated with these events will be increasingly important for the financial services industry. This article will outline possible sources of climate change risk within the financial services industry, focusing namely on the insurance, banking and pension fund industries, and will highlight why prompt action must be taken if we wish to economically manage these risks and maintain a stable economy. It should be noted that several of the climate change risks identified in this report have varying degrees of impact across

multiple sectors of the financial services industry.

The Insurance Industry

Climate change has been a major concern for the insurance industry for many years, with the first reinsurer reports on the prospective rise in natural disaster losses due to changes in climate appearing in the early 1970s.

Several insurers/reinsurers have since participated in climate-related efforts including research collaborations with the scientific community, raising the awareness of clients and the general public, and conducting internal reviews to assess the risks and opportunities associated with climate change. Despite this involvement, the number of worldwide weather-related loss events has tripled since the 1980s, and inflation-adjusted insurance losses from these events have increased from an annual average of around \$10 billion to around \$50 billion over the past decade.^[4]

While the attribution of increases in claims to specific factors is complex, studies have shown that insurers have realized substantial costs directly associated with climate change. In a catastrophe modeling and climate change report by Lloyd's, it was estimated that the 20 cm rise in sea-level observed at the southern tip of Manhattan since the 1950s equated to an increase of approximately 30% in the ground-up surge losses from superstorm Sandy in New York alone.^[5] In addition to direct costs, insurers have suffered increased losses through indirect events such as the disruption of global supply chains or resource scarcity. Consequently, the insurance industry has immense incentive to understand climate change and manage the risks associated with it.

The ways in which the insurance industry may be impacted by climate change are diverse, complex and uncertain. However, it is crucial for risk management and loss reduction purposes that all foreseeable material risks are considered. In a recent study, the Bank of England's Prudential Regulation Authority (PRA) identified three main channels through which

climate change is likely to impact the insurance industry; namely physical risk, liability risk and transition risk. ^[6]

The implications of climate change, including the increase in the number and severity of extreme weather events, pose obvious direct physical risks to insurers by means of property insurance liabilities, devaluation of financial assets and real-estate investments, and increased morbidity and mortality due to severe weather conditions. There are also secondary physical risks to consider which arise indirectly through subsequent events such as disruption of global supply chain, resource scarcity, or potential macroeconomic, political or societal shocks. Indirect physical risks can include financial market losses due to economic damage, declines in resource production resulting in scarcity, and increased morbidity and mortality caused by indirect impacts of rising temperatures such as the increase in vector-borne diseases.

In the short term, insurance companies are quite well-equipped to assess and manage their physical risks by way of catastrophe modelling, portfolio diversification and risk transfer. However, in the long term, the effects of climate change may impact the soundness of current catastrophe models and may reduce the efficacy of portfolio diversification and risk transfer. Over the past 20 years, catastrophe models have been extensively developed to simulate the physical characteristics of likely events and quantify their effects. These models are complex and have inherent uncertainty which will only be exacerbated by the uncertainties associated with climate change. In particular, climate change intensifies properties such as global micro-correlations, fat tails and tail dependence which can greatly impact environmental risk estimations, and influence the effectiveness of diversification strategies. ^[7] Standard & Poor's (S&P) recently suggested that current catastrophe losses may be undervalued by as much as 50% at the 1 in 10 and 1 in 250 return periods if the past decade were to be representative of future environmental trends. ^[8]

Liability insurance, which protects the purchaser of the insurance from the risk of being held legally liable for the loss and damages suffered by other parties as a result of the insured's actions, poses

a large risk to insurers over a broad time frame. In addition, the true cost of liability claims is often uncertain and complex to determine. In the context of climate change, there is already evidence of liability risks with existing cases suggesting three primary lines of argument; failure to mitigate, failure to adapt and failure to disclose. Climate change litigation is still very much in its beginning stages, varying considerably from jurisdictions to jurisdiction. As it evolves, insurers will have to consider how the climate change exposure of the parties they insure impact their own liability risks.

Given the widespread governmental acceptance of climate change and the global shift to reduce greenhouse gas emissions, there will likely be several changes and additions to existing climate change-related policies and regulations in the near- to mid-term. The severity of future climate change-related events depends on how aggressive these policies are, both in terms of the size and timing of carbon emission reduction. According to the IPCC,

“Delaying mitigation efforts beyond those in place today (2014) through 2030 is estimated to substantially increase the difficulty in the transition to low longer-term emission levels.”^[1]

Transition risk encompasses the financial risks which may result as adjustments are or are not made towards a lower-carbon economy. These risks can be triggered by changes in public policy and regulation as well as the advent of new technologies, shifting investor preferences, physical events, and progress in climate science.

Transition risk may impact both the liability and asset sides of an insurance company's balance sheet. This type of risk has similar effects on an insurance company's liabilities as physical and liability risk. By inducing uncertainty about the timing and extent of future climate change, transition risk creates additional uncertainty about claims stemming from climate-related events. In addition, mispricing of insurers' assets may also occur if assets prices do not fully reflect the risk associated with climate change related transition pathways. Studies have shown

that climate change and other environment-related factors are not properly accounted for in financial and corporate decision-making leading to the possible mispricing of assets. ^[9, 10]

Climate change poses large challenges for the insurance industry but also introduces many new opportunities. The advancement of clean technologies and low carbon infrastructure offers new sources of premium growth by providing new insurance products such as renewable energy project insurance. Similarly, new products relating to public policy risk, including those to cover unforeseen withdrawals of environmental subsidies, can also provide revenue growth. Climate change also brings new investment opportunities in clean technologies, emerging carbon trading markets, and in 'green bonds' as well as in the financing of the de-carbonisation of our economy. ^[11]

Insurance companies provide protection and risk transfer to all other sectors of the economy, and thus have a clear role in supporting economy-wide adaptation to climate change. While there is still time for insurance companies to effectively manage climate change, the window of opportunity for economical mitigation is shrinking. ^[12] In order to promote global resilience to climate change and support an orderly transition to a lower carbon economy, insurance companies should be willing to participate in international collaboration, engagement and research, and unrelenting stress testing and risk modelling.

The Banking Industry

The banking industry is involved with a wide range of financing and investment activities, such as retail banking, mortgage lending, business lending, project finance, asset management, and investment banking.

These activities span all sectors of the economy, including those that are carbon intensive, making the banking industry uniquely susceptible to climate change-related risks. In order to maintain their financial health and that of the broader economy, and protect their shareholders' interests, banks must assess their exposure to climate-change

related risks, implement comprehensive risk management strategies, explore new opportunities for revenue growth and provide proper climate change-related disclosure. It has been found, however, that many of the world's largest banks have not adequately accounted for climate change in their long-term business strategies and risk management processes and none have yet to disclose a comprehensive carbon footprint analysis. ^[13, 14]

The first step in developing a comprehensive climate change strategy is to identify the climate change-related risks to which the banking industry is exposed. These risks include physical risk, regulatory risk, systemic risk, opportunity risk, and reputational risk, all of which have clear implications on a bank's investments, as well as lending practices and other aspects of a bank's performance.

The physical impacts of climate change pose a direct risk to a bank's own operations and lending portfolios, with real estate, infrastructure and agricultural business being particularly at risk. For instance, the increase in the number and severity of extreme weather events driven by climate change may increase the instances of physical damage to corporate assets leading to an increase in commercial lending defaults. Moreover, mortgage portfolios in geographical areas that are at high risk of weather events such as flooding may also face higher default rates as well as the risk of devaluation. Undoubtedly, the banks' own infrastructure is also vulnerable to the physical risks of climate change. To account for operational and portfolio exposure to the physical effects of climate change, physical risk must be incorporated into a bank's risk management framework and investment decisions.

The global consensus that climate change is a primary threat to economic and societal stability has led to considerable developments in climate change policy both at the regional and national levels. The 2015 Global Climate Legislation Study found that the number of laws and policies aimed at climate change mitigation and adaptation has been steadily increasing, with 54 laws and policies in 1997 and 426 in 2009. By the end of 2014, 98 countries, responsible for 93% of the global greenhouse gas

emissions, had enacted just over 800 climate change laws and policies.^[15] Many of the current asset valuation models employed by the banking industry do not take climate change regulations adequately into consideration. Moreover, as our understanding of climate change improves and awareness spreads, existing climate change regulations will be modified and new ones will be imposed, introducing increased uncertainty around the risk of climate change regulations on the banking industry.

Fossil fuel companies, for one, tend to base asset valuations on all known reserves that can be exploited. It follows that more than 50% of an oil and gas company's market value is derived from long-term cash flows based on the extraction of reserves over a broad 10 year-plus time frame.^[16] However, to achieve the climate change mitigation goals and greenhouse gas reductions outlined by the IPCC, no more than one-third of established fossil fuel reserves can be consumed prior to 2050.^[17] This puts companies at risk of asset stranding and devaluation. Consequently, banks with exposure to these companies may face losses due to incorrect asset valuation, and additional credit and default risk. Research by both Standard and Poor's and HSBC has shown that stricter emissions-reducing policies will have a direct negative impact on the creditworthiness and market capitalisation of high carbon energy companies.^[18, 19] Conversely, if governments do not implement sufficient policies to curb greenhouse gas emissions, economic growth in all sectors will suffer and market volatility will likely increase.^[20]

The banking industry is also susceptible to the broader systemic risks associated with climate change and the transition to a lower carbon economy. Amongst other things, these risks can be driven by changes to public policy and regulation, the advent of new technologies, progress in climate science and shifts in carbon pricing. For example, the oil price shocks observed in 2015-2016 show the far-reaching effects that re-pricing can have on both financial markets and the real economy.^[21] The European Systemic Risk Board's Scientific Advisory Committee Report suggests that first-order losses related to carbon-intensive assets will likely be manageable, however the initial re-pricing shocks may trigger negative feedback loops.^[12] As

reported by Clerc et al., financial frictions can amplify relatively small initial shocks, generating systemically relevant second-round effects. Uncertainty about which firms are heavily exposed to the initial shock may lead to a contraction in aggregate corporate funding and an overall economic decline, exacerbating the shock's damage.^[22]

As our economy reduces its dependence on fossil fuels, new investment opportunities will arise in sectors that produce green products and services. Financing these investments represents a new source of growth for the banking industry. For example, banks can underwrite green bonds, sometimes referred to as climate bonds, which are issued by governments or corporations to finance investments in climate change abatement or adaptation projects. Banks that do not take advantage of these opportunities risk increased competitive pressure from banks that do.

Finally, banks must adapt to diminished public perception of participating in carbon intensive industries. As public awareness grows and perceptions about climate change evolve, banks should expect that continued misalignment of their financing and investment practices with the transition to a low carbon economy will lead to increased reputational risks. While many of the largest banks have acknowledged reputational issues associated with financing carbon intensive industries, several remain heavily invested in these industries.^[23] As climate change advances, banks will have to do more to manage the reputational effects of their investment and financing decisions.

Climate change has huge financial implications for both the banking industry and the broader economy. The banking industry plays an integral role in funding all sectors of the economy, thus society has a large stake in the industry's successful adaptation to climate change. In an effort to mitigate their exposure to climate change-related risks, banks must build comprehensive climate change strategies, risk management processes and provide complete climate change-related disclosure. As a part of this effort, banks should strategically rebalance their portfolios in view of their climate change risks by scaling back exposure to high carbon industries and other assets that could suffer in transition,

and avail themselves of new green opportunities in commercial and investment banking. According to a comprehensive report by the University of Cambridge which considers multiple climate change transition paths, global investment portfolios stand to lose up to 45 percent as a consequence of the short term shifts in climate sentiment. While approximately half of these potential losses can be avoided through mindful portfolio reallocation, half have been deemed unhedgeable unless action on climate change is taken at a system level.

[24] The banking industry is in a key position to promote these system level changes and should be responsible in doing so.

Pension Funds

Pension funds play an integral role in society, ensuring that fund beneficiaries around the globe receive retirement income on which they depend when they reach the end of their working years.

In order to do this, pension funds must maintain the long-term stable growth of their portfolios which, at the end of 2015, amounted to upwards of \$35.4 trillion US. [25] As fiduciaries they must also manage their portfolios under their duties of loyalty, care, and prudence for the well-being of their beneficiaries. It follows that pension plan investments must fully consider the plan's liabilities and must not take undue risks, including those of an environmental or social nature. [26] As has been detailed in a number of reports, including one by the University of Cambridge, climate change poses a real and potentially devastating risk to investment portfolios. [24] To fulfill their fiduciary duties, pension funds must therefore fully consider the risks associated with climate change and manage them to the best of their ability. The most significant climate change-related risks that pension funds must address are physical risk, regulatory risk, systemic risk and liability risk.

As previously discussed, physical risk, regulatory risk and systemic risk can all have significant effects on physical assets and investment portfolios. These risks impact pension funds much in the same way

as they do the investment and asset management sides of other financial services firms. The physical risks of climate change, including those caused by changing weather patterns, sea-level increases, temperature extremes and natural resource scarcity, can lead to the physical damage of pension fund assets. Regulatory risk may result in the stranding or devaluation of assets in carbon intensive industries. Systemic risks, on the other hand, can lead to shifts in the broader market, which can subsequently impact pension fund portfolios.

The liability risk which pension fund portfolios face principally arises from the developing interpretations of fiduciary and tortious duties of care. Given the overwhelming scientific consensus about the implications of global climate change, the rejection of climate change is not an option for pension fiduciaries. The duty of prudence requires a comprehensive and judicious evaluation of all pertinent information on which fiduciary decisions are to be made. If pension funds choose to ignore these facts they may be faced with litigations for financial claims based on damages to beneficiary assets caused by climate change-related risks.

In order to avoid financial liability and mitigate climate change-related risks, pension funds must diversify their portfolios across all sources of risk and increase allocations to low carbon technologies and green energy. In doing so, they must be mindful in balancing their long-term assets with their long-term liabilities. Due to their extensive portfolio size and long-term investment horizon, pension funds are also uniquely placed to play an important role in the shift towards a low-carbon economy through public policy involvement and the decarbonisation of the capital markets.

Conclusions and Next Steps

There is no denying that climate change is one of the defining social, environmental and economic challenges of our time, which should be seen not only as a short-term financial risk but also as a long-term economic threat.

It is a global issue that will affect all sectors of the economy, and impact how we do business and who we do it with. Given its heavily integrated role in society, the financial service industry is particularly susceptible to the risks associated with climate change. It must therefore ensure that proper climate change strategies and risk management procedures are in place in order to remain viable. Financial Institutions must also recognise the immense value in performing stress testing for a wide range of sustainability risks, not limited to climate risk, in order to fully understand their financial impacts and how to manage them. The financial service industry is also uniquely placed to help guide the broader economy's transition to a low-carbon future by promoting disclosure of exposure to climate change, financing abatement and adaptation projects and reallocating investments towards green opportunities.

In understanding the importance and vast implications of climate change and in an effort to support financial institutions in their understanding and mitigation of climate change-related risks, the Global Risk Institute will be contributing to climate change research through two funded partnerships with world class financial researchers. The first initiative will focus on assessing existing publicly traded portfolios that provide hedges against environmental risk, and finding new dynamic environmental risk hedge portfolios. The second will focus on determining a governmental investment strategy that will minimize climate change risk subject to achieving a targeted level of real GDP per capita. Project updates will be provided to our membership as this research progresses.

In closing, the financial service industry, given its unique role in the economy, is susceptible to risks posed by climate change and has a duty to lead the way in responding to them. The message is the same for insurance companies, banks, and pension funds alike: climate change is a top priority that must be addressed systematically and without delay.

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