

Climate risk

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A new normal

The past two full years – 2017 and 2018 – were the most costly back-to-back years on record for weather-related disasters say insurance companies, with economic losses exceeding \$650 billion. Moreover, 2018 was the fourth costliest year on record for weather-related events, even though there were no events on the scale of hurricanes Katrina in 2005, and Harvey, Irma and Maria in 2017.

Experts believe 2018 represents a ‘new normal’, when a large number of relatively small natural disasters added up to substantial losses.

Trying to ascertain how many of these events are the result of global climate change, and how many would have happened regardless, is extremely challenging, but historical data can certainly be applied to show that the frequency of severe weather events has increased in recent years.

Investment firm Schrodgers estimates global economic losses from climate change could reach \$23 trillion per year in the long term if action isn’t taken. That’s almost four times the impact of the 2008 financial crisis.

But for individual firms, trying to quantify the risk of physical climate change on their assets, infrastructure, businesses and supply chains is no easy feat. While many firms are used to managing weather risk on an annual or seasonal basis, managing the long-term, ever-increasing effects of climate change requires a very different approach. It is something many firms are grappling with now, not least because shareholders and investors require greater transparency on it (see page 3).

This report explores how corporates – and the banks that invest and lend to them – are approaching this new discipline. It also examines developments in disclosure – particularly those stemming from the guidelines of the Task Force on Climate-related Financial Disclosures.

However, climate risk is not just about the economic losses caused by severe weather events, rising sea levels and higher temperatures. It is also about trying to understand how the transition to a low-carbon economy might affect businesses. Firms involved in the production of fossil fuels will be particularly affected by policy efforts to reduce carbon emissions and curb demand for the highest-polluting fuels.

Several banks have already started to model transition risk in their investment and lending portfolios although, again, this is a discipline in its infancy (see page 13).

While there are many different approaches to modelling this risk, most agree that the long time horizon and the sheer number of variables and possibilities mean that a scenario approach makes most sense.

There is also widespread agreement that assessing and managing climate risk will require the co-operation of enterprise risk and business risk managers, but it will also require them to work alongside environmental and social responsibility teams. While climate risk is identified as a top risk at many firms now, it needs to move beyond the level of public relations and ethics to a quantifiable business risk that can be communicated in a transparent and standardised way.

We hope this report provides invaluable information to companies as they embark on this journey. As ratings agency Standard & Poor’s noted at last year’s UN Climate Change Conference: “Climate change has already started to alter the functioning of our world.”

Stella Farrington
Head of content, **Energy Risk**



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When climate risk starts to bite

As climate change increases the frequency and severity of natural disasters, energy firms are under increased pressure to assess physical climate risk. By Mark Nicholls



Need to know

- Energy companies have always faced extreme weather and natural disasters, but climate change is increasing the frequency and severity of these risks.
- “Climate change doesn’t necessarily create new risks, but instead it acts to change existing risk profiles,” says Anna Haworth, senior risk adviser at Acclimatise.
- Some firms are already building more robust infrastructure in anticipation of climate change, but trying to assess and quantify the physical risks is challenging. Even if a firm’s assets are mapped according to weather patterns, modelling the impact of exposures all the way along the supply chain is very complex.
- Additionally, there is no consensus on how high temperatures might rise. A world with a temperature of 1.5°C above pre-industrial levels would be completely different to a 4°C world.
- Despite the difficulty of measuring physical climate risk, shareholders are demanding energy firms quantify and disclose this risk.

Last year was an unremarkable one as far as natural disasters were concerned. There were no events on the scale of hurricanes Katrina in 2005, and Harvey, Irma and Maria in 2017. Yet the global insurance industry paid out \$76 billion in losses from natural catastrophes, the fourth-highest sum on record, according to reinsurance giant Swiss Re. Economic losses in the US alone totalled \$91 billion, mainly from hurricanes and wildfires, according to the US National Oceanic and Atmospheric Administration.

Swiss Re describes 2018 as a template for the “new normal” – when a large number of relatively small natural disasters, often linked to extreme weather, add up to substantial losses. This new reality, partly the result of a warming climate, can easily bring down large companies, with the energy industry being particularly susceptible. In January, Californian utility Pacific Gas & Electric Corp (PG&E) filed for bankruptcy in the wake of wildfires – made worse by drought and higher temperatures – that left it facing costs of at least \$30 billion.

It is not only acute climate events that pose risks: chronic changes threaten the industry. In Europe, heatwaves in 2019 and 2018 – becoming much more common as the climate warms – forced French utility EDF to shut down nuclear

power plants to avoid breaching regulatory limits on the temperature of river water used to cool reactors. Drought in 2018 saw water levels on the Rhine drop to the extent that coal-fired plants were unable to receive fuel shipments, curtailing generation.

Energy companies, whether utilities such as PG&E and EDF, or extractive oil and gas firms, have always faced extreme weather and natural disasters. But they now have to grapple with a warming climate increasing the frequency and severity of these extreme events – and with increasingly tough questions from investors, regulators and governments.

“There are a number of types of extreme weather that companies are already exposed to, such as extreme heat, windstorms and coastal and river basin flooding,” says David Lunsford, co-founder of Carbon Delta, a Zurich-based climate data and analysis firm, recently purchased by MSCI. “Climate change turns up the amplifier of these extreme weather events.”

According to analysis by Carbon Brief, a climate science website, 68% of 257 extreme weather events analysed between 2011 and 2018 were made more likely or more severe by human-caused climate change.

Climate change is also changing the nature of these events: for example, as Hurricane Dorian showed this year – and hurricanes Florence and Harvey demonstrated in 2018 and 2017, respectively – there is evidence that changing patterns of atmospheric circulation are causing hurricanes and tropical storms to become slower-moving, meaning they can dump considerably more rain over a given area.

“Climate change doesn’t necessarily create new risks, but instead it acts to change existing risk profiles,” says Anna Haworth, senior risk adviser at Acclimatise, a UK-based advisory and analytics firm specialising in climate adaptation and resilience. “It can alter their frequency, severity and spatial distribution.”

Certainly, some parts of the industry are responding. US utility Consolidated Edison was hit hard by Hurricane Sandy in 2012, when flooding from the resulting storm-surge knocked out power to more than 1 million of the New York-based firm’s customers. Since then, it has spent \$1 billion in upgrades to protect its systems from extreme weather, including equipment that can withstand flooding, ‘smart switches’ that can isolate overhead lines that have come down, and miles of flood walls to protect critical substations.

Last year, it announced plans to invest another \$100 million to make its overhead electrical distribution system in Westchester County more resilient to storms, following a number of outages in the area in 2018.

“Climate change is real, and we have a responsibility to protect our customers and equipment from severe weather events, which are becoming more frequent and destructive,” says a ConEd spokesman.

“We are working on a study to understand the vulnerability of our energy systems to climate change and identify and implement actions to enhance system resilience,” he adds. While the study is not yet complete, “it is clear that all three of our commodity-delivery systems have vulnerabilities and will require investment. The biggest threats to our equipment come from wind and flooding.”

EDF, meanwhile, has invested in weather forecasting to help it anticipate river-water temperatures and better manage its output during heatwaves, and has improved the efficiency of its cooling towers to reduce the amount of water they use.

Oil and gas companies, meanwhile, are no strangers to extreme weather risk. “Energy companies have been on the hunt for climate-change risk within their operations for a number of decades,” says Nik Steinberg, director of analytics at San Francisco-based climate risk firm Four Twenty Seven, which was recently acquired by Moody’s. However, he argues that, as far as the climate issue goes, they have focused more on energy transition



“There are a number of types of extreme weather that companies are already exposed to, such as extreme heat, windstorms and coastal and river basin flooding. Climate change turns up the amplifier of these extreme weather events”

David Lunsford, Carbon Delta

risks – on how their businesses should respond to the shift to a low-carbon economy.

“The energy transition has been the defining feature of the scenario analyses drawn up by energy companies – they have considered physical climate risk to a lesser extent,” he says.

Getting physical

For firms attempting to quantify their physical climate risk exposures, there are a number of challenges.

Firstly, even if a firm’s assets are mapped according to weather patterns, modelling the impact of second-order exposures along the supply chain will add significant complexity, says Steinberg.

“The interconnectedness of the energy supply chain is underestimated. There are a number of supply-chain nodes that are highly concentrated in the energy markets that, if affected by some climatic event, would lead to pretty significant disruption,” he says, giving the US Gulf, Oklahoma and China’s Pearl River Delta as examples.

Rohan Hamden, CEO of XDI Systems, an Australia-based climate modelling firm, suggests taking a cross-sectoral approach to climate risk.

“What do you do if you find the power company on which you rely is underinvesting?” he asks. By analysing the problem collaboratively at the system

level, the costs of investing in resilience can be quantified and equitably – and more efficiently – shared, he says.

He gives as an example a project his firm undertook with the governments of New South Wales and the city of Sydney, where his firm quantified the climate risk faced by critical infrastructure across power, water, roads, rail and telecommunications. It found that, among other things, the water and telecommunications firms were exposed to extreme weather vulnerabilities faced by the electrical infrastructure.

“It turned out it was much cheaper for them to upgrade key components of the power network than it was for them to gold-plate their own infrastructure.”

Quantifying the full costs of climate risks is another huge challenge. “Estimating the number of days that a facility may be additionally exposed to extreme weather impacts is more or less understood,” says Carbon Delta’s Lunsford. However, understanding what that might cost is considerably more complex. For example, warmer temperatures will, at some point, persuade the owner of a building to invest in an expensive air conditioning system. “The exact cost and the point in time that the cost is incurred are difficult to estimate,” he says.

Trying to estimate how a changing climate might alter current weather risk profiles is another difficulty. Haworth at Acclimatise says the oil and gas sector is “very experienced and well equipped in terms of identifying and managing risk”, particularly when it relates to operations, business continuity and supply chain management. “What they are struggling with a bit more is bringing in the longer-term dimension and understanding how those risks might change over time, driven by changes in the climate and evolving stakeholder expectations.”

As yet, there is little agreement on the best way of measuring and quantifying these future risks. “The level of risk awareness is high but, in our opinion, in order to adequately respond to the risk efficiently, we need to measure the risk appropriately, and there’s not really consensus on how that’s done,” says Michael Ferguson, a director in the sustainable finance team at S&P Global Ratings. For example, some companies use scenarios developed by the US Energy Information Administration. “The more forward-looking companies have pretty disciplined ways of tabulating and calculating and updating their expectations of what climate risk looks like.”

One of the biggest challenges is the lack of consensus about how much the world will heat up over the next few years. This is hampering investment in more resilient infrastructure, especially since there is a lack of regulatory guidance. Marion Labatut, policy director at Eurelectric, the European

electricity industry association, notes that utilities are faced with difficult decisions when it comes to upgrading infrastructure – and the extent of cost-recovery they can request from their regulators.

Of course, no one is in a position to predict accurately how much global temperatures will rise from here. It is likely that the current upward trajectory will be reined in by environmental policy, in particular by policies implementing the 2015 Paris Agreement on climate change, which aims to stop global average temperatures exceeding 2° Celsius above pre-industrial levels, and by the uptake of new low-carbon technologies. However, forecasts range from a world of with only 1.5°C warming to one of 4°C. These two scenarios would be vastly different places.

“It’s completely different to plan for 1.5°C compared with 4°C,” says Labatut, but companies have little guidance on how to proceed.

Investor pressure

While energy companies face a complex task assessing and mitigating their physical climate exposures, they are coming under increasing pressure to do so from investors.

Some investors are coming to the conclusion that the market is not adequately pricing physical climate risk. In April, BlackRock published a white paper – *Getting physical: scenario analysis for assessing climate-related risks*¹ – that used data from Rhodium Group to assess the economic impacts of climate risk on a localised basis, using US electric utilities as one of three case studies. It analysed 4,500 power plants, assessing the risks they face from acute shocks, such as hurricanes and wildfires, and chronic events, such as drought.

The analysis found that the most climate-resilient utilities trade at a “slight premium” to their peers, while the most vulnerable trade at a slight discount. (BlackRock did not quantify “slight”). Nonetheless, it concluded that, “climate-related risks are real for utilities, but [are] mostly not priced in.”

“This gap may become more pronounced over time as weather events turn more extreme and frequent – and more investors factor climate change into their risk/return analysis,” the report says.

“We’re at the very early stage of any investor really putting to use climate-change scenario analysis,” says Lunsford at Carbon Delta. “But we’ve had a tremendous amount of interest, and the more progressive [investment] firms now understand the data, and have put the quants on the data to understand its quality and to figure out the sort of benefits they could achieve by using it.”

He says these firms are, for example, applying Carbon Delta’s analysis to internal platforms they use to monitor ESG or sustainability exposures, or



“What [oil and gas firms] are struggling with is bringing in the longer-term dimension and understanding how those risks might change over time, driven by changes in the climate and evolving stakeholder expectations”

Anna Haworth, Acclimatise

are using it to identify more – and less – “climate-efficient companies” that stand to outperform their peers as the impacts of climate change and the low-carbon transition become more apparent. “There are quite a lot of use cases. Within five to 10 years, this will become mainstream.”

S&P Global Ratings has also carried out investor studies assessing the preparedness of energy firms for the energy transition and the physical impacts of climate change. A recent one focused on NextEra Energy, the Florida-based utility, looking at the degree of risk posed by rising sea levels to its nuclear power plants. “We found they’d carried out rigorous studies of potential sea-level rise ... and found that, even in a very unexpectedly severe storm, these assets would still have been above the waterline,” says Ferguson.

However, he believes energy firms could be doing more to communicate their assessments of these risks. “The challenge investors have is deciding the relative materiality of the different data points they receive from issuers,” he says.

“They are not always consistently provided, there can be selective disclosure, a propensity for too much information rather than for the right information. The challenge is to make sense of all of that ... It’s what we’re trying to do.”

Antonios Panagiotopoulos, vice-president, ESG research at index and financial data provider MSCI, agrees. “Companies are not disclosing enough information. The oil and gas sector is one of the most exposed” to physical climate risk, he says. “They should be providing to investors ‘what if’ scenarios,” setting out which of their assets are at risk from natural disasters in the context of rising risks.

Public disclosures on climate change from energy firms tend to focus only on transition risk and not physical risk. BP, Shell and Total declined to be interviewed for this article or to answer questions regarding physical climate exposures.

A spokesman for Chevron, however, highlighted a report that the company has produced, entitled *Climate-change resilience – a framework for decision making*, that sets out its response to climate change. While most of the report addresses its response to a low-carbon economy, it contains a section on climate risk, where the company notes that it is applying “long-standing practices” to manage the impact of “ambient conditions on its operations”, and that these practices are being “extended to reflect possible effects of climate change and to ensure the ongoing resilience of our infrastructure”.

Analysts say that the work of the Task Force on Climate-related Financial Disclosures (TCFD) is likely to contribute to the consistency that investors need.

The TCFD was established in 2015 by the Financial Stability Board, a Group of 20 body, and published in 2017 recommendations on how companies (and investors) might disclose investment-relevant information about climate risk, including using scenario-planning to set out how they will be affected by different levels of climate change.

“The work of organisations like the TCFD has really driven a much greater appreciation of what these risks mean and how to start thinking about them,” says Oliver Rix, at advisory firm Baringa Partners.

But it is about more than disclosure: meeting the TCFD’s disclosure recommendations is also changing corporate behaviour. “The TCFD’s recommendations have really created an impetus for companies to progress their climate risk and opportunity assessment and management,” says Haworth at Acclimatise. “Oil and gas companies are increasingly aligning their climate-change activities with these recommendations,” such as improving governance, strategic planning, risk management and reporting on targets.

But there is much work still to be done. “The fact remains that the physical aspects of climate change are affecting more and more companies,” says Panagiotopoulos at MSCI. “Companies need to put out information on how they plan to mitigate these impacts.” ■

Previously published on Risk.net

Companies delay climate policy action at their peril

Failure to take immediate action on the proposals set out in the Paris Agreement on climate change could cost approximately \$1.2 trillion over the next 15 years in policy risk costs. Oliver Marchand, co-founder of Carbon Delta and executive director of MSCI, explores the potential impact of a delayed regulatory response to climate change on a number of sectors, and compares the risks of 'dirty' technologies – such as coal and oil – with the revenue opportunities of green technologies

Despite the ratification of the Paris Agreement on climate change in November 2016 – in which 185 nations committed to fight climate change and limit global warming – there remains a significant gap between implementation and the agreement's envisioned goals. Consequently, the profiles of physical and transition risks are likely to become more complex and more severe than anticipated, potentially creating detrimental costs for companies in certain sectors.

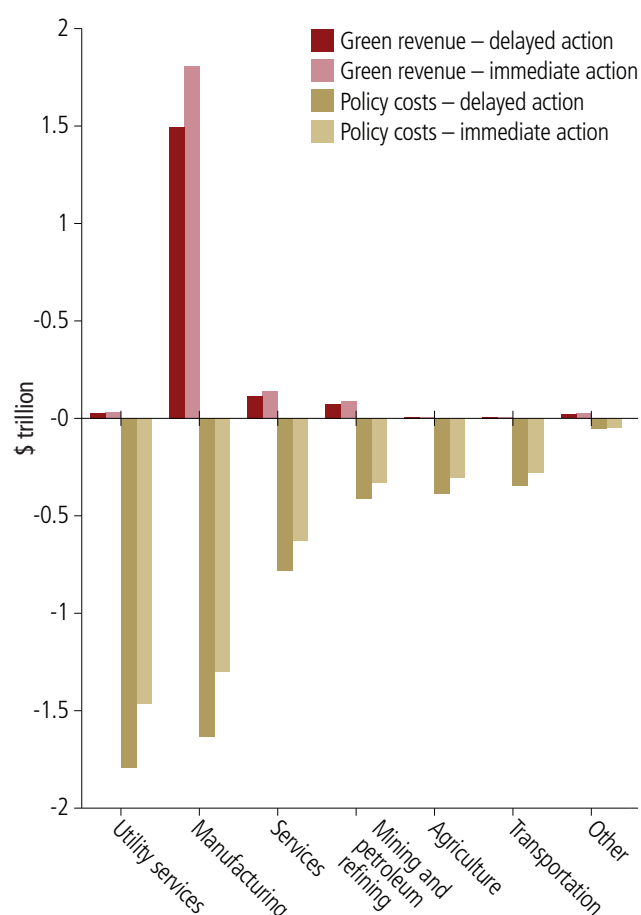
Climate change is intensifying – as are countervailing attempts to work towards a low-carbon world – and was highlighted in the UN Environment Programme's (UNEP's) *Emission gap report 2018*.¹ The report reiterated that achieving the Paris Agreement's target of a 1.5° Celsius warming level would require unprecedented and urgent action by all nations.

To be more explicit on the ramifications of delayed action, pioneering analysis by Carbon Delta, which was acquired by MSCI in October 2019 and is a global leader in climate change scenario analysis,^{2,3} demonstrated that companies face potential losses of \$1.2 trillion over the next 15 years if climate action is delayed.⁴ This analysis formed part of a wider landmark *Changing course* investor guide published by the UNEP Finance Initiative, which investigated methods for assessing climate risk while piloting the recommendations of the Task Force on Climate-related Financial Disclosure (TCFD).^{5,6}

Action must supplant aspirations

There is no denying that climate change risk has risen to the top of the corporate agenda, and is a high priority for investors as understanding of their respective exposures has grown. With financial institutions and companies beginning to implement scenario analysis and stress-testing methods, the potential monetary losses are being explored. However, there are even greater costs – to which funding has already been committed by national governments, depending on what each government can achieve with their own resources or with additional external funding – to delaying action. Not acting immediately on the Paris Agreement could potentially amount to the aforementioned figure of approximately \$1.2 trillion over the next 15 years in policy risk costs, based on data from 30,000 companies studied by Carbon Delta. Further analysis of specific sector risk revealed an even wider gap in risk between sectors, with some sectors more acutely exposed than others (see figure 1).

1 Policy risk cost and green revenue in a delayed and immediate transition scenario



Moving towards a 2°C world

The two scenarios used in MSCI's analysis model a 2°C world, but adopt different transition pathways. The immediate action scenario is based on an integrated assessment model, the Regional Model of Investments and Development – known as Remind – and utilises a shared socioeconomic pathway (SSP) with a middle-of-the-road narrative (SSP2), whereas the delayed-action model was modelled using the Global Change Assessment Model (GCAM4) in combination with an 'inequality' narrative (SSP4). SSPs describe broad socioeconomic trends that could shape the future of society.⁷ The delayed action, modelled using GCAM4 SSP4, translates into a higher carbon price further into the future to meet the emissions reduction requirements in the 2°C global temperature goal, and thus a higher total reduction cost than an immediate action.

Sector comparisons reveal wide disparities

In MSCI's analysis, sector exposures to transition risk in both immediate- and delayed-action scenarios are determined by attributing costs to different sectors. The manufacturing and utility sectors are most at risk, based on Carbon Delta's sector classification system (see figure 1). Within the manufacturing sector, companies in the cement, and iron and steel segments faced the highest risk. They are closely followed by the chemicals sector, which MSCI also believes to have the highest technology remediation opportunities. For the utility sector, the conventionally emission-intense technologies coal and oil faced the highest risk in our analysis. Greener technologies, such as solar and wind, faced much less risk. Despite the risk in 'dirtier' technologies, there are potentially attractive green revenue opportunities if such companies chose to transition to more green technologies.

In both transition scenarios, the manufacturing and utility sectors are respectively responsible for 30% and 33% of the total policy cost. In terms of absolute costs, the potential difference between an immediate and a delayed scenario for both sectors was \$300 billion. By contrast, although other less materially intense sectors such as services and transportation still faced a significant risk, it is notably less severe. In short, a delay in action is likely to compound the very high risks that materially intense sectors already face in immediate-action transition risk scenarios.

FOCUS ON CLIMATE CHANGE

MSCI ESG Research has worked with institutional investors for more than 20 years to enable them to incorporate climate change considerations into their investment processes by providing an extensive climate risk assessment and reporting offering. This offering equips global investors with solutions to better understand the impact of climate change on their investment portfolios and comply with mandatory and voluntary climate risk disclosure initiatives and requirements. MSCI's climate change solutions support investors seeking to achieve a range of objectives, including measuring and reporting on climate risk exposure, implementing low-carbon and fossil fuel-free strategies, and factoring climate change research into their risk management processes.

The acquisition of Carbon Delta expands MSCI's robust suite of climate risk capabilities with state-of-the-art modelling technology that supports climate scenario analysis and forward-looking assessment of transition and physical risks, as well as extensive company-level analysis of publicly traded companies globally provided by MSCI ESG Research.



Oliver Marchand, Carbon Delta

Not all doom and gloom

Despite the high policy costs in both the immediate and delayed policy scenarios, there are significant new investment opportunities to be explored. High costs to the manufacturing sectors are potentially offset by a very high-potential green revenue stream due to the large amount of low-carbon innovation taking place in such companies. These companies are investing in research and development to provide the technologies and services to enable the transition to a low-carbon world. Despite the technology opportunity across the sector, it is worth highlighting that some companies in the manufacturing sector will find it a

challenge to transition due to a lack of concerted effort.

For policy-makers, the results suggest that transitioning to a more stringent policy pathway could also create low-carbon innovation and green revenues for sectors under stress. Manufacturing companies would encounter a less steep reduction curve and have more time to transform business models and develop clean technology, which could favour them rather than put them in the high-risk zone from climate policy.

Risks and opportunities for investors

MSCI's analysis indicates both risks and opportunities for investors. As previously illustrated, a delayed regulatory environment could significantly increase the risks companies will face and may be detrimental to certain sectors of the economy more than others. Investors have an interest in understanding the risk and opportunity hotspots within their portfolios as well as a responsibility to apply forward-looking investment strategies to accelerate the transition to a low-carbon economy.

Climate change has the potential to pose a systemic risk to the financial sector, while at the same time producing new investment opportunities. Managing these risks and capturing new opportunities can be crucial to protecting investment and optimising performance while meeting sustainability goals.

MSCI's risk metrics indicate that investors who act fast will potentially be able to minimise risks and access high-growth companies, whereas investors who are slow to align their strategies with the fast-changing regulatory backdrop may face significant consequences. MSCI's suite of climate change solutions provides a holistic toolkit to build more resilient portfolios.⁸ These are designed to assist institutional investors in prioritising their engagement strategies, allowing them to, for example, identify large reserve holders and emitters in their portfolios that also lack a strong carbon management strategy. ■

¹ UNEP (November 2018), Emissions Gap Report 2018, <https://bit.ly/2tRoffo>

² MSCI (September 2019), MSCI to strengthen climate risk capability with acquisition of Carbon Delta, <https://bit.ly/2IEHGkx>

³ MSCI (October 2019), MSCI completes acquisition of Carbon Delta, <https://bit.ly/30TCR5F>

⁴ In April, Carbon Delta analysed costs for 30,000 publicly traded companies worldwide, analysing the potential costs and green revenues in each sector of the global economy in both delayed- and immediate-action transition scenarios.

⁵ UNEP Finance Initiative (May 2019), Changing course – A comprehensive investor guide to scenario-based methods for climate risk assessment, in response to the TCFD, <https://bit.ly/2WJzNrD>

⁶ To support the goals of the Paris Agreement on climate change, the Financial Stability Board created the TCFD in 2015. The voluntary disclosure platform was designed to "provide a framework for companies and other organisations to develop more effective climate-related financial disclosures through their existing reporting processes", and support "more informed investment, credit [or lending] and insurance underwriting decisions". In February 2019, the UN Principles of Responsible Investment (PRI) indicated its climate risk strategy and governance indicators, which align with the TCFD guidelines and will be mandatory for PRI signatories from 2020. Public disclosure will be voluntary.

⁷ Elsevier (January 2017), The SSPs and their energy, land use, and greenhouse gas emissions implications: An overview, Global Environmental Change, vol. 42, pp.153–168

⁸ MSCI's climate change solutions offer evaluation of over 9,000 companies and 200 sovereign issuers, covering over 95% of equity and fixed income market value. All research is produced in-house, updated on an annual basis and submitted to companies for factual accuracy. MSCI climate metrics and carbon metrics are provided by MSCI ESG Research. MSCI ESG indexes and ESG analytics utilise information from, but are not provided by, MSCI ESG Research. MSCI equity indexes are products of MSCI and are administered by MSCI UK.

A hot topic for banks

Financial institutions must entrust oversight of climate risk to named individuals under senior managers regime.

By James Ryder and Tom Osborn

Global warming is widely believed to be hastening climate change, and the temperature is rising in the risk departments of financial firms as senior executives wrangle over who should be responsible for managing climate risk.

The Bank of England is the first major authority to issue guidance for banks and insurers to assign individual responsibility for overseeing financial risks arising from climate change.¹ The move is forcing institutions to consider which department is best placed to handle this emerging exposure, and how to develop concrete plans to manage it.

"We're all being invited not only to think about [climate risk], but to put frameworks in place," says a senior London-based risk executive at a global bank. "But trying to model and stress-test for climate change, make it real and relevant, and make it into something that is more than a tick-box exercise is going to be a challenge."

The BoE has given firms until October 15 to submit their initial plans for internal reporting standards, risk management disclosures and the use of quantification techniques such as scenario analysis. Firms must also nominate senior individuals as climate-responsible under the Senior Managers and Certification Regime (SMCR).²

By including the climate role as one of the senior management functions under the SMCR, the regulator has sent out a strong message that it intends hold companies and individuals to account for managing the risk of loss from climate change. The regime was introduced in the wake of the financial crisis to establish clear accountability for risk oversight, as well as to ensure that key individuals at financial firms are fit to perform those tasks. Failure to fulfil required obligations can lead to a range of penalties for individuals, from fines to suspensions.



The onus is now on banks to ensure they devote adequate expertise and resources to the management of climate-related risk. The stakes are rising, as one financial services lawyer and regulatory specialist explains.

"The question is, now, when those individuals are going to be held accountable – and what for," the lawyer says. "It's a specific risk, but it increases the potential for complaints and litigation. Firms will need issue-specific knowledge, and that's the tricky part at the moment. Whoever has that kind of experience is going to be highly marketable."

The BoE's guidance has sparked debate within banks over whether the operational risk function should take control of climate risk, previously the preserve of credit risk managers. The topic was under discussion at the Op Risk Europe conference in London on May 14 and 15.

Alan Leigh, international head of business controls at Bank of America, said the policy shift could prompt banks to start treating climate risk akin to conduct risk, with banks taking a more judgement-led, non-quantitative approach to areas such as lending decisions.

Leigh said it was possible the designated senior manager responsible for climate risk would be a front-line risk manager – one who, like Leigh, is tasked with directly monitoring risk-takers in a bank's front-office functions and their support staff – rather than a second-line risk manager, who is tasked with formulating risk policies and seeing they are stuck to.

"I'd say it has a conduct dimension. There are things, now, that firms don't want to do that would have been completely normal 20 or 30 years ago – industries they would support, deals, transactions, clients they would service – that we just don't want to be involved in any more."

Speaking during a panel debate at the same conference, Paul Berry, chief risk officer at Mizuho International, said his firm was evaluating the BoE's supervisory statement as part of its wider corporate and social responsibility. "We're looking at it in the framework of our environmental, social and ethical policies," he said.

"The BoE paper is going to force banks to come up with a much more co-ordinated approach around all things climate"

Patrick Moynihan, Barclays

He noted the guidance would have the dual effect of focusing firms' minds on addressing the growing exposure – but also introducing a potential source of op risk in the shape of penalties for non-compliance.

"We need movement on this by October. So that now becomes an emerging risk," he said. "[The BoE has] put a hard deadline in place, and there are consequences to missing that deadline."

Asked who he thought would be designated as the senior manager responsible for climate risk at his firm, Berry said: "Why not the CEO?", though he added it would probably be "delegated to the CRO".

One head of compliance at a large UK bank is described as "absolutely vehement" that he should not be made climate-responsible senior manager.

The BoE's supervisory statement does acknowledge industry concerns that "it was too early to assign individual accountability" under the SMCR. But, the statement argues, "the unique and unprecedented nature of the financial risks from climate change" justifies the move.

Speaking at the same conference, Tim Parkes, chair of the regulatory decision committee at the BoE's sister regulator, the Financial Conduct Authority,



Paul Berry, Mizuho International

noted that establishing a culture of individual accountability was "exactly" what the SMCR was designed to achieve.

Patrick Moynihan, group head of operational risk at Barclays, said the guidance will require banks to assess the impact of climate risk across the breadth of a firm's operations, not just on isolated business lines.

"The BoE paper is going to force banks to come up with a much more co-ordinated approach around all things climate," he says. "Areas of activity you'll support and won't support; the financial stresses from

a move in what governments and regulatory bodies want to do to prepare us all for a different climate future; what stresses that will put on financial services and the current book of business we've got, and the book of business we should have for the future."

While the BoE's statement of expectations is intended to prompt swift action, the regulator has also made it clear that it does not expect firms to develop a comprehensive climate risk management toolkit and strategy overnight. Rather, firms are expected to demonstrate developing expertise in the relevant areas over time. Sarah Breeden, executive director of international banks supervision at the central bank, explained in an April speech that the BoE's expectations are deliberately non-prescriptive, and that "more granular" requirements would be introduced into policy "over the next year or so".³

The official guidance came two days before the publication of an open letter written by BoE governor Mark Carney, Banque de France governor François Villeroy de Galhau and Frank Elderson, executive director of supervision at the Netherlands Bank.⁴ In the article, the three supervisors said that meeting the objectives of the 2015 Paris Agreement on climate change would require a "massive reallocation of capital", and called for a concerted effort in the financial sector.

More recently, the European Securities and Markets Authority published its technical advice to the European Commission for sustainability-related amendments to the revised Markets in Financial Instruments Directive.⁵ The advice proposes the introduction of two new pieces of regulation to the directive, which would instruct firms to account for sustainability risk in compliance, internal audit and senior management functions. Esma also proposed amending the directive to require that firms include sustainable investments in their processes for identifying conflicts of interest.

Moynihan noted the BoE guidance also had implications for banks' third-party relationships with suppliers – a core part of all banks' op risk frameworks. Third-party risk evaluates banks' exposure from firms they depend on for external service provision.

"Our suppliers – what's their stance on climate? Should we buy from some suppliers and not others, depending on their climate stance?" Moynihan asked. "We're seeing the first ripples of how this is going to work." ■

Previously published on Risk.net

¹ BoE (April 2019), Supervisory statement SS3/19 – Enhancing banks' and insurers' approaches to managing the financial risks from climate change, <https://bit.ly/2ZktH2x>

² BoE (April 2019), Policy statement PS11/19 – Enhancing banks' and insurers' approaches to managing the financial risks from climate change, <https://bit.ly/2OhtlkK>

³ S Breeden (April 2019), BoE, Speech, Avoiding the storm – Climate change and the financial system, <https://bit.ly/2UDhsQc>

⁴ BoE (April 2019), Open letter on climate-related financial risks, <https://bit.ly/2VaUEXs>

⁵ Esma (April 2019), Final report – Esma's technical advice to the European Commission on integrating sustainability risks and factors in Mifid II, <https://bit.ly/2WjHoNm>



Navigating the impact of climate risk on financial stability

As uncertainty abounds on the impact climate change may have on the industry, financial services firms must best equip themselves for potential regulatory and socioeconomic changes to ensure they maximise the opportunities of embracing new best practices. Here, **Aviva** explores potential future scenarios that could arise as a result of action or inaction to minimise climate change, and what these scenarios could mean for the industry

Aviva anticipates unmitigated climate-related risks presenting a systemic threat to financial stability over the coming decades. As a result, it is taking action today to identify, measure, manage, monitor and report climate-related risks and opportunities. The insurer has already invested £4.4 billion in green assets since 2015 and is committed to supporting a *Just transition* to a low-carbon economy in line with the 2015 Paris Agreement on climate change. Aviva also welcomes the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD).

In particular, Aviva has been developing a climate value-at-risk (VAR) measure in conjunction with

the UN Environment Programme Finance Initiative (UNEP FI) Investor pilot project¹ and environmental financial technology firm Carbon Delta, an MSCI company. This enables investors to measure the potential business impacts of future climate-related risks and opportunities on their equity and corporate bond investments. Aviva has extended this measure with Elseware, a risk management and quantification expert consultancy, to cover other asset classes, and life and general insurance to assess the potential business impacts of each of the Intergovernmental Panel on Climate Change (IPCC) scenarios², as well as in aggregate.

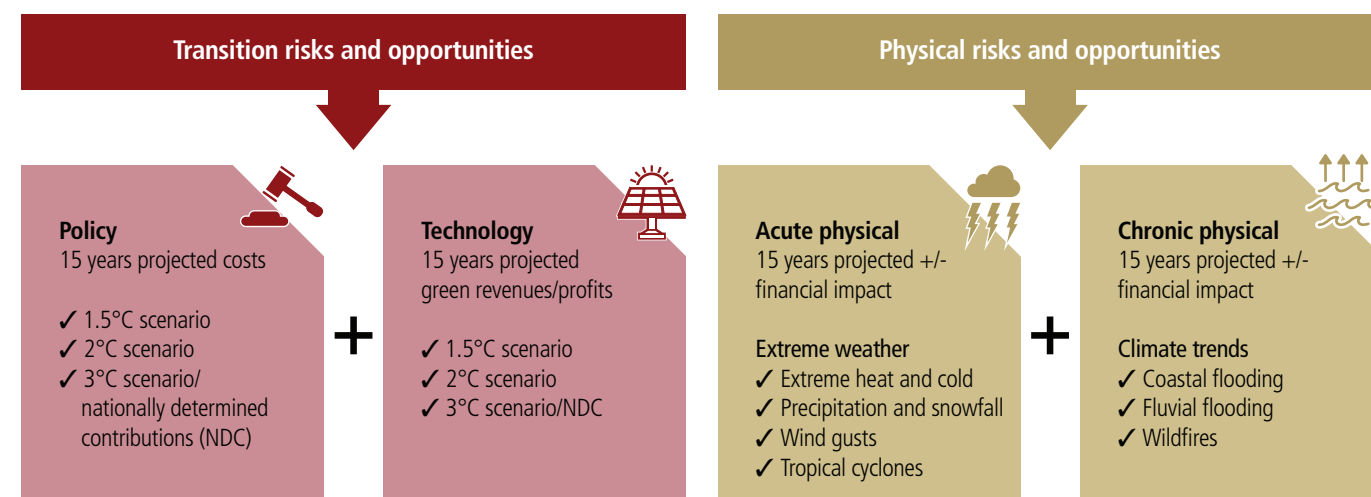
This climate VAR measure provides a holistic, forward-looking view of the climate-related

transition and physical risks and opportunities to Aviva's business (see figure 1). Transition risks and opportunities include the projected costs of policy action that aims to limit greenhouse gas emissions, and projected profits from green revenues arising from developing new technologies and patents. Physical risks cover the financial impact of climate change through extreme weather as well as the impact of rising sea levels and mean temperatures.

¹ UNEP Finance Initiative (May 2019), Changing course – A comprehensive investor guide to scenario-based methods for climate risk assessment, in response to the Task Force on Climate-related Financial Disclosures, <https://bit.ly/2j0k6C>

² IPCC (2015), AR5: Synthesis report – Climate change 2014, <https://bit.ly/32MrheF>

1 Transition and physical risks and opportunities



Source: Carbon Delta

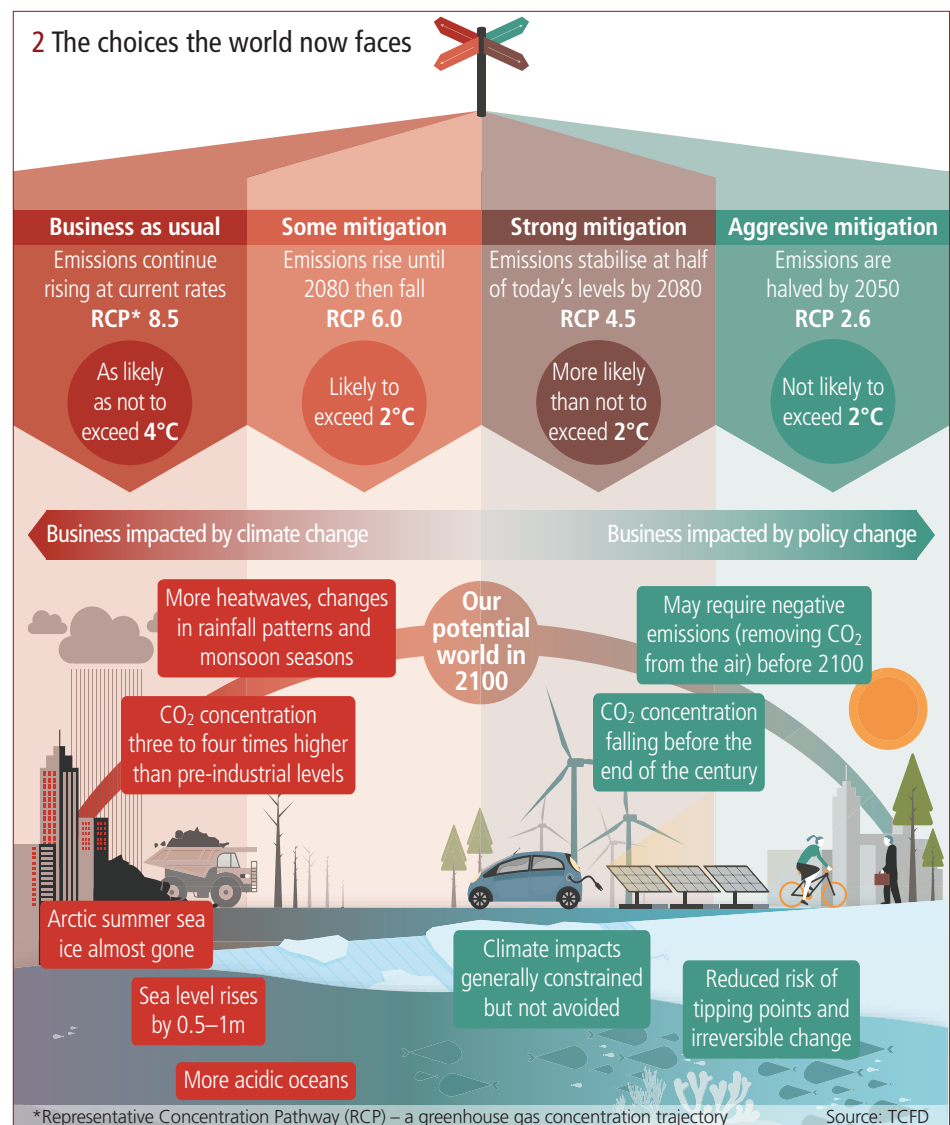


To support this initiative, an internal interdisciplinary team was created with representation from across the business to manage the project day to day, and an expert panel was established to review and challenge the main assumptions made in the selection, development and modelling of the scenarios.

The panel included internal experts, as well as three from the Grantham Research Institute on Climate Change and the Environment at the London School of Economics – Simon Dietz, Nick Robins and Swenja Surminski.

The IPCC has identified four potential future scenarios with respect to climate change (see figure 2). Each scenario describes a potential trajectory for future levels of greenhouse gases and other air pollutants, and can be mapped to potential temperature rises and the levels of mitigation required: 1.5°, 2°, 3° and 4° Celsius.

It is important to note that the four scenarios all assume a gradual path, in which temperatures rise slowly but climate policy is ramped up at varying speeds with a fairly high degree of global co-ordination. They do not consider the transition risk in a more chaotic policy environment where there is a lack of global co-ordination and policy action is taken too suddenly and too late. This may result in an understatement of transition risk. Carbon Delta's model and scenario analysis tools also allow consideration of the five *Shared socioeconomic pathways*. These consider socioeconomic characteristics, including population, economic growth, education, urbanisation and the rate of technological development.



The IPCC's October 2018 special report, *Global warming of 1.5°C*, indicates the need to take dramatic action now to keep warming below this temperature, and the potential severe consequences if this is not achieved.³ The scale of change required to meet the 1.5°C target is unprecedented – industry will have to slash its CO₂ emissions by 65–90% by 2050, and investments in low-carbon energy technology and energy efficiency will need to increase fivefold by 2050 versus 2015 levels. Buildings and transport will also need to shift heavily towards green electricity and tools to remove CO₂ emissions from the atmosphere, such as carbon capture and storage (unproven at scale), will be needed to store between 100 and 1,000 gigatons of CO₂ over the century.

In the IPCC's 4°C scenario – which corresponds to emissions continuing to rise at current rates – the transition risk is clearly more limited but the potential physical risks are significant and the likelihood of tipping points being reached is much higher. In particular, increased precipitation, coastal and river flooding, periods of extreme heat and cold, wildfires and droughts can be expected. In addition, sea levels could rise significantly, resulting in major displacement of populations as well as the spread of diseases currently endemic in tropical areas into more temperate areas.

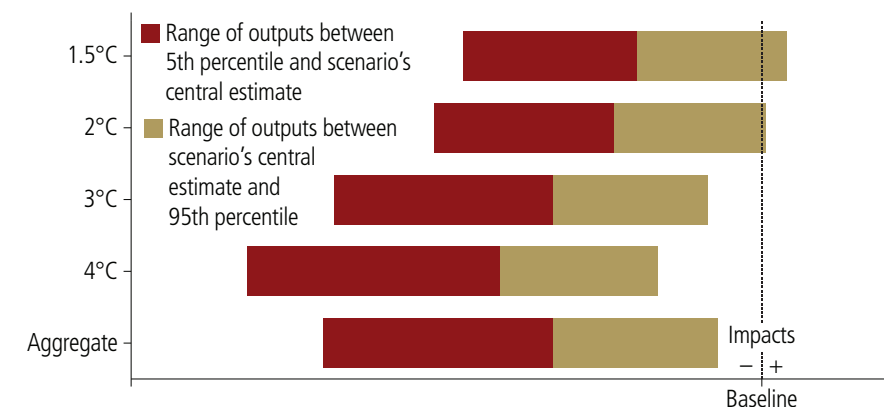
Finally – particularly in more extreme warming scenarios – it is important to consider whether climate might trigger changes in social attitudes, which result in increased litigation against companies for failing to reduce emissions or to disclose climate risks transparently.

The initial results of Aviva's climate VAR analysis compares a plausible range of outcomes (5th–95th percentile) from the different scenarios considered. As can be seen from this analysis, Aviva is most exposed to the 'business as usual' 4°C scenario, in which physical risk dominates, negatively impacting long-term investment returns on equities, corporate bonds, real estate, real estate loans and sovereign exposures.

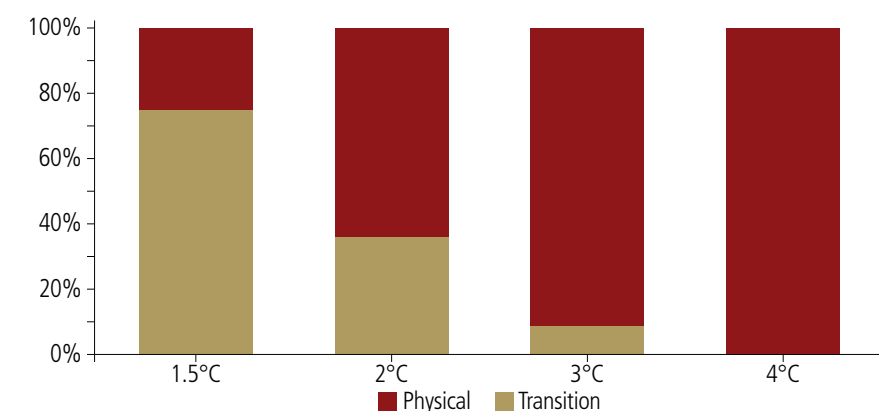
The aggressive mitigation 1.5°C scenario is the only scenario with a potential upside. Physical risk impacts are much more limited but there is still downside risk on long-term investment returns from carbon-intensive sectors, such as utilities, as a result of transition policy actions. This is offset partially by revenues on new technologies from some sectors – automotives, for example.

When aggregated to determine an overall impact of climate-related risks and opportunities across all scenarios, the plausible range is dominated by the results of the 3°C and 4°C scenarios, reflecting that neither existing nor planned policy actions are sufficiently ambitious to meet the goal set by the Paris Agreement.

3 Initial climate VAR output by scenario for Aviva's shareholder funds



4 Physical versus transition risks by scenario for Aviva's shareholder funds



The 1.5°C scenario is dominated by transition risk, even after taking into account mitigating technology opportunities. In the 2°C scenario, transition and physical risks are more evenly balanced, whereas in the 3°C and 4°C scenarios physical risk dominates.

In all scenarios, the impact on insurance liabilities is more limited than on investment returns. However, there is potential for some impact on life and pensions business as a result of changes in mortality rates in different scenarios, either from physical effects such as more extreme hot and cold days or transition effects related to changes in pollution levels. The impact on general insurance liabilities is relatively limited because of the short-term nature of the business and the ability to reprice annually and mitigation provided by Aviva's reinsurance programme. However, the physical effects of climate change will result in more risks and perils becoming either uninsurable or unaffordable over the longer term.

This analysis is just the beginning of Aviva's journey to further develop metrics and targets to support decision-making and understanding of the impact of climate-related risks and opportunities on its business. Aviva will continue to develop and

incorporate climate VAR into its overall strategy, risk management and reporting frameworks, with particular focus on the impact of climate-related risks and opportunities on specific insurance products, geographies and investments.

Aviva fully anticipates that this approach will evolve and improve in light of new research and data becoming available, as well as emerging best practices over the coming years. ■

³ IPCC (October 2018), Special report – Global warming of 1.5°C, <https://bit.ly/2Ng8L7R>

To learn more

For more details on Aviva's climate VAR methodology, see the firm's 2018 *Climate-related financial disclosure* at www.aviva.com/TCFD

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Stress-testing climate risks in loan books

Efforts to quantify the risk of global warming are changing the way banks manage credit portfolios. By Steve Marlin

Banks are required to run stress tests to model the impact of a 5% rise in unemployment, or a jump in interest rates. But what if the temperature of the earth rose a full 2° Celsius, or more?

Two degrees was the limit set by the 2015 Paris Agreement on climate change, brusquely set aside by President Donald Trump. But banks, less climate-sceptic than the president, have begun to filter their portfolios through doomsday scenarios: coastlines seeping inland, stewing heats, violent winds, parching droughts, ice-blasted winters and other 'biblically inflected' weather.

PNC, for instance, is stress-testing its oil and gas loan portfolio to see how it would perform in a scenario where global warming spurs demand for electric vehicles. If gasoline-dependent businesses struggle, it wants to be in position to pivot its portfolio to superfast-charging stations and electricity-hungry products.

Gary Way, senior vice-president for credit strategy at PNC, says the stress tests are indicative of a switch from reactive to proactive thinking on climate change.

"As banks, we tend to be well versed in responding to things that blow up, like the 2008 mortgage crisis," he says. "We want to focus on the risks that we can stress-test now. The risks are well-visualised. The question is what probability to attach to them. If revenues decline for companies in our retail gasoline portfolio, what is the impact on default?"

The risks are significant. Bank of America, Citigroup, Goldman Sachs, JP Morgan and Morgan Stanley may have suffered combined losses as high as \$9 billion on loans to troubled oil and gas companies when prices plunged in 2014 and 2015, according to Moody's.

And calls for banks to disclose climate risks are getting louder. France has led the parade by requiring climate risk disclosures from publicly traded companies from last year. A Financial Stability Board task force recommended that disclosure by banks, insurers, asset managers and others be phased in over a five-year period. In June, Britain's parliament called for mandatory climate-related financial disclosures by 2022.

Need to know

- Banks are beginning to stress-test their loan portfolios to assess the fallout of climate change.
- Quantifying climate risk requires massive amounts of data on a borrower's assets around the globe.
- UBS found that incremental climate change could reduce production capacity at a US electric utility in its portfolio by 14.5%.
- Stress tests are also helping banks find lending targets that stand to benefit from the shift towards a low-carbon economy.
- "For a lot of banks, it's what you say 'no' to. We've been trying to flip that around to what you say 'yes' to," says Matthew Arnold at JP Morgan Chase.

"Disclosing climate-related risks and opportunities will be expected in the near future," says Anne Platou, a corporate social responsibility adviser at DNB, the Norwegian bank. More and more, investors are asking about environmental, social and governance risks in the bank's portfolio, she says. "If we can reduce risk, that provides an opportunity to attract new investors."

Disclosures would include the processes used to manage climate risk, as well as the metrics to break down portfolios by industry, geography and credit quality.

Another sign climate risk is entering the fabric of banking is the composition of sustainable finance teams. Whereas once those teams were almost all scientists, lawyers and engineers, now they are interlaced with more straight-up bankers. For a project with the UN Environment Programme Finance Initiative, for instance, Citi assembled a team of experts in sustainability, credit risk, environmental and social risk management and quantitative modelling.^{1,2}

Banks are starting to knit climate change into their day-to-day business, either as an element of risk management, or an avenue of new business.

"If a business can derive revenue from these issues, it will attract a lot more capital," says Matthew Arnold, global head of sustainable finance at JP Morgan Chase. "For a lot of banks, it's what you say 'no' to. We've been trying to flip that around to what you say 'yes' to."

Not your average stress test

Everybody knows what credit, market and operational risks look like. So how to quantify climate risk in a loan portfolio?

One thing banks quickly discovered is the stress tests they use to meet regulatory capital targets offer little when it comes to climate risk. On global warming, the particulars matter.

Take JP Morgan. The bank is sifting through its portfolios of carbon-heavy industries such as oil and gas, thermal power and fossil fuel transportation. But each portfolio can have between 200 and 300 companies, and each of them anywhere from 10 to 80 subsidiaries scattered around the globe, selling different products.

"When you talk about stressing a portfolio, it's too broad to make an assumption across an entire portfolio. The art form as an investor or lender is these risks will hit companies differently within the same industry," says Arnold. "That's an area we're spending a lot of time on."

It gets trickier. UBS's first effort at stress-testing its climate risks in 2014 relied on a top-down approach to see how its balance sheet would perform under various scenarios, such as government actions following the Paris Agreement, or extreme weather. The results showed only a moderate impact, in line with economic stress tests that included an oil shock component.

But when UBS later put its energy loan portfolio in North America through a bottom-up approach – one built on micro, individual circumstances rather than an overarching array of factors – it was a different story.

"The [top-down] analysis indicated no significant losses, but given the methodology limitations we could not trust if the results were robust," says Rahel Wendelspiess, UBS's executive director of environmental and social risk. "Bottom-up means getting a perspective on individual borrowers, and aggregating that until you have a view on the entire portfolio."

Still, implementing a bottom-up approach means making a lot of assumptions about missing data, she adds.

In another exercise, UBS gauged the impact of extreme weather on a US electric utility in its portfolio. It used mapping software from Bloomberg to pinpoint the location of each of the company's assets and gathered climate-risk data for each location. The exercise revealed a 14.5% hit to production capacity from incremental climate change, and a negligible effect from extreme weather events by the 2020s.

UBS again concluded this information was not enough to guess the company's likelihood of default. Other variables would come into play: spare production capacity; the likelihood its competitors would also be hit; whether regulators would let the company raise rates; and other factors.

In addition to top-down and bottom-up factors, banks must also consider two more elements: timeframes and 'transition risk', the changes the economy will undergo as businesses shift to accommodate a hotter planet. Scenarios on climate change, for example, can stretch to the end of the century, and banks that participated in a recent UN transition risk pilot worked with scenarios that assumed a 1.5°, 2° and 4°C rise in global temperatures by then.¹

Applying these scenarios required assumptions on the changes that may occur in the next 100 years. For example, a model that assumed less use of coal, but rapid adoption of carbon capture and storage, would have a different outcome than one that assumed a quick swivel to renewable energy.

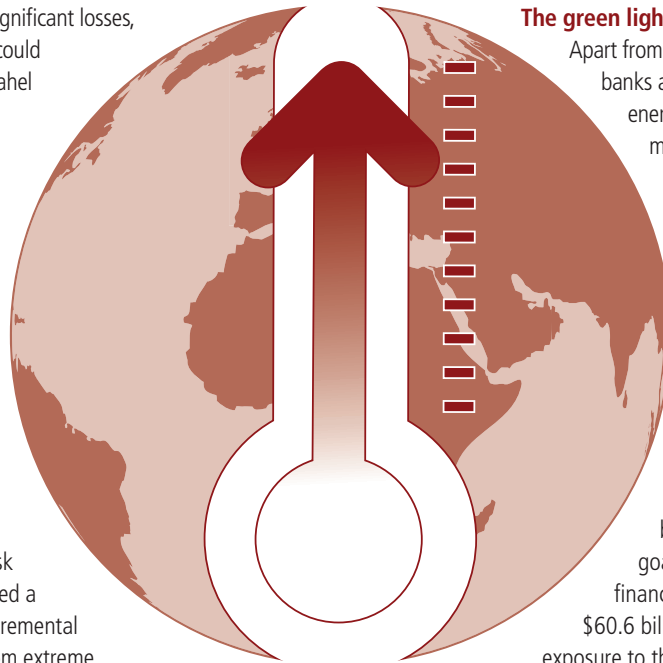
"This process and these early results really drove home that for each of these three climate-warming scenarios, there are multiple pathways," says Val Smith, global head of corporate sustainability at Citi.

PNC is embedding the results of its oil and gas stress test into its capital planning with a much closer horizon: 10 years. "People have asked us if we're doing stress tests far into the future," says Way. "We are looking for instances where there is transition risk in the next five to 10 years, which is our capital-planning horizon. We tend to be more focused on the risks that we can stress-test now versus a 2°C temperature increase over 20 or 30 years."

Stress-testing exposures over a longer horizon will require data of a very granular level that is not currently available. BBVA has conducted stress tests of transition risks on its loan portfolios in the energy and transportation sectors, as well as the threats of 'physical risks' to retail real estate in Mexico. So far the tests have not foreseen any significant deterioration in loan portfolios, but the lack of data and the long horizons for climate risk make it difficult to be certain.

"This is a real unknown for banks," says Antoni Ballabriga, BBVA's global head of responsible business. "They have no experience about how these risks can impact their business models, and very limited data regarding clients' assets."

Wendelspiess concurs. "You need time to develop the methodologies and address the data gaps. Banks alone can't solve this," she says.



The green light

Apart from shielding themselves from climate losses, banks are turning to the new opportunities in clean energy, as well as exploring what money can be made from freakish weather.

At some banks, the amount of financing committed to clean energy already outstrips their exposure to oil and gas loans. As of June 30, 2018, Citi had \$51 billion of credit exposure to the energy and commodities sector – the most of the large US banks. But it has also committed \$57 billion to finance projects that reduce the effects of climate change and promote alternatives, with plans to increase that to \$100 billion by 2025. Meanwhile, JP Morgan has a goal of providing \$200 billion in clean-energy financing by 2025, of which it has committed \$60.6 billion so far. The bank's wholesale credit exposure to the oil and gas sector currently stands at

\$42 billion.

JP Morgan also worked with BlackRock to launch a fixed-income index benchmarked against environmental, social and governance risks in emerging markets, and helped raise \$140 million in funding for Proterra, a maker of electric buses powered by batteries.³

Others are taking smaller steps. One bank conducted a feasibility study of a power plant being built in an area given to storm surges. It found the site needed to be at least 3.5 metres above sea level to stay dry, 2 to 3m above its planned foundation, adding to the amount of financing needed.

DNB is identifying which segments of its portfolio are most exposed to climate change and coming up with new products.

"By eliminating risk you create opportunities," says Platou at DNB. "By identifying how different segments of the portfolio are exposed, we are currently developing a green-loan framework that can provide favourable terms to certain clients or projects."

UBS is doing something similar. "We focused primarily on the risk side," says Wendelspiess. "We are using some of the information that's been gathered in this project to analyse opportunities."

In the meantime, climate is claiming its spot in the risk framework. The head of sustainability at a large bank says the field is trying to come to some mutually agreed understandings, but the particulars of each company will be difficult.

"We are collaborating with our peers on the fundamental assumptions about climate risk that we're making for the upstream oil and gas industry, for the thermal power industry and the fossil-fuel transportation industry," he says.

"The uncertainty in how the micro economic risks will play out, technology, market acceptance – all of that is where a significant amount of work needs to be done," he says. ■

Previously published on Risk.net

¹ UN Environment Programme (April 2018), Extending our horizons – Assessing credit risk and opportunity in a changing climate: Outputs of a working group of 16 banks piloting the Task Force on Climate-related Financial Disclosures recommendations, Part 1: Transition-related risks & opportunities, <https://bit.ly/2YNHEZy>

² UN Environment Programme and Acclimatise (July 2018), Navigating a new climate – Assessing credit risk and opportunity in a changing climate: Outputs of a working group of 16 banks piloting the Task Force on Climate-related Financial Disclosures recommendations, Part 2: Physical risks and opportunities, <https://bit.ly/3OHTkKo>

³ Proterra (January 2017), Proterra secures \$140 million in series 5 funding for new high-growth phase of capacity expansion and product development, <https://bit.ly/2pJ4O3j>



A driving force in lending decisions

Barclays, BNP Paribas and others are analysing risk of climate change-related losses. By Stella Farrington

A number of banks have reduced or stopped the funding of polluters in recent years. The reasons for such actions are complex, ranging from ethical concerns to political and shareholder pressure. Increasingly though, lenders are starting to think that it also makes good financial sense.

The 2015 Paris Agreement on climate change has raised the reputational costs of lending to carbon-heavy companies and accelerated a global move towards a low-carbon economy. But a newer pressure on banks to go green comes from the risk of losses on loans to firms with much to lose in the transition away from dirty energy.

"We're already seeking to implement climate change risk in our customer evaluations and we're trying to weave it into the architecture of our credit frameworks," said Mathew Murphy, general manager of wholesale credit and head of social and environmental risk at Australian bank ANZ.

Murphy was speaking at a May webinar introducing a methodology – developed by 16 banks and the UN – for evaluating credit risks arising from the low-carbon transition.¹ The working group is also preparing a second report, covering methodologies for assessing physical climate risks,

such as droughts and floods.

In parallel with this, several banks are developing their own quantitative approaches to climate-related credit risk. These early attempts are hampered by the sheer complexity of the task, a lack of data and organisational constraints but they represent the first steps towards robust modelling of climate risk.

The modellers are trying to gauge how individual corporate borrowers in the energy sector or how that sector as a whole will be affected by future environmental regulation – for example, a limit or tax on carbon dioxide emissions – and by lower demand for conventional fuels.

One of the problems is there is a myriad of scenarios in which a low-carbon economy could be achieved, with variables ranging from what future governments in different countries are likely to do to how the affected companies may evolve in response. And each path to keeping the global temperature this century no more than 2° Celsius above pre-industrial levels – as pledged by governments in the Paris Agreement – would have a very different impact on a loan portfolio.

"There are multiple ways to achieve a 2°C scenario; each path can lead to vastly different sector impacts depending on the underlying scenario assumptions, such as the feasibility of wide-scale carbon capture and storage technology," says the report by the UN working group, adding as another example that "in some scenarios, the oil and gas sector can benefit from a rapid phase-out of coal".

New risk, new approaches

At BNP Paribas (BNPP), the corporate and social responsibility (CSR) and risk teams are working on a pilot project to assess the impact of a potential carbon tax on the energy companies they lend to. The model assumes a certain level of a global carbon tax, which would have a similar impact to a restriction on emissions, rendering some projects economically unviable. "We want to find out if our portfolio is resilient and whether clients are resilient

if there is a carbon tax in the future," says Nathalie Jaubert, deputy head of CSR at the bank.

The aim of the model, which is currently being tested, is to work out which specific companies will stay within their emissions allowance at various points in time – and these will then be the companies the bank should have in its loan portfolio at those points. "We will follow this energy mix to make sure it's in line with a 2°C scenario, and we will check it in 2020, 2025 and 2030," Jaubert says.

At those points, if some companies are exceeding their carbon budget – calculated to keep overall global emissions in check – BNPP will engage with them to investigate the issue more thoroughly, she adds. One option would be to see whether the firm is diversifying into renewable power generation and whether it needs more time to implement the strategy. "Alternatively, we might stop working with a firm altogether," says Jaubert.

Barclays carried out a similar pilot project focused on electricity markets in the US and Europe. The project sampled 35 utilities involved in the production, distribution and supply of power and compared each firm's 2017 generation mix against projections of what the generation mix will be in 2030 and 2040, taking the firms' plans into account.

"If the generation mix of the firm was higher carbon than the baseline [emissions allowed for the two-degree scenario], we classified them as high-carbon, and if below – as low carbon," said Tim Kök, vice-president of credit risk at Barclays, explaining the project at the May webinar.

The team then worked out how much the firms would need to spend in order to put their businesses on the 2°C pathway and estimated the impact of this increased capital expenditure on the firms, which allowed them to calculate default probabilities. The results showed a significant increase in climate-related default risk among the companies in the bank's portfolio by 2040 compared with 2017, albeit from a low base. The vast majority of firms in the portfolio remained investment-grade, Kök added.

Need to know

- Lenders are starting to quantify the long-term impact of the global energy transition on their carbon-heavy corporate borrowers.
- Banks' climate risk modellers are grappling with a multitude of scenarios, insufficient data and dispersion of relevant staff.
- BNP Paribas and Barclays are among the first banks to evaluate the possible effects of climate policies on their loan portfolios.
- Ethical and reputational concerns remain important drivers of banks' approaches to borrowers in the energy sector.

These much longer timeframes for assessing borrowers' creditworthiness and the assessment's impact on a bank's actions are some of the particularly novel aspects of analysing climate-related credit risk. Banks are trying to understand which of their carbon-heavy clients will be creditworthy in 10 or 20 years from now rather than in three or five years, which is the traditional horizon for evaluating credit risk.

As the gradual energy transition is unlikely to affect the clients' finances in the next three to five years, there is usually no reason to reduce lending to them now. But a bank may still want to do that in order to prod those firms into diversification – a multiyear process – so that they are creditworthy in the longer term.

Data gaps

According to both Jaubert and Kök, it was a struggle to obtain all the data necessary for the projects. "Several utilities around the world do not specifically disclose their generation mix," noted Kök. "This is vital information for us."

Companies are increasingly being encouraged to disclose their emissions and other environmental data through initiatives such as the UK-based CDP, formerly the Carbon Disclosure Project. A not-for-profit organisation, the CDP gathers the data via an annual survey, covering some 650 companies around the world with assets totalling \$87 trillion.

This year, the CDP introduced questions on companies' climate-related plans – for example, investments in low-carbon technology research and development, says Tony Rooke, technical director at the charity. "What a firm is going to do is more indicative of how they will perform in a low-carbon economy than what they've done in the past," he says. "So this gives a better idea of what a firm's future emissions will be and therefore their resiliency to the low-carbon transition."

CDP was a valuable source of data for BNPP's project, Jaubert says, as were firms' own public disclosures. The rest came down to discussions with clients. "We were lacking data from a lot of public companies and small companies," she says.

Banks already have some data on corporate borrowers but much of it is of limited use for analysing climate risk.

"Bank data isn't set up for assessing climate change impact," said Simone Dettling, banking specialist at the UN, at the webinar. "It isn't sufficient to know that your counterparty is a car manufacturer. You need to know what kind of cars they make, [for example, whether it is] electric vehicles, where they are based and so on." Knowing the location of the client is important for understanding how it may be affected by government policies and physical risks from climate change.

There is also a personnel issue: the discipline of climate risk modelling requires the input of people dispersed throughout the bank – from credit and sector experts to risk management and quantitative finance specialists – and few banks have a framework allowing them to work together.

However, as climate risk starts to be seen not just as a reputational or ethical concern but as an emerging financial risk, co-operation between CSR departments and risk desks is growing.

"Seven years ago, when BNPP's CSR department was built, we were quite separate from risk," Jaubert says. "We had a different, maybe complementary view from the risk department, usually more long-term and based on risks that are more difficult to quantify. Now, things have changed quite a lot."

She says there is now a greater understanding of financial risk management within the CSR team enabling them to talk to the risk team in their own language. At the same time, the risk managers have become more used to working on other emerging risks, such as cyber security, which require a more creative approach than traditional risks.



Jakob Thomä, 2° Investing Initiative



Nathalie Jaubert, BNP Paribas

Good old ethics

Despite the improvements, the discipline of financial climate risk modelling is still in its infancy and hard numbers are hard to produce. Therefore, for now, the old drivers of climate-related lending decisions – such as reputational and ethical considerations – remain important.

According to Jakob Thomä, a managing director at think-tank 2° Investing Initiative, these are the real reasons behind decisions by several banks, including BNPP and HSBC, over the last 18 months to stop working with carbon-intensive industries.

BNPP said last October that it would no longer do business with companies whose main activities focus on oil and gas from shale or tar sands, following a previous decision to reduce its support for coal mines and coal-fired power generators.²

"BNP Paribas is committed to bringing its financing and investment activities in line with the International Energy Agency scenario, which aims to keep global warming below 2°C by the end of the century," the bank said in a statement. "To achieve this goal, the world must reduce its dependence on fossil fuels, starting with oil and gas from shale and oil from tar sands whose extraction and production emits high levels of greenhouse gases and has harmful effects on the environment."

As for coal mining, it is considered high carbon mostly because, when burned for power generation, it emits almost twice the carbon dioxide of gas. This falls into coal miners' so-called Scope 3 emissions – those from the use of sold products – according to international standards on greenhouse gas accounting and reporting.³

"The level of analytical rigour that underpins some of these announcements [by banks] is pretty limited," Thomä says. "They are based more on a qualitative assessment looking at reputational gain. A very granular analysis would not result in a blanket ban of a sector." For example, some coal firms may be economically viable in a low-carbon world because they are diversifying or are in a regulatory environment in which they would get government assistance, he explains.

However, Thomä believes a shift is happening: "What we're seeing now is a transition from these decisions being driven by the CSR department towards banks looking at factoring this risk into their lending decisions." ■

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¹ UN Environment Programme (April 2018), Extending our horizons – Assessing credit risk and opportunity in a changing climate: Outputs of a working group of 16 banks piloting the Task Force on Climate-related Financial Disclosures recommendations, Part 1: Transition-related risks & opportunities, <https://bit.ly/2YNHEZy>

² BNP Paribas (October 2017), BNP Paribas takes further measures to accelerate its support of the energy transition, <https://bit.ly/334MUqd>

³ Greenhouse Gas Protocol, the World Business Council for Sustainable Development and the World Resources Institute, Product lifecycle accounting and reporting standard, <https://bit.ly/2MgDykr>

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