

Climate Financial Risk Forum: A guide to help the financial industry address climate-related financial risks

Amy Nicholson, FIA
Sophie Smyth, FIA, CERA



Introduction

On 8 March 2019, the Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA) hosted the first meeting of the jointly established Climate Financial Risk Forum (CFRF). The CFRF was established with the objective to:

[Build capacity and share best practice across financial regulators and industry to advance financial sector responses to the financial risks from climate change.](#)

The FCA and PRA have been working closely together, alongside senior representatives from across the financial sector, including banks, insurers, and asset managers, to combine and build on joint knowledge in order to develop an approach which will enhance the UK financial system's resilience to climate change.

CFRF guide

The CFRF have produced a guide to help firms understand the risks that arise from climate change and to provide support on how to integrate these risks into strategy and decision-making processes. The CFRF emphasise the importance of greater transparency and consistency around firms' disclosure of climate-related financial risks, the benefits of effective risk management and scenario analysis, and the opportunities for innovation in the interest of consumers. The CFRF has set up four working groups to explore the risks that climate change poses in each of these areas, and each has developed practical guidance. This paper summarises the key guidance from each working group.

Risk management

By appropriately embedding climate-related financial risk into governance and risk management processes, firms can make informed business decisions and improve their resilience.

The risk management working group outlines how firms can approach designing and implementing a governance approach for climate risk, and considers how a risk management framework should be developed.

RISK GOVERNANCE

Effective governance should ensure that there is understanding, oversight, and accountability for financial risks arising from climate change. Board-level governance should be cascaded down through the organisation. There should be senior management responsibility for climate risk, and responsibility should be assigned to someone with an existing senior management function role, such as the chief risk officer, chief financial officer, or chief investment officer.

The quality of a firm's climate risk governance can be indicated by the extent to which climate risk is integrated effectively within risk management. Examples of good practice to consider when implementing climate risk governance include:

GOOD PRACTICE ON CLIMATE RISK GOVERNANCE

Effective management and oversight from the board

Appropriate allocation of senior management responsibility

Clear roles, responsibilities, and accountability across all three lines of defence

Update of risk frameworks and policies for relevant risk types through which climate risks manifest

Board-approved risk appetite and management reporting metrics

Clear risk authorities, reflecting the materiality of risks, which are implemented effectively

Controls embedded into relevant processes covering risk identification, assessment, acceptance or approval, monitoring, and reporting

Education and awareness building to develop climate risk understanding at all levels in an organisation

RISK MANAGEMENT FRAMEWORKS

When developing a risk management framework, it is important to consider whether climate risk can be treated as a standalone principal risk type, a risk within other existing risk types (cross cutting), or both within existing risk types and as a principal risk. This is decided based on a materiality assessment, which should consider exposure to physical and transition risk, and a firm's vulnerabilities based on sectors and geographies.

If climate risks are considered within other risk types (cross cutting), it is important to identify risk frameworks, such as credit or market, where the integration of climate risk into these existing frameworks has the highest priority.

Good practice to follow when implementing a climate risk framework includes:

GOOD PRACTICE ON RISK MANAGEMENT FRAMEWORKS

Treat climate risk as a cross-cutting risk type that manifests through most of the established principal/standalone risk types. Whether treated as a principal risk or a cross-cutting risk type, linkages of climate risks with established risk types (particularly the more material risks such as underwriting, credit, operational, and financial market) should be established and understood in the firm.

There should be tools to identify and assess physical and transition risks. It may be necessary to collaborate with external experts to fill the internal knowledge and expertise gaps.

Central risk frameworks and relevant policies should be updated.

A uniform risk taxonomy and risk categories should be developed, both for individual clients and transactions (particularly for material transactions) and at an aggregate portfolio level so risk concentrations may be assessed.

Climate risk management information should be included in established risk reporting (e.g., to governance committees).

RISK APPETITE

The risk appetite will differ depending on whether climate is treated as a standalone risk category or considered within other existing risk categories (cross cutting). If standalone, the risk appetite should contain a clear statement with metrics. If within other risk categories, this clear statement may not be possible; however, there should still be metrics.

Risk appetite statements are usually based on a three- to five-year time horizon. Given that financial risks from climate change may not materialise in this time, a mature appetite should consider the impacts over a longer period, e.g., a 30-year timeframe with interim milestones. This mature appetite should also include long-term qualitative statements based on the results from scenario analysis, and impact assessments or trend analysis.

Firms can take the following steps in order to define the risk appetite:

- Consider business strategies, the existing portfolio and the type of climate risks faced.
- Engage the board and ask questions to probe around specific aspects of risk appetite. Questions can cover the following areas:

1. **Defining the brand, ambition, and targets**, e.g.

What global frameworks do we want to commit to? E.g., Paris Agreement, TCFD, Principles for Responsible Banking. What does this mean practically?

Do we have the right data and systems in place to report against these targets? What additional data do we need? How do we validate the quality of the data on which we base decisions?

2. **Aligning the business model**, e.g.

What does aligning with the Paris Agreement mean in terms of the structure of our portfolio and the companies that we finance? Which sectors and companies will we have to reduce exposure to? What does it mean for our own operations and people?

Are we willing to exit profitable customers or sectors? What timeframe is our exit strategy over? Which exit/reduce strategies could be implemented?

3. **Measuring and embedding risk management**, e.g.

What is the agreed methodology by which we define high transition risk and high physical risk elements across the portfolio?

Do we see climate change risk appetite driven by corporate responsibility, transparency requirements, financial threat, or opportunities?

4. **Enabling through people, clear accountability and training**, e.g.

To what extent are climate risks and opportunities incorporated into the board's understanding of directors' duties? Who is responsible for climate change at board level?

Does the composition of the board allow for informed and differentiated debate and objective decision making on climate issues?

- Develop and approve a qualitative statement.
- Identify metrics which can be used to track climate risks to the firm, and determine appropriate appetite or tolerance thresholds.
- Longer-term, assess how metrics can best include the results from scenario analysis and impact assessments

RISK ASSESSMENT

Climate risks will include both the physical risks and the transition risks. Transition risk includes policy and legal, technology, market, and consumer risk. The physical risks can affect the functioning of the firm, whereas both sets of risks can impact cash flows and the balance sheet.

Risk assessment of the financial risks and non-financial risks is essential to measure, monitor, and mitigate the risk within a firm's appetite. The most material risks applicable across the financial sector are insurance underwriting risk, credit risk, financial market risk, and operational risk. The following sections discuss these risks from a climate perspective.

Insurance underwriting risk

The physical and transition risks that can be mapped to the insurance underwriting risk landscape are as follows:

- Physical risks impact insurance losses due to higher frequency and severity of weather-related events, from both acute physical risks (for example, from catastrophe events) and chronic physical risks (for example, from global warming and changed weather patterns.)
- Transition risks can manifest through technological and market shifts. Examples are the extensive policy, legal, technology and market changes that are required to make the transition to a low-carbon economy.

Long-term climate risks can be identified with a forward-looking approach using active monitoring and research—for example, using emerging risk tools. Risks can then be measured and mitigated using the following techniques:

RISK MEASUREMENT TECHNIQUES

Heat maps	Heat maps give an indication of the potential impact from climate change factors, in terms of probability and potential impact of certain risks materialising. Firms may develop their own maps or refer to industrywide assessments.
Metrics	Metrics can track the potential impact from climate change at portfolio or segment level. However, the impact of climate change can only be indirectly measured and is difficult to isolate.
Portfolio steering	According to their risk appetite, firms can use: Climate risk limits: For example, limits related to carbon intensity of counterparties. Enhancements: Increase share of products with an attractive risk return profile under climate change assumptions. Target green/brown ratio: Steering towards a target contribution from 'green' and 'brown' activities. Taxonomies defining 'green' and 'brown' are being developed.
New products / impact underwriting	During the product design, consider risk mitigation and adaption strategies. Impact underwriting would provide incentives for the transition to a low-carbon economy by promoting adequate adaptation measures that limit the impact of climate change.
Risk transfers	Natural catastrophe reinsurance is common practice to mitigate property losses due to natural hazards. Most covers are renewed annually, which allows regular reassessment of the risks related to a changing climate. Multi-year contracts providing incentives to invest in more mitigation during the contract period could be further developed.
Policy measures	Climate adaptation should be aligned and integrated into a broader strategy of economic growth, national development policies, and local planning. Raising awareness through disclosures and the incorporation of climate risk in sovereign and company credit ratings by rating agencies will be useful in promoting greater transparency.

When implementing a climate risk framework, all firms should take the following steps while maintaining a proportionate approach:

- Research climate change:** Firms need to define which information is relevant for them based on their exposures and access the relevant research channels, e.g., academics, private and governmental organisations, working groups.
- Define and operationalise risk appetite:** There should be clarity around the materiality of climate change factors and time horizons, and depending on these, different layers of escalation. Risk factor mapping can be used to assess materiality and identify lines of business with high exposures.
- Assess processes, data, and tools:** Firms can leverage existing risk management processes and tools for the assessment of climate change risks.
- Risk mitigation plan:** Firms can consider short- and long-term risks and the time horizon. Scenarios should be included to test the effectiveness of the plan.

Credit risk

Credit risk reflects the potential financial loss that may arise due to diminished creditworthiness or default of counterparties. From a climate perspective, this could be a physical risk (for example, due to a breakdown of supply chains as a result of poor weather) or transition risk. Physical risk is often challenged by a lack of detailed disclosure and can prove difficult in due diligence.

Counterparty risk has been less of a concern in terms of climate change, but this is likely to increase—for example, as more bank counterparties will be dependent upon the carbon credit markets. Attention should be paid to concentration risk, as risk concentrations can aggregate across portfolios over time. The following table gives some examples of good practice to follow when looking at credit risk.

GOOD PRACTICE FOR CREDIT RISK

Consider the impact of climate risk on the balance sheet, cash flows, and the P&L account metrics.

Consider climate change as a financial risk rather than only as an economic, social, governance (ESG) and a corporate social responsibility (CSR) risk.

Evidence an understanding, commitment, and communication on climate risk—for example, have an example of a verifiable and credible transition plan.

Analyse physical and transition risks as part of business-as-usual processes.

Build in sustainability to client discussions, which can be used to inform consideration of both risks and opportunities.

The climate risk assessment process needs to be anchored alongside risk decisions. It should be explicitly incorporated into the risk identification process and risk appetite statement. The primary responsibility for climate risk should lie with the first line of defence, but involvement should be cascaded down business lines. Firms can assess the impacts on clients and counterparties using the following techniques:

RISK ASSESSMENT TECHNIQUES

Quantification	<p>In order to quantify future climate risk in terms of probability of default and loss given default, historical data sets are built.</p> <p>Most banks currently use a qualitative approach, with risk categories (e.g., high, medium, low) or in financial loss terms (dollar/absolute loss thresholds or percentage loss thresholds).</p> <p>Good practice combines qualitative assessment using due diligence questionnaires and a thorough review of public disclosure, with a more quantitative analysis using internal and external data.</p>
Top 10 lists	<p>Materiality is usually difficult to assess in isolation. It is, therefore, important to be able to benchmark counterparties, portfolios, and countries against their peers.</p> <p>Materiality of climate change on customers (carbon footprint or potential financial loss), is assigned high, medium, low or on a numerical scale. This may then be incorporated into a matrix assessment including the impact of customer on the bank, e.g., level of exposure and RWA, relationship, etc.</p>
Heat maps	<p>Qualitative assessments lend themselves to a 'heat map' type of approach covering direct and indirect risks.</p>
Peer comparison	<p>Within each sector, identify whether the counterparty is ahead with, in line with, or behind on their consideration of the risks from climate change.</p>

Financial market risk

Financial market risk can manifest in transition risk channels through market value loss, and asset and liability management impacts due to societal, legal, and technological responses to climate change. This particularly affects bonds and loans, commodities, and equities. It will manifest differently between banks, insurers, and asset managers.

Physical risk channels can also result in market value loss and asset liability management impacts due to weather impacts, particularly affecting property, real estate, and commodities.

Risk identification, assessment, and monitoring processes for financial market risk in respect of climate change include:

When implementing a climate risk framework, all firms should take the following steps while maintaining a proportionate approach:

- **Investment decision process:** The climate risk assessment should be both current and forward-looking.
- **Identification of climate risk as part of company, sectorial, and underlying analysis:** Climate risks can be relevant to a variety of sectors and can directly impact equity values, credit spreads, commodities, interest rates, foreign exchange, bond prices, and all other associated market parameters. The risk identification process can look at how sensitive the portfolio is to climate-related risks, as it can directly impact asset values in addition to physical risk being measurable on real assets.

- **Climate metrics included as part of regular portfolio monitoring and increasingly in scenario analysis:** Scenario analysis can provide insight into risks, opportunities, and drivers of change, as well as the potential impact on the fund and individual investments. Scenario analysis is discussed in section two.
- **Climate reporting:** Asset owners and fund evaluators are increasingly interested in the carbon profiling of funds. Leading practices include these metrics in client reporting while fund rating providers evaluate carbon profiles of various funds. Disclosures are discussed in section three.

Operational risk

The major operational climate change impacts will likely be due to physical risks affecting the operations of financial institutions (business continuity events) as a result of increasing frequency and severity of weather events. There might also be compliance and reputational impacts due to failures in producing climate-related disclosures as required or expected by the market. There may also be supplier and third-party operational risk due to climate events—for example, there could be heat- or flood-related outages at third-party cloud or data centre providers.

There is a lack of complete, accurate, and timely data and management information on climate, which makes it difficult for management, executives, and boards to make good decisions. In addition, there is a heightened risk, given the lack of good quality data, of 'unknown unknowns.' Firms should remain conscious of the downsides as well as upsides of available data sources, and should also consider carefully what data is measuring and the consistency of data published.

When assessing risks and considering risk mitigation activities, firms should be careful not to overstate the impact of mitigation, as mitigating factors might not work as well as expected. The quality of a firm's operational resilience framework, including for example, business continuity procedures and management of reputational risks, will be crucial in mitigating climate-related operational risks in future.

Firms should map the components of climate change risk to the risk taxonomy and make targeted updates to existing risk management policies and risk appetite statements to explicitly include consideration of the risks related to climate change. Where appropriate, updates can be made to limits and triggers. Factors should be considered when updating these, such as the long-term financial interest of the firm, results of stress and scenario testing, uncertainty around timing and channels which risks will materialise, sensitivity of the balance sheet to key risk drivers and external conditions, and the ability to deliver on the climate change strategy and commitments.

This updated risk management framework can then be embedded into the regular risk management cycle, developing new risk management information as appropriate. Incremental updates are likely to be required as sophistication, capabilities, and data increase.

DATA AND TOOLS

Firms can seek data from the external providers (from dataset or tools), from customers through questionnaires or publicly available disclosures, and through development of internal tools using own data, models, and assumptions.

The key tools that are available to support and inform risk assessments are:

DATA TOOLS

Expert judgement	Used to adapt findings from external sources; requires some level of expertise. It is a widely used tool in risk management and is recognised under regulatory frameworks subject to appropriate governance.
Hazard maps	These provide location-level information on the extent or severity of perils. Typically based on historic events but can be also created for future states.
Footprints	Footprints show the impact of a single event on a geographical map, i.e., highlighting areas with major physical impact from this event.
Catastrophe models	Catastrophe models are probability models that assess the loss potential for various natural hazards.
Economic scenario generators	These are tools that simulate future possible states of economies and financial markets, based on risk factors driving financial variability.
Scenario analysis	This is discussed in the following section.
Transition assessment tools and frameworks	These tools consider the implications of policy, legal, technology, and market changes likely to be associated with a transition to a lower-carbon economy. They are forward-looking and incorporate the current positioning of businesses, the plans to mitigate risks, and the implications of a longer-term stress scenario.
ESG scoring	Environmental, social, and governance (ESG) scores provide a rating across a wider lens than climate risk. Many tools will split out environmental scores and sub-section scores to assess climate impact.
Own firm questionnaires	These are often compiled from publicly disclosed data and supplemented, where possible, through direct interaction with the client during the due diligence process.

TRAINING AND CULTURE

Culture is the ethos and strategy of the firm; consideration should be given to how the importance and urgency of climate change financial risks are understood and embedded across the organisation. Each firm will have its own unique business model and strategy, and hence differing approaches will be relevant to embed a strong culture that results in the effective management of climate change financial risks. While it is recommended that the tone of the culture should be driven from the top, ownership and personal accountability should be encouraged across all staff.

Firms can ask four questions to inform the approach to embedding and maintaining effective climate risk management frameworks:

- **Why:** Establishing the link to strategy and organisation purpose. This provides the wider context to the importance and urgency of acting on climate financial risks.
- **Who:** Identifying the populations of employees and stakeholders who will receive training, along with the reach and scope of broader cultural awareness initiatives.
- **What:** Understand the varying topics and level of detail required to support staff in their roles, dependent on the degree of direct involvement in managing climate financial risks. Consider the timeline of activity to be undertaken; including immediate upskilling, as well as ongoing embedding.
- **How:** Consider use of existing tools to deploy training and awareness to identified populations of colleagues, and to influence cultural and behavioural change. Tailor and agree the frequency of activities.

CHALLENGES, BARRIERS, AND GAPS

Challenges, barriers, and gaps that arise when assessing climate risk. These arise from:

- Availability of data and tools
- Standards: Some standards are not mandatory or clear
- Proportionality: Climate risk is seen as lower priority
- Uncertainty over the longer time horizon
- Aligning with strategic planning and risk management timeframes
- Unintended consequences

Scenario analysis

By appropriately modelling and considering a range of possible scenarios, a firm can better understand and manage future risks today while also capturing opportunities to support the transition to a net-zero carbon economy.

Firms that responded to the PRA's Consultation Paper 23/18 indicated that scenario analysis is the one of the most challenging aspects of meeting supervisory expectations. Scenario analysis can be daunting given the number of assumptions and the data and decisions required, so the CFRF guide provides a practical approach to help firms get started with implementing their climate scenario analysis.

The CFRF encourages firms to start work with urgency to develop an understanding of their vulnerabilities, and to understand the strategic and business opportunities from climate risk. It is for individual firms to determine their own best approach.

The first step of scenario analysis is to identify potential material exposures, as these will inform the scenario-development process. Simple ‘what if’ questions can be used to refine and identify new risks and potential exposures. The discussion from these questions will in turn inform the development of scenarios and the identification of new ones.

This scenario analysis section is split into four main areas:

- **Climate scenarios for the financial services industry:** This focuses on the types of questions that can be answered using scenario analysis and looks at how firms can identify their potential exposures to climate-related financial risks.
- **Scenario identification and development:** This discusses how firms can identify and develop suitable climate-related scenarios, taking into account their potential exposures.
- **Scenario assessment:** This focuses on the assessment of quantifiable risks and deals with how firms can then assess the financial impact of those scenarios on their business.
- **Challenges and barriers:** This highlights the key challenges and barriers facing the financial industry’s use of scenario analysis.

In considering scenarios, firms should be aware of measures in place to respond to climate change. For example, there are global initiatives such as the 2015 Paris Agreement where national governments agreed to strengthen the global response to the threat of climate change. Additionally, firms should be aware of the current climate environment.

It is widely accepted that the increase in the Earth’s temperature is man-made, caused by the release of greenhouse gases into the atmosphere, the most prevalent of these being carbon dioxide. To limit global warming, aggressive mitigating actions need to be carried out for carbon dioxide annual emissions to decrease rapidly. These mitigating actions include making changes to the energy system, the land system, industry, transport, and agriculture, as well as influencing consumer behaviour. These changes are designed to move human activity away from dependence on fossil fuels, result in greater efficiency of energy usage, change land system usage, and reduce emissions in agriculture and industry. Climate change also raises distinct challenges:

- **Far-reaching impact in breadth and magnitude:** Climate change will affect all agents in the economy (households, businesses, governments), across all sectors and geographies.
- **Foreseeable nature:** There is a high degree of certainty that some combination of increasing physical and transition risks will materialise in the future.
- **Irreversibility:** Scientists have shown with a high degree of confidence that climate change will have irreversible consequences on our planet, though uncertainty remains about the exact severity and time horizon.

- **Dependency on short-term actions:** The magnitude and nature of the future impacts will be determined by actions taken today.

CLIMATE SCENARIOS FOR THE FINANCIAL SERVICES INDUSTRY

For decision making involving complex risks, scenario analysis is typically the most useful tool to deepen understanding of the potential impacts. A scenario is an alternative state of the world, typically centred on a narrative that brings it to life and helps to specify its inner logic. Scenarios should be plausible while challenging business-as-usual assumptions.

Before beginning the process of developing and assessing the impact of climate-related financial risks and opportunities, it is important to be clear on what question or business decision the scenario analysis is intended to help the firm answer, and to think about how the results will be used to take action. By better understanding the scenarios, firms can better anticipate the macro-financial consequences of selected temperature and emission pathways.

There are many possible actions that a firm may decide to take as a result of undertaking scenario analysis. For example, a firm might decide to reduce the exposure to assets which are particularly at risk, and/or increase exposure to those seen as benefitting. Firms can test the alignment of their business, investment portfolios or funds—for example, with the Paris Agreement goals—and firms can carry out reverse stress tests to see which sources of transition and physical risks will be particularly difficult for them to withstand.

There are three steps required to identify potential exposures to climate-related financial risks and opportunities:

- Examine both physical and transition transmission channels
- Identify climate-related financial risks and opportunities
- Conduct exposure analysis and assess materiality

Examine both physical and transition transmission channels

Transition risks and opportunities can operate through a number of transmission channels, making this a broad area for firms to consider. The assessment of these channels may include key components that contribute to lower emission pathways and their economic consequences—for example, use of renewable energy sources, increased electrification, actions taken to reduce industrial emissions, increased energy efficiency, and carbon capture mechanisms, as well as consumer behaviour (e.g., less flying, less food waste, adjusted diets). The economic consequences are varied and range from changes in investment returns to effects on growth and employment.

Climate change is expected to lead to an increase in the frequency and severity of ‘acute’ weather-related effects (such as increasing severity and frequency of extreme weather events, e.g., heat waves, landslides, floods, wildfires and storms), as well as longer term ‘chronic’ shifts in climate (e.g., changes in precipitation, extreme weather variability, ocean acidification, rising sea levels and average temperatures).

The incidence and severity of both acute and chronic events will differ by region. While acute events are currently evident, without mitigation they are expected to increase in frequency and severity over time, and may become more prolonged, compounding their impact.

Identify climate-related financial risks and opportunities

While there is inherent uncertainty over the climate future, firms should be including climate-related financial risks in the risk identification process. There are two complementary approaches that firms can take to start identifying climate-related financial risks:

- Start from the business profile and risk register of firms and question which business areas or risks are vulnerable to the physical effects of climate change or the transition to a low-carbon economy.
- Start with a future climate scenario and consider how macroeconomic variables (such as GDP and unemployment) used in existing financial risk assessments could be affected.

Conduct exposure analysis and assess materiality

To assess how exposed firms are to climate risks, they will need to source relevant data about their exposures. For example, having data on the location of suppliers, facilities, customers and sales is important for transition and physical channels.

In order to ensure a relevant and proportionate approach with respect to this data, firms may wish to focus on exposures with the highest carbon intensities and longer durations as well as examine the type of the financial relationship (e.g., a lending commitment, bond underwriting, or other).

SCENARIO IDENTIFICATION AND DEVELOPMENT

Climate scenarios are typically described using a combination of the following components:

- Socioeconomic context
- Technological evolution
- Climate policy landscape
- Emissions pathways and associated changes in the physical atmosphere

Firms may choose to analyse only one of these components or may decide that analysis should cover several of these components. This will depend on the context of the business decision being answered as well as the type and materiality of exposures. There will usually be feedback loops and interdependencies that exist between components. The complexity will increase as more interdependencies are considered.

Socioeconomic context

The socioeconomic backdrop should be described to help to contextualise the setting in which a climate scenario occurs. For example, a world in which consumption patterns become more sustainable could have a marked reduction in emissions, whereas a world in which fossil-fuelled development continues will either increase emissions or reinforce the pathway we are currently on.

Technological evolution

Curbing emissions will require a shift to renewables, an increase in electrification, emissions abatement in industry, and increased energy efficiency. Scenarios should define assumptions on the technologies that will drive a transition, the rate of progress of these technologies, and their associated costs. Firms may need to explore technological progress not just in the energy system but also in different sectors such as aviation, transport, and heavy industry.

The climate policy landscape

Describing a climate scenario implies making an assumption about future climate policy ambition. Climate policies will impact emissions either directly (e.g., through imposing taxes or quantity restrictions on emissions) or indirectly (e.g., through regulations on technology, materials, and efficiency).

In developing a scenario or assessing the plausibility of an existing scenario, it is important to consider climate policies across three dimensions:

- **Timing:** The economic consequences of emission reductions will be different depending on whether actions are taken sooner or later.
- **Scale:** Refers to the speed and force with which climate policies are imposed, as well as their coverage.
- **Fragmentation:** Addresses the degree of coordination across countries in tackling climate change.

Emission pathways and associated changes in the physical atmosphere

The combination of and interactions between the socioeconomic context, climate policy ambition, and technological pathways will result in a certain level of industrial activity and, therefore, greenhouse gas emissions. The following aspects should be considered:

- **Greenhouse gas concentrations:** To understand the level and type of industrial activity that underpins the assumed emissions pathway.
- **Type of impact:** Physical impacts resulting from greenhouse gas concentrations can manifest in various ways, such as heat stress, water stress or flooding from sea-levels rising.
- **Geographical distribution:** The extent of physical impacts will differ significantly by country and region.

The consensus around physical scenarios is that the impact of extreme weather events will be more frequent and severe the higher the rate of global warming. Some data providers now have the ability to display the severity and frequency of physical events (e.g., sea-level rise, heat stress, water stress) for specific geographical coordinates at five-yearly intervals over several decades. By overlaying exposures, firms can see which assets are more likely to be impacted by the physical effects of climate change.

Developing climate scenarios

Firms may choose to combine the four components (socioeconomic pathways, policy ambition, technological evolution, and emissions pathways) and explore their interdependencies either through bespoke models or off-the-shelf models.

A bespoke modelling approach requires firms to make a number of assumptions and use potentially complex modelling techniques. This option could be useful for developing rich insights into the macro-financial consequences of climate scenarios. Plausible scenarios must be developed using feasible combinations of the four core components, e.g., a low-emission pathway would not be compatible with low climate policy ambition and low technological evolution.

SCENARIO ASSESSMENT

Firms face transition and physical risks, which manifest themselves in existing risks types, such as market, credit, operational, underwriting, and reserving and/or reputational risks. Firms can use scenario assessment to model and quantify their exposure to these risks using the following steps:

- Define a risk measure
- Choose impact assessment tools
- Assess financial impacts and translate these impacts into financial metrics used in decision making

Define a risk measure

Firms need to measure the impact of climate-related financial risk drivers, either transition or physical or both, on their key financial metrics. This means quantifying through a variety of transmission channels (e.g., credit risk, market valuation, operational risk, etc.).

Considering the time horizon is important when defining a risk measure. Climate change is usually considered as having a long time horizon, but the time horizon considered will in part depend on the business being analysed and the duration of a firm's exposures. Merits for both time horizons include:

- **Long:** A long time horizon helps firms understand the nature of transitions that could occur and the time taken for decarbonisation goals to be achieved, and the most significant and extreme physical impacts are likely to arise only over several decades. Longer-term horizons may allow firms to explore a richer combination of both multiple transition and physical outcomes.
- **Short:** The crystallisation of macro-financial risks from transition could occur considerably sooner than the transition away from fossil fuels. Shorter time horizons allow firms to construct alternative transition scenarios that can take multiple pathways.

Firms can assess the impact of climate-related financial risks as a one-off shock to their current portfolio. This can be suitable for assessing the impact of a particular stress—for example, from a physical event. For shocks to be modelled, there must be no transition or physical risk already captured in the base scenario. This may be inconsistent with the risks priced into the current market valuations.

Alternatively, climate-related financial risks can be assessed as the difference between a central projection and alternative pathways evolving over time. For example, overlays can be applied to the central 'baseline' projection to assess the impact of different emission and temperature pathways. This approach has the benefit that firms can take into account the impact of management actions over time. Capturing management actions, such as asset re-allocation away from carbon intensive sectors, should result in more decision-useful scenario analysis output. However, too much reliance should not be placed upon mitigating actions where there is uncertainty.

Choose impact assessment tools

Firms need to select appropriate impact assessment tools to analyse the change in the chosen risk metrics for a given scenario. Tools tend to fall into two broad categories:

- **Macro-economic impact assessment tools:** Firms regularly use these tools to assess the resilience of their business model to macroeconomic stresses in the financial system over the capital planning horizon (three to five years).
- **Asset or company-specific impact assessment tools:** These models require more involved analysis and are resource-intensive, meaning that they are typically applicable for smaller portfolios. These models are characterised by high granularity which considers company and/or geography-specific idiosyncrasies.

Assess financial impacts and identify required actions or follow-up analysis

Firms should assess financial impacts and translate these into financial metrics to be used to inform decision making, e.g. profit and loss statement and capital ratios. This translation should be comparable with the way these metrics are already incorporated in decision making while taking into account the potential differences in the time horizon and baseline used.

Firms may decide to take actions as a result of the analysis—for example, to diversify a particular portfolio if there has been an unacceptably high concentration of transition risk identified.

CHALLENGES AND BARRIERS

There are many challenges and barriers to overcome in performing scenario analysis, in particular:

- **Breadth and magnitude of transition and physical risks:** The financial risks from physical and transition risk factors are relevant to multiple lines of business, sectors, and geographies. The risks are potentially correlated and aggravated by tipping points in a non-linear fashion, which means large impacts that are widespread and diverse.
- **Extended and uncertain time horizons and feedback loops:** The time horizons over which climate-related financial risks may be realised are uncertain, and their full impact may crystallise beyond most current business planning horizons. Using past data may not be a good predictor of future risks, and currently there is often little economic incentive to take the short-term actions needed.

- **Weakness of many climate economic models:** Many economic models of climate impacts perform poorly in higher warming scenarios and usually fail to respond in a way that is consistent with the scientific analyses and expectations.
- **Data gaps and comparability of disclosures:** Some questions are difficult to resolve based on currently available data. Firms may need to use additional metrics requiring new data and new modelling methods to capture climate impacts on the economy and their business. A further issue is that there is still low comparability of climate-related disclosures from companies regarding their climate change risks and opportunities.
- **Cognitive bias:** Cognitive bias must be recognised and accounted for when developing and using any type of scenario. For example, people unconsciously assess probability of a future event or outcome on the basis of how easily they can remember past examples or how easily they can imagine possible events.

Disclosures

By making effective climate-related financial disclosures, a firm can improve transparency, thereby helping the market appropriately assess the true future value of assets.

To support this, the guidance produced by the disclosures working group aims to promote understanding, consistency, and comparability by providing practical recommendations for financial institutions on the disclosure of climate-related financial risks. While the capacity and resources available to make such disclosures will vary across firms, the guidance offers advice on what firms could do to strengthen their climate-related financial disclosures and should therefore be useful for financial institutions of all types and sizes.

While the guidance covers disclosures by banks, asset managers, and both life and general insurers, we will focus in particular on the guidance for asset managers and life insurers in the following sections.

CURRENT CLIMATE-RELATED DISCLOSURE IN THE UK

In 2016, the Task Force on Climate-Related Financial Disclosures (TCFD) established a global voluntary set of recommendations on climate-related disclosures covering governance, strategy, risk management, and metrics/targets. This aims to achieve 'consistent, comparable, comprehensive, and decision-useful' disclosures. This was used as a starting point for developing the guidance in the CFRF guide.

As at January 2020, while more than 900 organisations had expressed their support for the TCFD recommendations and the levels of climate-related financial disclosures had increased, disclosures were still insufficient, with no specific or mandatory TCFD-type reporting requirements in the UK, which has resulted in varying disclosure approaches.

In addition to the TCFD guidance, there are various reporting requirements under UK law that require companies to disclose material issues, including in relation to environmental matters. Further, there are rapidly emerging regulatory requirements relating to climate change matters for financial institutions in the UK, including the PRA Supervisory Statement SS3/19 on enhancing banks' and insurers' approaches to managing the financial risks from climate change, the 2021 biennial exploratory scenario on the financial risks from climate change, and the FCA's proposals to introduce new rules requiring certain insurers to make climate-related disclosures aligned to the TCFD's recommendations.

Despite these significant advisory, legal, and regulatory developments, climate-related disclosures continue to be insufficient, with only partial disclosure across all four TCFD categories, varying approaches across financial institutions, and limited information disclosed on the potential financial impacts of climate change or resilience of business strategies.

PRINCIPLES FOR GOOD PRACTICE

The TCFD recommendations provide seven principles for effective climate-related financial disclosures. The key lessons that are emerging as firms work towards meeting these expectations are drawn upon within the CFRF guide.

In summary:

Determine and focus on the objectives of disclosure

When preparing disclosures, firms should be clear on the purpose of the disclosures to ensure that they are decision-useful for the different users of the disclosures. To this end, firms should focus on aspects that are material to users, which may differ to what is considered material by the firm.

Acknowledge and address the needs of different audiences

Audiences of disclosures are likely to focus on aspects such as the potential for absolute and relative financial loss, the potential for a firm to mitigate climate-related financial risk, and the potential for a firm to adapt to future developments. This should influence the information that is disclosed.

Manage the evolving opportunities and expectations for disclosure

It is likely to be necessary for firms to start with simple disclosures and to develop them over time as understanding of climate risk evolves and processes are developed. Metrics should be comparable over time, and the underlying methodology should be described in detail to enable comparability. Disclosures should include the risk that the firm's lending, investment, and underwriting choices pose to the climate.

The importance of transparency and issues of cost and competitiveness

Quantitative disclosures should have qualitative disclosures alongside to enable understanding, and there should be transparency around the inputs and assumptions used to generate outputs, any current limitations, and the purpose of the metrics disclosed. It is acknowledged that the costs of gathering data and the benefit to competitors of the information disclosed will inevitably be another consideration for firms.

Selecting metrics and targets

The wide array of metrics for climate-related financial risk that has emerged and the absence of best practice regarding targets has resulted in an inconsistency of measures adopted by financial firms and poses challenges for comparability. The guidance puts forward recommendations for three categories of metrics: 'basic' metrics that are widely used based on methodologies available today, 'stretch' metrics for which there is some use and methodologies are at an early stage of development, and 'advanced' metrics for which methodologies are not yet developed. While the use of targets is currently very limited, it is expected that targets should emerge over time once metrics are in place.

Choosing where to report

Disclosing firm-level information in consolidated, publicly available reporting such as the annual report and accounts is an efficient and cost-effective means of addressing the needs of different audiences. This also allows existing audit and control process to be leveraged.

DISCLOSURES ON GOVERNANCE AND STRATEGY

Climate-related governance disclosures allow users to assess board oversight and management of climate-related risks and opportunities. Firms should therefore describe the governance and operational arrangements in place, and in particular the board's role in overseeing climate-related issues.

The responsibility for climate-related risks and opportunities below board level and the processes for managing these should also be disclosed, including identifying who is responsible for day-to-day management and the reporting lines for the outcomes of risk monitoring.

Firms should also articulate their firm-level strategy for identifying, assessing, and managing climate-related risks and opportunities over the short, medium, and long term. The resilience of this strategy should also be described and informed by the results of climate-based scenario analysis.

Potential metrics

The guidance sets out some potential metrics that firms could use to report on governance and strategy matters, such as:

POTENTIAL METRICS

'Basic' metrics	<p>The number of board/committee meetings per year in which climate-related issues have been a substantive agenda item</p> <p>Proportion of portfolio held for which climate change risk metrics have been requested and for which metrics of a suitable quality have been provided</p>
'Stretch' metrics	<p>Adjustments to executive remuneration to reflect performance against specified climate-related targets</p> <p>Results of scenario analysis/stress testing expressed in terms of earning or value at risk</p>

DISCLOSURES BY ASSET MANAGERS

This section of the guidance focuses on good practice for disclosures relating to risk management processes and metrics/targets by asset managers, including asset management within insurance companies. This includes both qualitative and quantitative measures at the firm and product level, and provides some suggested reporting metrics.

Firm-level disclosures

Where firm-level metrics are used, their purpose should be explained, and the metrics should be tracked over time to measure progress and be supported by an explanatory narrative.

The process by which climate-related financial risks have been identified, assessed, and managed should be disclosed, as well as the extent to which these processes are integrated into the wider risk management process. Information should be disclosed on the process for assessing the size and potential scope of climate-related financial issues, as well as the process taken to mitigate identified risks.

Specific areas identified for risk management disclosure are:

- **Operational disclosures.** This includes information on the firm's business operations and reducing the firm's own greenhouse gas emissions. Key risk indicators (KRIs) can be used to set benchmarks and track progress.
- **Public engagement disclosures.** This includes firm-level efforts on advocacy to change the market framework and engagement with investee companies.
- **Investment disclosures.** This includes information on the use of top-down or bottom-up scenario analysis.

Product-level disclosures

Product-level disclosures on climate-related issues should be considered for inclusion in key fund documents as well as be provided directly to clients where appropriate.

'Static' information that does not need to be updated regularly, such as investment philosophy or governance arrangements, can be contained in fixed documents such as the product prospectus and investment management agreement.

'Dynamic' information that is more variable and short-term, such as reporting against KRIs, should be included in documents that are routinely updated, such as fund factsheets and firm websites.

The results of product-level risk assessments, as well as the processes and tools used, should be disclosed. This should ideally include information on the scenarios tested, the inputs and assumptions used, and the purpose of the analysis performed.

Potential metrics

The guidance provides some potential metrics that asset managers may consider to report on for their products. Over time these can also be aggregated to describe the composite risk at the firm level. The metrics suggested include:

POTENTIAL METRICS

'Basic' metrics	Financed greenhouse gas emissions by product Weighted average carbon intensity of each product
'Stretch' metrics	Proportion of products with explicit and credible climate change risk mitigation plans Proportion of sovereign bonds held in the portfolio issued by countries with net-zero 2050 targets
'Advanced' metrics	Quantified weather-related losses for real estate/infrastructure assets

DISCLOSURES BY INSURERS

To date, climate-related disclosure by insurers has focused on assets rather than liabilities, i.e., on asset management rather than underwriting. As such, the previous section on disclosures for asset managers is also applicable to asset-side disclosure for insurers.

However, in consideration of the liability side of the balance sheet, this chapter focuses on the underwriting activities of insurers, in particular for general insurers, as general insurance underwriting is more directly exposed to the perils caused by climate change, such as increased natural disasters. Since this paper focuses on implications for life insurers, we have not summarised this information here. However, this chapter provides guidance on how climate change should be integrated into underwriting activities and sets out some suggested metrics for disclosing the climate risks associated with underwriting.

TIMELINES, GAPS, AND BARRIERS

The guidance proposes a two-stage phased implementation for climate-related disclosures:

- **Phase 1 – Suggested completion mid-2021**
This phase focuses on implementing high-level, mostly qualitative disclosures around governance arrangements, strategy, and risk management processes.
- **Phase 2 – Suggested completion end-2022**
This phase focuses on adding quantitative disclosures on the financial impacts from scenario analysis and product-level targets, as well as completing the roll-out of full disclosure.

The guidance recognises that firms will face gaps and barriers in their work towards implementing decision-useful climate-related financial disclosures. At a high level these include:

- Data availability can be limited or of poor quality.
- Many risk assessment tools are inadequate and/or potentially misleading.
- There is a lack of standardisation of metrics and methodologies.
- Making judgements on materiality levels.
- Concerns over competitive disadvantages that may result from increased disclosure.

Innovation

By developing novel products, services, policies, and approaches, a firm can adapt its business to respond to the potential impacts of climate change, benefit consumers, and deliver the change required to meet climate goals.

The innovation working group has produced guidance which provides recommendations for how financial institutions and other stakeholders can start to deliver a step change in aligning private sector financial flows with climate goals. This entails both increasing resilience to physical climate change and supporting the transition to net-zero greenhouse gas emissions. The guidance notes that delivering the UK's net-zero carbon goal by 2050 is likely to require investment of around 1% to 2% of GDP by 2050, a substantial portion of which will need to come from the private sector.

While there has been an increase in public and private sector finance allocated to climate-related issues in recent years, this does not come close to meeting the changes needed to financial flows in order to meet the Paris Agreement goals. A diagram of global climate finance flows in 2017/2018 included within the guide shows that the vast majority of expenditure is targeted at climate mitigation, with a very limited amount being targeted at climate adaptation.

The financial sector will need to respond to fundamental changes to products and markets driven by climate change, which could result in stranded assets across multiple sectors. An understanding of the technologies and social practices that will replace existing systems will be required—for example, as energy production will become a system with high upfront costs but low operating costs, moving it into the domain of long-term investment for financial institutions, this will impact the need for firms to find other sources of higher risk/return to achieve diversification.

The guidance focuses on three main areas: approaches for matching the sources of finance and capital pools against potentially investable assets and technologies, the role of data and innovation to facilitate the effective allocation of capital, and practical measures to address mobilisation of finance to tackle climate change.

POOLS OF CAPITAL AND CHANNELS FOR DELIVERY

While there has been sizeable investment in renewable energy and green/climate aligned outcomes, this is still only a fraction of what is required for the climate transition and to manage climate-related financial risks associated with potential stranded assets.

As many pools of capital are projected to grow over coming years, there is the opportunity to deploy a higher proportion of this new capital towards climate-mitigating assets. Aligning these capital pools with climate solutions will require action across the financial industry, including asset owners and managers and insurers.

Globally, responsible investing has increased in recent years, with responsible investments now making up a sizeable share of professionally managed assets in each of the five main global markets. However, within the UK and more widely, extra investment is required across the economy to deliver net-zero emissions, and there are significant opportunities for global innovation in which UK financial institutions can play a leading role.

Some current initiatives and issues within the UK financial sector include:

- The development of financial instruments to unlock finance needed to retrofit housing in the UK.
- Changes introduced by the UK Department of Work and Pensions requiring trustees to set out how they consider ESG and climate risks in their statement of investment principles. However, currently the majority of funds are not yet taking demonstrable action.
- Defined contribution pensions provide greater scope for investing in climate solutions; however, current regulation around investment in illiquid assets is constraining this.

Recommendations for financial institutions

A challenge for financial institutions is to balance the importance of climate-related financial risk management with recognising the investment opportunities and requirements for tackling climate change.

The guidance provides a range of recommendations for ensuring that capital allocation plans are effective. Some of the notable recommendations for insurers and asset managers include:

- **Board statements.** Boards should publish both a climate-related financial risk appetite and a capital allocation statement.
- **Review capital relief treatment on long-dated green assets.** This will attract more investment from insurers, if capital relief for investment in such assets is permitted under Solvency II.
- **New investment vehicles.** The development of a market for climate-related insurance-linked securities (securitised reinsurance transactions including, but not limited to catastrophe bonds) should be promoted.
- **Enable new transition bonds.** These would support business in raising finance to transition away from more carbon-intensive activities and processes, allowing investors to reduce exposure to potentially stranded assets and reallocate funds to investments that enable transition.
- **Valuation of assets.** Physical climate risk and stranded asset risk should be built into valuations, which could be promoted by mandating stress testing for financial institutions.

DATA INNOVATION

While there is a vast supply of capital and a wealth of available data, the lack of effective dataflow is leading to a misallocation of resources, missed opportunities, and substantial climate-related financial risks on global balance sheets. Data infrastructure is a seriously neglected aspect of meeting climate goals.

Data infrastructure for climate-ready investment must be defined as a matter of priority. There is also a need for clear data governance and transparency on methodologies and assumptions underpinning climate risk models and analytics.

In order to achieve greater data interoperability, areas of focus should include:

- Asset-level data (location and ownership information enabling effective cross-linking with group entities and financial details).
- Geospatial data (administrative, land usage, elevation)
- Environmental data (in which assets exist)
- Climate data
- Policy, regulatory, and legal environment

Increasing access to this data will benefit financial markets, asset owners and managers, the public sector, and the scientific sector.

‘Open banking’ is a regulated standard that enables the sharing of sensitive data across the banking sector, and was created by developing common principles and good practice for sector-wide data sharing. These same principles could be applied to climate-related innovation to help companies and regulators build and develop new financial products and services with a shared set of principles and practices.

Opaque, estimated data based on undisclosed assumptions and models, which may be several years out of date and have a high error rate, is not fit for purpose given the need for sophisticated climate risk data at scale. Investors, procurers, and asset-owners should effect change by requiring the provision of relevant information on a continuous basis as part of their conditions. Setting such standards for data will enable financial institutions to innovate, and when linked to scenario analysis, can be used to drive effective actions.

Some of the current issues and initiatives include:

- While there is extensive focus on data supporting the negatives of climate-related financial risk, such as carbon intensity of energy, there is an equivalent need for clearer data on the solution side of climate change.
- Most companies do not currently report at a sufficiently granular level to identify the revenues associated with green products and services.
- Many asset owners are looking to grow investment allocations to green industries, but are hindered by the lack of data and products. For example, the inability to identify revenue from green products makes it hard for investors to identify levels of activity in green sectors.

Recommendations regarding data innovation

It is recommended that the finance industry and regulators build on the open banking approach to build the 'data plumbing' that is needed to enable the capital allocation commensurate with the risks of stranded assets and the opportunities in new markets.

Financial institutions should adapt their reporting to show revenues associated with green products and services in order to allow capital to be allocated preferentially to companies with a higher proportion of green revenue.

A consistent set of definitions for what is 'sustainable' or 'green' is needed. Various markets are currently developing potentially interrelated systems, with the most advanced being the EU Taxonomy, which is a unified classification system for environmentally sustainable economic activity. UK regulators and policymakers could play a role in forming a global consensus on taxonomies.

MOBILISING CAPITAL FOR CLIMATE SOLUTIONS

This section sets out key strategic issues and initiatives in the financial sector for mobilising capital towards climate solutions, and outlines examples of practical actions that can be taken by financial institutions.

These recommendations include:

- **Staff knowledge and training.** Enhancing staff knowledge across all levels of seniority is a key building block to operationalise financial innovation. Firms should partner with trade associations and training organisations to run training and skills courses for staff on the operational implications of the climate transition.
- **Staff incentives.** Senior staff are beginning to be incentivised through climate-related factors, such as a reduction in air miles. Firms should examine and reduce company incentive structures which misalign staff activity with corporate climate strategy.
- **Corporate impacts on climate.** Firms should review, revise, and deliver their corporate commitments to climate impact to be at the forefront of change—for example, by targeting net-zero emissions by the 2030s.
- **Understanding and supporting early stage innovation.** Financial institutions are developing a closer interest in the emergence of new solutions, such as through recognising the opportunities associated with supporting companies that develop products and services with a sustainable impact. Firms should review and operationalise their knowledge of emerging solutions for tackling climate change.

Existing guidance

This guide is not designed to replace regulatory expectations or to provide a set of standards but is intended to complement approaches. This guide should sit alongside:

- SS3/19 'Enhancing banks' and insurers' approaches to managing the financial risks from climate change'¹
- CP23/18 'Enhancing banks' and insurers' approaches to managing the financial risks from climate change'²
- Discussion Paper 'The 2021 biennial exploratory scenario on the financial risks from climate change'³
- CP20/3 'Proposals to enhance climate-related disclosures by listed issuers and clarification of existing rules'⁴

¹ SS3/19: <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2019/ss319>

² CP23/18: <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2018/cp2318.pdf?la=en&hash=8663D2D47A725C395F71FD5688E5667399C48E08>

³ Discussion paper, 18 December 2019: <https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf?la=en&hash=73D06B913C73472D0DF21F18DB71C2F454148C80>

⁴ CP20/3: <https://www.fca.org.uk/publication/consultation/cp20-3.pdf>

How Milliman can help

Milliman consultants have considerable experience helping firms to develop their risk management frameworks and enhance their scenario analysis capabilities. We are well-placed to benchmark firms' approaches against the rest of the industry, and provide insight and advice that is tailored to your individual circumstances and needs.

We have helped numerous clients to introduce robust processes for identifying and assessing emerging risks ranging from building up a narrative through to the use of new analytical techniques and artificial intelligence.

If you have any questions or comments on this paper, on the subject of climate change, or on any other aspect of your risk management framework, please contact any of the consultants below or your usual Milliman consultant.



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[milliman.com](https://www.milliman.com)

CONTACT

Amy Nicholson
amy.nicholson@milliman.com

Sophie Smyth
sophie.smyth@milliman.com