MSCI Sustainability Institute

How can I use climate scenarios?

A practical guide

December 2024

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Foreword

The growing impacts of climate change and the global shift toward a low-carbon economy require investors, risk professionals and policymakers to turn long-term risks into today's actionable strategies.

Climate scenario analysis plays a key role in this process by offering structured frameworks to explore a range of possible futures. These scenarios help us understand how changes in climate policy, technological advances and the physical risks of a warming planet could affect financial markets and actors.

This report provides a clear overview of the various types of climate scenarios used by finance practitioners. Each type is an important tool for understanding the economic, financial and societal consequences of climate change. With the financial community facing increasingly complex climate challenges, the insights that scenario analysis offers are now more essential than ever.

The decisions we make now about clean energy investments, corporate strategies and government policies will have long-lasting effects on the global economy. This paper clarifies how climate scenarios can be applied in practice, providing straightforward guidance. By organizing these scenarios based on their complexity and offering a roadmap for integrating them into investment decision-making, the paper can help stakeholders make informed choices.

At this critical time, when aligning financial strategies with the realities of climate change is so important, the insights in this report provide valuable support to investors and fiduciaries as they fulfill their responsibilities. This work will also help mobilize the necessary capital to drive the energy transition.

I would like to thank our colleagues at the MSCI Sustainability Institute for their leadership in advancing this important conversation. Their work helps prepare us for the significant challenges ahead and guides us toward a more climate-resilient future.

David Carlin
Former Head of Risk
United Nations Environment Programme Finance Initiative

Executive summary

Investors and other capital markets participants increasingly rely on climate scenario analysis to quantify the potential impacts on their investments of a warming world and the transition to a low-carbon economy.

The ability to ponder a range of hypotheticals can help investors assess the possible influence on portfolios of national climate policies, technological developments or climate-driven tipping points that cannot be discerned from historical data. Climate scenarios also can help investors understand courses of action that lead to these futures and evaluate potential risks and opportunities.

While investors routinely use climate scenario analysis, even experienced practitioners can struggle with implementing it. Challenges include choosing from an array of possible scenarios to weighing the uncertainty inherent in making assumptions about the future.

This report aims to help investors make the most of climate scenario analysis in practice. It does so in three ways.

The report classifies climate scenarios based on their complexity and characteristics. It details four types of scenarios, examining strengths and weaknesses of each as well as the analysis that investors can reasonably expect them to augment.

Second, the report sets forth a series of suggestions to guide the use of scenario analysis by practitioners. The suggestions span a progression of four levels according to scope, quantification of risks, refinement and integration of scenarios into decision-making.

Finally, the report considers the use of climate scenarios in specific applications. They include internal stress testing for both prudential supervision and regulation and uses of scenario analysis to fulfill mandatory or voluntary disclosure obligations. They also include stress testing for investment activities such as portfolio construction and asset allocation, risk management and stewardship.

The report recognizes that practitioners have a variety of experience and expertise in the use of scenario analysis. They confront challenges in analyzing climate scenarios that range from building acceptance of scenario analysis within their institutions to deepening its use in the investment process. It also recognizes that practitioners can incorporate climate scenarios of progressively greater complexity into their process.

The report espouses a holistic approach to climate scenario analysis designed to improve financial decision-making and infuse planning with resilience. It expresses our view that by wielding complementary scenarios and integrating scenario analysis seamlessly into existing workflows, practitioners can sharpen management of climate risks and capitalize on opportunities.

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Introduction

Financial professionals have long used scenario analysis to estimate potential change in asset values given possible changes in economic or market conditions. Climate scenarios plausibly describe how the future may develop based on a set of assumptions about key driving forces and relationships.[1]

Climate scenario analysis represents a developing area of practice in which investors, risk professionals, managers, and policymakers translate scenarios developed by climate scientists into models that examine how future pathways might affect their investments. We have found in practice that different use cases within the investment process require tailored approaches to address users' specific needs. These use cases include:

- **Reporting obligations**: Whether voluntarily or by mandate, institutions are disclosing information on climate risk management and performance to regulators, investors and the public.
- **Stress testing**: Institutions are being asked by stakeholders, regulators and prudential supervisors to estimate the potential impacts of climate on portfolio values, profitability and operations.

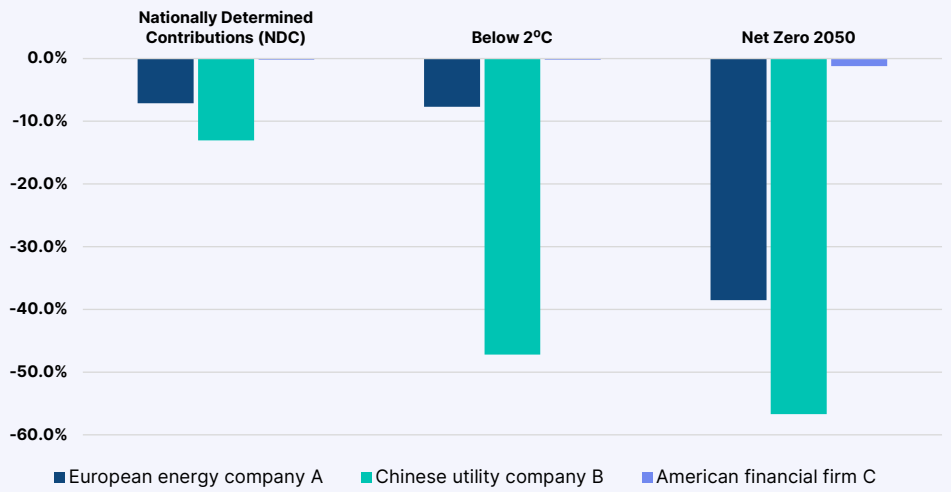
Use cases also increasingly extend to business functions, including:

- **Investment activities**: Investors are seeking to maximize risk-adjusted returns based on anticipated climate risks and opportunities. This can include high-level activities such as strategic asset allocation and asset-liability management, as well as portfolio construction and security selection.
- **Risk management**: Risk teams are tasked with quantifying and managing risk arising from climate change, from the overall enterprise down to the security level.
- **Client advisory**: Advisory teams are advising clients on strategies designed to mitigate climate risks, identify opportunities and inform investment decision-making.

Climate scenario analysis begins with the assumption of hypothetical future events that define each scenario. Consideration of discrete future outcomes is necessary because our global climate future will be greatly influenced by distinct, bifurcating events, including action (or inaction) by governments, technological shifts and potential climate-related tipping points.

Figure 1 shows sample output of scenario analysis. Here that analysis shows the estimated maximum devaluation of several companies based on three scenarios for the low-carbon transition.

Figure 1: Estimated company devaluation in three different climate scenarios (maximum depreciation)



Source: MSCI ESG Research. Maximum devaluation forecasts are taken from MSCI Climate Value-at-Risk output and reflect enterprise value. Scenarios developed by the Network for Greening the Financial System. Companies are publicly listed firms with names anonymized .

1. "Glossary," Scenarios Portal, Network for Greening the Financial System

Criticisms and challenges

Climate scenario analysis pushes the limits of expertise in financial modeling. The field remains immature, whether measured in know-how or acceptance among investment-industry practitioners.

At the same time, practitioners are being asked to develop models designed to meet the biggest questions of our climate future. Practitioners must also present the current generation of results in a way that shows the value of climate scenario analysis to a wider audience and invites further investment in its development.

Against these difficulties, a divergence of approaches to scenario analysis has formed. Some practitioners champion qualitative scenarios, while others embrace quantitative modeling. Others omit climate-related factors they believe to be too speculative for decision-making. At the same time, some critics of climate scenario analysis say that practitioners are luring themselves into complacence by failing to consider climate-related risks that may be all too real.

We advocate for an approach to climate scenario analysis that considers the benefits of both qualitative and quantitative scenarios and its ability to supply insight. As we see it, a collection of imperfect forecasts beats a blind future, provided practitioners recognize the uncertainty.

Against this backdrop, even experienced practitioners have found it challenging to implement climate scenario analysis. Key barriers this report aims to address include:

- **A lack of guidance**: The field suffers from an absence of guidance when it comes to best practices or instruction for how to make the most of scenario analysis in specific organizations. Practitioners don't need specific expertise in mathematical modeling to derive value from considering a range of what-ifs about the future. Even rudimentary analysis can hold value.
- **Range of scenarios**: Practitioners may tend to overlook the value that considering complementary scenarios can provide, whether in the substance of output for decision-making or the ability to communicate the learnings to a wider audience.
- **The role of uncertainty**: Climate scenarios by definition entail uncertainty. Yet communicating uncertainty in the results of scenario analysis can be a challenge even for practitioners who execute scenario analysis effectively.
- **Customization and flexibility**: Though many nongovernmental organizations have developed climate scenarios for the financial industry, practitioners may find that off-the-shelf scenarios fail to address the specifics of their strategies. At the same time, such scenarios can be difficult to customize.

This paper aims to facilitate the use of scenario analysis by showing how practitioners can wield it to their advantage. We do that by:

- Classifying **climate scenarios by type**, from simple to highly complex. We discuss the strengths, weaknesses and compatible scenario analysis associated with each type.
- Showing how practitioners can use **different types of scenarios** across use cases and at each level of implementation within financial institutions, as shown in Figure 2.
- Detailing how practitioners can use **climate scenarios in combination,** with the aim of helping them make the most of the exercise.

Figure 2: Progressive levels of scenario analysis

Source: MSCI Sustainability Institute

A typology of climate scenarios

Although institutions are often familiar with traditional macroeconomic scenario analysis, climate scenario analysis diverges from this field in several key respects. [2]

Differing methods and a lack of consensus on what constitutes best practice add to the challenge of analyzing (and quantifying) the impacts of plausible future pathways. The figure below shows a high-level checklist of the defining characteristics for any climate scenario.

In the following section we classify viable scenario types based on their complexity. Table 1 (overleaf) proposes a typology of climate scenarios and summarizes the strengths and limitations of each. Practitioners should consider the list a menu of techniques that can be combined to form an analytical program that addresses their needs and not a catalog of mutually exclusive approaches.

2. See the section on use cases for further discussion of these differences.

✓

Scenarios ARE:

- Descriptions of potential futures
- Significantly different views of the future
- A movie of evolving dynamics over time
- Specific decision-focused views of the future
- To be shaped by practitioner's insight and perceptions

✗

Scenarios ARE NOT:

- Predictions of the most likely outcome
- All variations on the same base case
- Snapshots of endpoints
- Generalized views of feared or desired futures
- To be taken only from outside sources

Source: Adapted from Carlin (2023)

Table 1: Typology of climate scenarios (in ascending order of complexity)

Strength | Limitation | Neutral

Scenario type	Compatible scenario analysis	Attributes of analysis	Flexibility	Treatment of uncertainty	Time, cost and expertise required	Ease of communication
Fully narrative: A written narrative of a potential climate future is developed.	Professionals in traditional risk and investment roles have the expertise to translate a suitably defined written narrative into informed qualitative assessments of climate-driven risk and opportunity for each scenario.	• Scenario construction and analysis are subjective and susceptible to bias/groupthink	• Easily adjustable • Can capture risks that are very difficult to quantify	• Can only opine on uncertainty in a qualitative, written manner	• Time cost is relatively low • Construction requires only high-level climate knowledge • Analysis requires only financial subject matter expert knowledge	• Output, being qualitative, is easily consumable by a range of audiences • Lack of numeric output may be limiting for communication and actionability
Quantified narrative: A narrative of a potential climate future is translated to quantitative data (macro forecasts, asset class returns, regional physical damages) through an informed expert-driven approach.	Suitable quantitative data produced for each scenario may be fed into traditional risk and investment models/analyses, forecasting outcomes respective to each climate scenario.	• Scenario construction is subjective and susceptible to bias/groupthink • Analysis is made more objective through quantitative scenario output	• Scenarios can be created or adjusted relatively easily to fit new or alternate potential futures	• Does not opine on uncertainty directly • Flexibility allows for low-cost sensitivity analysis to output	• Construction does not require complex quantitative models • Credibly quantifying a narrative typical requires a higher level of subject matter expertise • Analysis using quantitative scenario output requires traditional quant skills.	• Rationale behind scenario output can be presented narratively, lowering barriers to understanding drivers. • Numerical output makes the definition of the scenario less prone to interpretation.
Model-driven: A scenario definition regarding the future economic environment (policy, technology, socioeconomics) are fed into a linked economic-environment model such as an integrated assessment model (IAM) to estimate required scenario output.	Suitable quantitative data produced for each scenario may be fed into traditional risk and investment models/analyses, forecasting outcomes respective to each climate scenario.	• Mathematical relationship between scenario definition and output increases objectivity and transparency • Output is still a function of necessarily subjective assumptions underlying modelling	• Constructing new scenarios is costly and requires special technical expertise, restricting the ability to easily adjust or augment scenario sets.	• Does not opine on uncertainty directly • Lack of flexibility restricts ability to perform meaningful sensitivity analysis on underlying modelling assumptions	• Creating new scenarios is costly and requires highly specific technical expertise, but typical users will take scenarios as given from standardized sources such as NGFS and IEA.	• Understanding drivers of scenario analysis output can be hindered by “black box” nature of scenarios • Since scenarios typically come from standard sources, understanding of their assumptions may be built up over time
Probabilistic: One or multiple climate-driven forecasts are combined with estimates of probability, variance, and covariance to form conditional or full distributions of potential climate futures.	Suitable quantitative distributional data produced may be fed into traditional risk/ investment models and analyses, offering estimates of both expected and tail outcomes.	• Mathematical relationships increase objectivity and transparency • Assumptions on top of model-driven approach needed to deal with uncertainty	• Constructing new scenarios is costly and requires special technical expertise • Lack of research on how climate affects distributions may limit assumptions to “no change from history”	• Directly models uncertainty in outcomes as a function of scenario definition • Still may be difficult to test sensitivity to modelling assumptions	• Probabilistic models are computationally expensive and require a high level of technical expertise	• A distribution of outcomes may be more interpretable for some audiences than point estimates across individual scenarios • Probabilistic output may be harder to interpret for other audiences

Source: MSCI Sustainability Institute

Fully narrative scenarios

Fully narrative scenarios are written qualitative narratives that can range from relatively simple and open-ended descriptions of a prospective future to detailed depictions of highly specific potential outcomes.

These scenarios support analysis designed to quantify possible outcomes for an enterprise, portfolio or asset based on plausible hypothetical pathways. Note that a fully narrative scenario can contain quantitative elements; fully narrative here refers to the specification of the scenario itself.

The strengths of fully narrative scenarios begin with their relatively low cost and ability to be customized. They can be created and analyzed by practitioners without specific technical skills or the need for computationally expensive workflows. Fully narrative scenarios are also easy to communicate and understand; they forgo black-box features or complicated specifications that can characterize quantitative modeling. Fully narrative scenarios also can be created without the need to either specify a model or calculate outputs and can explore phenomena (such as climate-related tipping points) that are difficult to quantify at much less cost.

Limitations are that fully narrative scenarios can be perceived as subjective and vulnerable to bias, blind spots and groupthink.

Figure 3: Examples of fully narrative scenarios

Scenario: **Boom and Bust (BB)**
Policy steps up after fossil fuel surge bursts

A Ukraine peace deal and easing of global geopolitical tension triggers an initial surge in economic growth which leads to overheating in major economies and higher fossil fuel prices. Policy is tightened in response, which leads to a bust, forcing governments to step in to provide support. A just green transition is driven by pro-active policies to ease private sector frictions and support the emerging world.

Scenario: **Meltdown (M)**
Policy failures compound weak growth

Climate policy is the casualty of mounting geopolitical tension and protracted recession. A Republican victory in the US elections is followed by Ukraine being partitioned. Tension with China undermines global decarbonisation efforts and technological progress. Extreme weather events are badly handled, triggering famines, mass migration and political instability.

Scenario: **Roaring 20s (R20)**
Policy and markets align

Proactive climate policies and dynamic markets create powerful positive feedback loops. More extreme weather events focus minds and create a sense of global solidarity around a recognition of humanity's mounting debt to nature. Constructive competition between nations accelerates technological progress and deployment.

Scenario: **Green Phoenix (GP)**
Market-driven, while policy lags

Climate action is initially upended by stagflation, the geo-political fallout of a stalemate in Ukraine and badly-handled weather shocks. Popular anger builds and civil society gradually emboldens more enlightened businesses and local governments to step up and roll out mature green technologies, but progress is patchy and erratic.

Source: "No Time to Lose: New Scenario Narratives for Action on Climate Change," University of Exeter and Universities Superannuation Scheme, 2023

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What the market thinks: A climate risk survey

Climate scenarios have helped financial markets supervisors and practitioners better understand a range of climate-related risks.

But such scenarios have not been able to tell investment professionals in particular what they say they most want to know to shape their strategies: what their peers across the industry and around the world expect when it comes to changes in policy, advances in technology, and patterns of climate-driven extremes of weather.

The MSCI Sustainability Institute and our firm's Climate Risk Center are constructing a climate scenario that reflects how investors and other capital-markets participants expect that the risks of a changing climate and the transition to a net-zero economy could impact their investments.

It finds agreement among global investors that the risks of severe weather events will escalate and that global action to date is insufficient to stave off the costliest warming.

The scenario is informed by a survey that asked more than 350 senior investors and risk managers across banks, insurers and investment institutions for their views on the trajectory of climate policy, the pace of the energy transition and the impacts of climate-related hazards.

We supplemented the survey with panel discussions and interviews of more than 30 experts from across finance, policy and academia to test and validate how the survey responses inform a climate scenario that reflects market expectations.

We've mapped the market's expectations to climate scenarios in use already, such as those developed by the Network for Greening the Financial System (NGFS), a network of central banks and supervisors, and find that the market expects a climate future that resembles pessimistic scenarios in a "Hot house world" or "Too little, too late" scenario rather than a world with an early and orderly transition.

Read our Climate Risk Outlook Study

Quantified narrative scenarios

Quantified narrative scenarios build upon fully narrative scenarios by adding quantitative output from experts to each part of the narrative. This means that for each part of the narrative (such as macro variables, sector growth, energy mixes or regional physical damage), a group of experts will attach data to the narrative based on their experience and knowledge, without explicitly using models to create output.

Unlike fully narrative scenarios, quantified narrative scenarios can be used in downstream applications that require numeric inputs such as risk or macro-financial models. Such scenarios are also relatively easy to communicate and understand because they retain the narrative nature of qualitative scenarios despite their quantitative component.

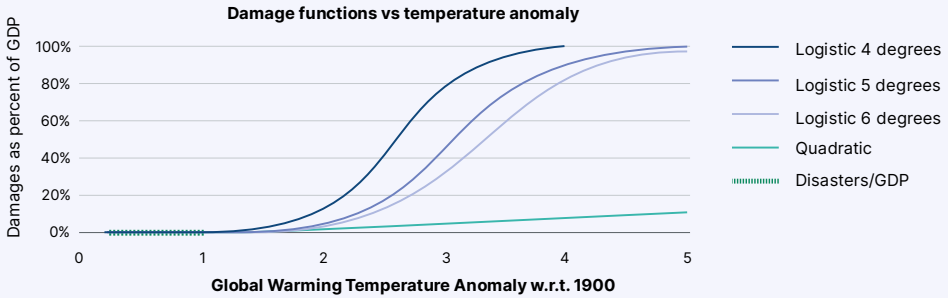
Compared with model-driven quantitative scenarios (described below), quantified narrative scenarios have the advantage of relatively easy customization and sensitivity testing. Quantified narrative scenarios are also flexible, which means they can be adapted to address potential futures that an institution thinks hold the most relevance while still providing outputs needed for quantitative analysis, all at low cost. Such scenarios also can complement model-driven scenarios by adjusting specific outputs to test either the effects of forecast results or underlying assumptions.

Figure 4 illustrates construction of a quantified narrative scenario, driven in this case by the scenario authors' concern that standard model-driven physical damage functions (the quadratic function in the figure) failed to capture fully the effects of physical climate change on economic growth. The authors speculate that economic activity might completely shut down at different levels of temperature increase (anomalies of 3ºC, 4ºC and 5ºC, respectively) and posited simple damage functions compatible with this assumption (the logistic functions in the figure). As shown in the tables beneath the chart, an assumed damage function can be employed on top of modeled or assumed warming paths to create a future path of GDP loss due to physical risk.

Because of how they are constructed, quantified narrative scenarios share many of the same limitations as fully narrative scenarios, including the risk of bias, groupthink or blind spots due to the subjectivity associated with their output.

In addition, the numerical output of quantified narrative scenarios can create a false sense of precision, hence practitioners who use such scenarios should communicate clearly the subjectivity inherent in their creation. It helps if users of these scenarios think conservatively, including considering how their construction may create uncertainty in output, and benchmarking the results of analysis using such scenarios against model-driven quantitative scenarios, where possible.

Figure 4: Stylized examples of quantified narrative scenarios



	2025	2030	2035	2040	2045	2050
Scenario 1: Current Policies						
Temperature anomaly w.r.t. 1900	+1.39	+1.52	+1.62	+1.74	+1.86	+2.00
Physical damage as percent of GDP (logistic 5-degree function)	1.7%	2.4%	3.1%	4.1%	5.5%	7.6%
Scenario 2: Net Zero 2050						
Temperature anomaly w.r.t. 1900	+1.40	+1.51	+1.60	+1.68	+1.70	+1.71
Physical damage as percent of GDP (logistic 5-degree function)	1.8%	2.4 %	2.9%	3.6%	3.7%	3.8%

Source: "The Emperor's New Climate Scenarios," Institute and Faculty of Actuaries and the University of Exeter, July 4, 2023, based on MSCI Sustainability Institute calculations. Temperature anomaly path adapted from the Network for Greening the Financial System

Model-driven scenarios

Model-driven scenarios are scenarios in which the output is constructed through an underlying model or suite of models. Given the complexity of potential climate phenomena, such models are typically complicated both in specification and computational burden.

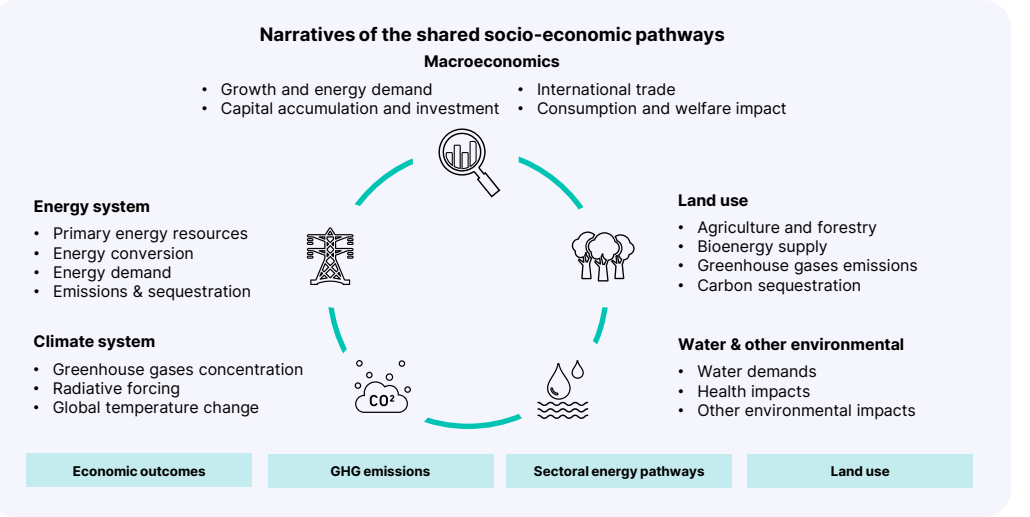
Modeling may be driven by adding shocks to traditional macroeconomic models (although this approach has its limitations), through integrated energy-climate models, and via full-system models or so-called Integrated Assessment Models (IAMs) that integrate all known systems (atmospheric, economic, energy and land use, for example) with feedback loops.

Examples of model-driven climate scenarios

Publisher	Representative scenarios
International Energy Agency	• Net Zero Emissions by 2050 (NZE) • Stated Policies Scenario (STEPS) • Announced Pledges Scenario (APS)
Network for Greening the Financial System (NGFS)	• Delayed Transition • Net Zero 2050 • Below 2°C • Low Demand • Fragmented World • Nationally Determined Contributions • Current policies
Intergovernmental Panel on Climate Change	• Shared Socioeconomic Pathways (SSPs) • Representative Concentration Pathways (RCPs)

Source: MSCI Sustainability Institute.

Figure 5: Simplified view of an IAM model



Source: NGFS, 2023

Model-driven scenarios include many of the scenarios used by investment practitioners. Such scenarios include those from NGFS and the International Energy Agency (IEA). Such scenarios use quantitative models to generate a full suite of economic and climate outputs that are driven by the scenario definition and that address climate policy, technological change and future socioeconomic trends by design.

At the same time, model-driven scenarios also have downsides. The scenario definition chosen to drive them is (of necessity) limited by the modeling specification, hence the primitive "story" underlying such scenarios is often much more generalized than for a narrative-based scenario. Consider, for example, the "Below 2°C" scenario developed by the Network for Greening the Financial System (NGFS).[3]

This scenario envisions a gradual tightening of climate policies globally that constrain the rise in average global temperatures to 2°C above preindustrial levels. But that stylized scenario assumes myriad individual policies and geopolitical relationships that may bear upon investors' assessments in the short and medium term. Hence, practitioners may benefit from supplementing such scenarios with a quantified or fully narrative scenario that allows them to consider the drivers of a below-2°C scenario in greater detail.

Model-driven scenarios depend heavily on assumptions both within their specifications and for chosen parameters. Varying the assumptions can change the outputs significantly. Changing the IAM used for a scenario defined by the NGFS, for example, will change the economic and climate outputs significantly for the same set of data.

Finally, model-driven scenarios come with complexity. Because models such as IAMs typically take time and specific expertise to run, it can be a challenge to create custom outputs and or to employ sensitivity testing, even for assumptions that are relatively easy to adjust.

3. "NGFS Long-Term Scenarios for Central Banks and Supervisors," Network for Greening the Financial System," November 2024.

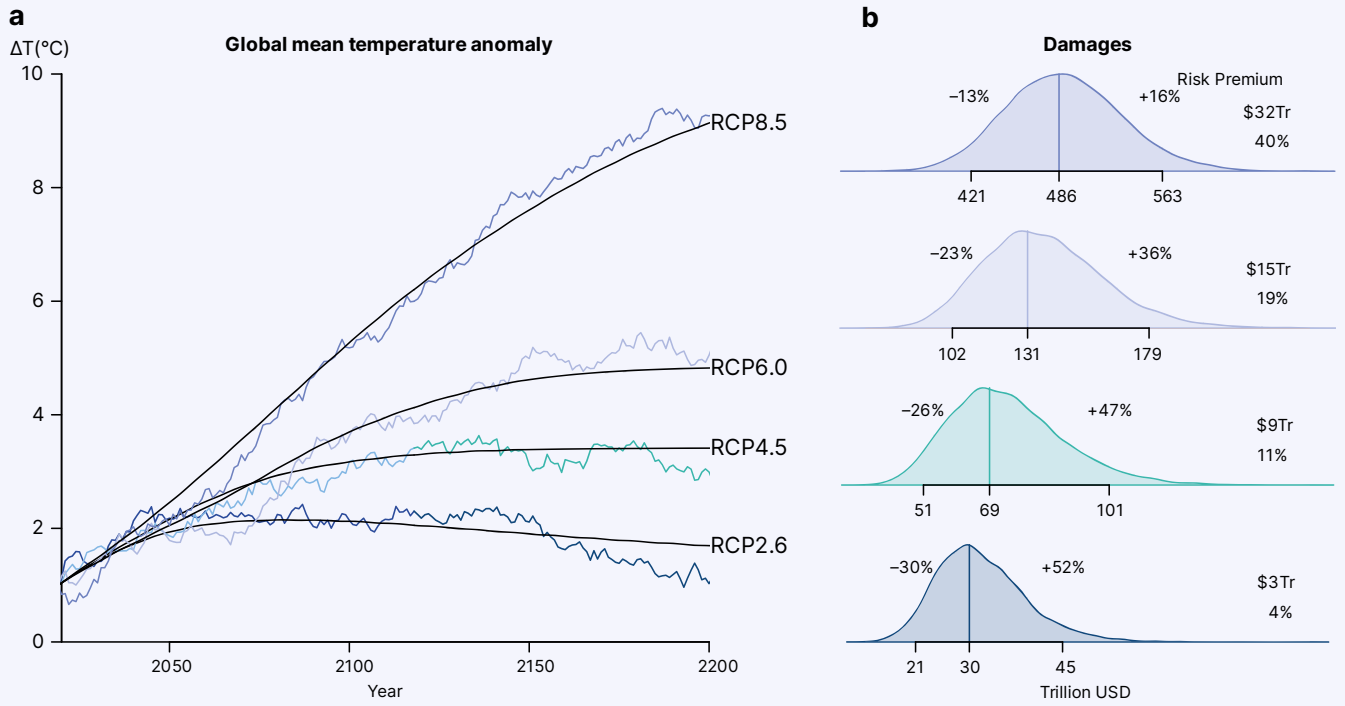
Probabilistic scenarios

Probabilistic scenarios (also called stochastic scenarios) incorporate the probability of events such as the rise in average global temperatures or specific climate-related physical risks (Figure 6). Investors use such scenarios most widely for quantifying physical risk with scenarios that build on modeling of natural catastrophes developed by the insurance and real estate industries (see discussion of use cases below).

The strengths and weaknesses of probabilistic scenarios magnify those of model-driven scenarios. Probabilistic scenarios allow for mathematical analysis of both expected outcomes and the uncertainty around them that includes both variance and tail analysis. The inclusion of uncertainty facilitates their use in risk-management workflows, where they can inform thinking about optimal behavior.

At the same time, probabilistic scenarios are complex and costly to build and use and require additional assumptions to inform their output. Models to understand how climate shocks will affect variance and covariance of climate effects are immature even where they exist; practitioners must often assume that baseline variance/covariance processes are unaffected and that climate effects influence only the mean of shocks. This can produce a false sense of precision and hide model errors.

Figure 6: Comparing temperatures with damages



Source: "Temperature Variability Implies Greater Economic Damages from Climate Change," Raphael Calel et al., Nature Communications, Oct. 6, 2020. Graph (a), solid black line, represents deterministic temperature model. Graph (b), deterministic damages, are the solid lines in the distribution.

A holistic approach

Although uses of climate scenarios analysis vary, they share a common goal, which is to improve decision-making by projecting and comparing a range of financial outcomes across plausible hypothetical futures. While each use case presents unique circumstances that require variation in analysis and output, we believe that high-level best practice across uses of scenario analysis in reporting, stress testing, investing (as well as lending and underwriting), risk management and client engagement includes more similarities than differences.

Practitioners new to climate scenario analysis confront a threshold question of how to stage the implementation of scenario analysis in their institutions while building expertise and gaining credibility and acceptance across the wider organization. Practitioners with more experience using such scenarios confront a question of how to further the current use of climate scenario analysis within the decision-making process. We characterize best practice as comprising the following progressive levels:

Level 1 – Scope

Identify and rank risk pathways and hot spots for the institution across different potential climate futures.

Level 2 – Quantify

Produce first estimates of the potential magnitudes of financial outcomes, with the focus of analysis guided by scoping.

Level 3 – Refine

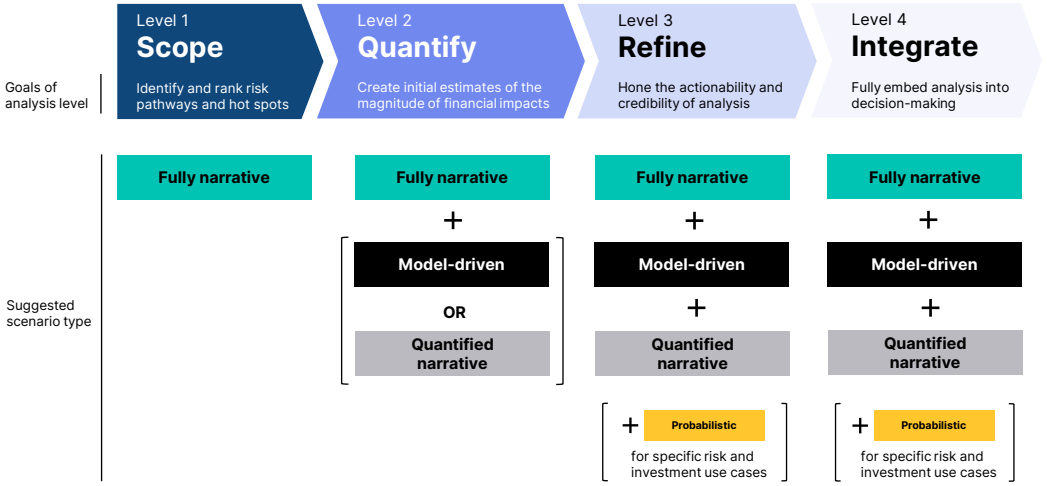
Enhance analysis with a focus on providing stakeholders with the most useful and credible output for decision making. Communicating underlying modeling pathways and uncertainty of forecasts is key to building acceptance.

Level 4 – Integrate

Fully embed scenario analysis output into existing systems and decision-making. For most institutions this is a long-term and aspirational goal.

A detailed discussion of best practices for each use case and level goes beyond the scope of this report. Instead, we provide suggestions of high-level frameworks for complementary scenario analysis across the four categories (Figure 7). Our suggestions for optimizing the use of different types of scenarios are similar across applications. We start with a general summary of suggested approaches by analysis level and follow with use-case specific commentary.

Figure 7: Levels of scenario analysis



Source: MSCI Sustainability Institute.

Using scenario types by level of analysis

Level 1: Scope

The first level of scenario analysis starts with simply identifying the most material risk pathways for its operations and investments.[4] Depending on the institution, pathways may include lower investment returns, credit risk, market risk, actuarial risk, financing issues, direct damage to physical assets, supply chain problems or a fall in demand for its products or services.

A goal at this level is to describe some level of detail of the risk within each pathway. Suppose, for example, that possible adverse outcomes include lower risk-adjusted returns. The investor could heat-map exposure across sectors, regions and asset classes to visualize hot spots for this risk.

Practitioners should aim to analyze as wide a set of potential futures and pathways as possible, and to focus on the ease of communicating results across the organization, with the aim of building support for future implementation. Although the magnitude of each risk need only be roughly estimated, practitioners are likely to have only limited resources at this level of implementation.

These requirements are particularly suited for fully narrative scenarios, which we suggest as the sole scenario type for this level. Subject experts in each potential risk pathway may be given a written narrative for multiple scenarios, and then asked to provide written forecasts including the analysis described above. Results are then collated to provide summary results to present across the organization.

Level 2: Quantify

For many institutions and use cases, scoping is merely a preliminary step, with quantitative output a necessity to drive any change in decision-making. Level 2 seeks to help stakeholders quantify the magnitude of risks.

We suggest that practitioners quantify financial outcomes using either model-driven or quantified narrative scenarios. In choosing between the two, practitioners might consider the relative ease of implementation based on their specific use case. Regardless of which quantitative scenario you choose, using a fully narrative scenario in parallel with it can help highlight areas of uncertainty in the quantified output.

4. Many organizations are already well past this stage, but it can be useful for practitioners to revisit this level of analysis periodically to confirm whether their underlying analysis remains up to date..

Using scenario types by level of analysis

Level 3: Refine

We define Level 3 scenario analysis as gaining acceptance organization-wide as stakeholders see the implemented analysis as both credible and actionable. Practitioners who aim to meet this bar may benefit from using multiple, complementary scenarios.

To achieve this, we suggest employing fully narrative, quantified narrative and model-driven scenarios, along with probabilistic scenarios for some use cases. Figure 9 illustrates one such approach that reflects the following levels of analysis.

Step 1: Baseline scenarios. In this example, model-driven scenarios serve as the core of the exercise, which typically will be the case for traditionally quantitative use cases in stress testing, investing and risk management. Here, the practitioner analyzes three NGFS scenarios that range from a net-zero and high transition risk to high physical risk. In practice, alternative regulatory scenarios and internally modeled scenarios might be employed.

Step 2: Augmentative scenarios. The inclusion of quantified narrative and fully narrative scenarios fills gaps driven by the limitations of model-driven scenarios. When linked directly to model-driven scenarios or to each other (comparison scenarios), such scenarios can serve as an alternative specification to the modeled approach. The links will, ideally, allow the practitioner to examine effects that the modeled approach may omit or that are characterized by high levels of uncertainty.

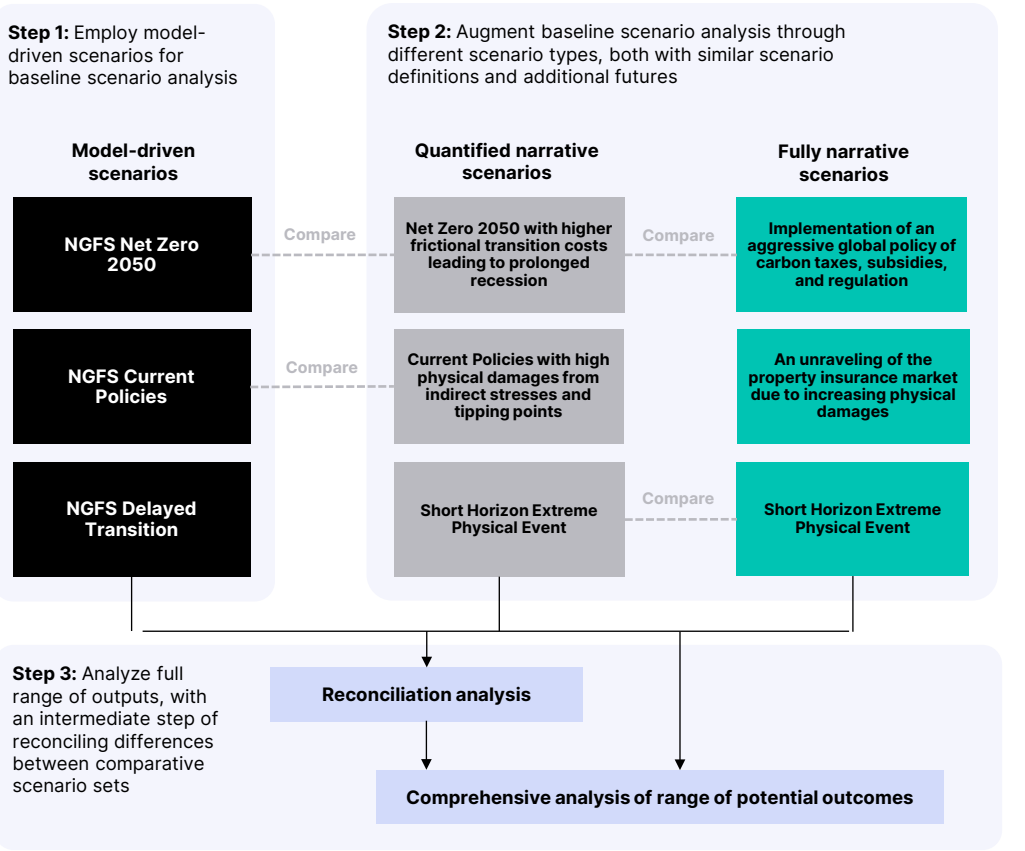
Step 3: Comprehensive analysis. At the completion of the first two steps, a practitioner now has output from multiple scenarios of different types, several of which are comparative forecasts of the same potential future. To contextualize these forecasts, the practitioner must first know what is driving the differences in output for the linked scenarios, a process we label reconciliation analysis. Reconciliation analysis entails a clear statement of the different assumptions, approaches and expectations that drive differences in forecasts between linked scenarios.

Although reconciliation analysis can become quite technical (and hence may not be conducive to sharing widely with internal stakeholders), it can inform practitioners as they perform the final exercise of comprehensively analyzing the range of scenario outcomes. That step, which concludes scenario analysis, entails discussing the implications of the analysis, including the range of potential outcomes, the most severe outcomes and the plausible likelihood of each of them.

Level 4: Integrate

The highest level of climate scenario analysis builds on Level 3 with enhancements to output and modeling. It includes honing climate scenarios in collaboration with stakeholders across the organization with the goal of integrating the scenarios fully into investment workflows.

Figure 8: Example of a complementary framework for analysis levels 3 and 4



Source: MSCI Sustainability Institute.

Considerations by use case

Uses of climate stress testing

Use	Objective	Key challenge	Commonly used by
Internal stress testing	To understand how climate change and the energy transition may affect the value of portfolios, profitability and operations enterprise-wide	To include drivers of climate-related risk and consider differences in impacts across sectors and regions	Financial institutions, including banks and insurers
Regulatory stress testing	To satisfy a regulatory or supervisory mandate	Whether to augment with internal stress testing	Financial institutions, including banks and insurers
Climate and sustainability reporting	To communicate exposure to climate-related risk	Whether to use quantitative scenarios as a complement to a fully narrative approach	Companies and investors
Investment activities	To inform investment decisions	Driving actionable insight from the volume of information	Asset owners and managers
Risk management	To assess climate-related risk both enterprise-wide and for specific investments	Lack of probabilities due to uncertainty in climate scenarios	Financial institutions, including asset managers, banks and insurers
Stewardship and engagement	To assess the climate-related risks of companies' business models	To analyze corporate scenarios using the same data that investors use	Asset owners and managers

Source: MSCI Sustainability Institute.

Considerations by use case

Internal stress testing exercises

For many institutions, an internal climate stress test represents the first use of climate scenario analysis within the organization.

Such exercises are typically driven by requests from management, investors and other key stakeholders who aim to understand how climate change and the low-carbon transition may affect the value of portfolios, profitability and operations. Given the comprehensiveness of the exercise needed to understand such effects, internal stress testing can serve as a starting point for implementing climate scenario analysis for the applications discussed below.

Banks, insurers and other financial institutions are familiar with the concept of internal stress testing, which supervisors in the U.S. and elsewhere mandated following the 2008 financial crisis. Many of these institutions have aimed to fit climate scenario analysis into the same macroeconomic stress-testing frameworks.

This history has produced internal climate stress tests that depend heavily on model-driven scenarios. Such models, however, risk the omission of drivers of climate-related risk and important sector and sub-regional differences in analyzing the effects of a warming world. The result is frameworks that exacerbate the limits of modeled quantitative climate scenarios discussed in the previous section.

The example Level 3 framework in Figure 8 represents an ideal for internal stress-testing exercises. Capabilities may be ramped up through Levels 1 and 2, but institutions generally would need complementary scenario analysis to understand risk at the enterprise level.

Regulatory stress-testing exercises

The workflow for a regulatory stress test resembles that of an internal stress test, with the difference that a financial supervisor or regulator has prescribed the exercise and its parameters.

Regulators have so far held off in pushing institutions to implement multiple types of climate scenarios and associated analysis. In the meantime, practitioners can implement complementary internal stress tests as described above to augment regulatory stress-testing requirements.

Climate and sustainability reporting

Investors and other capital markets participants confront an increasingly demanding series of voluntary and mandatory climate and sustainability reporting obligations.

The climate disclosure standard developed by the International Sustainability Standards Board (ISSB), for example, represents a global baseline for both mandatory and voluntary disclosure.[5] The standard directs companies and investors to use climate-related scenario analysis based on an approach commensurate with the entity's circumstances.

According to the ISSB, the entity's circumstances consist of both its exposure to climate-related risks and opportunities and the skills, capabilities and resources available to the entity for the climate-related scenario analysis.

The standard may, in practice, result in practitioners relying on fully narrative scenarios to assess their institutional exposure to climate risk. At the same time, practitioners should be mindful of the limitations of fully narrative scenario analysis and use quantitative scenario output where feasible. The use of quantitative scenarios as a complement to a fully narrative approach can help practitioners communicate the results of the analysis to stakeholders, both inside and outside their organization, because of the objectivity and comparability of numerical output.

Even an institution with limited technical capability might consider obtaining complementary scenario analysis from outside sources. For more highly exposed institutions, the framework in Figure 8 can serve as a model for scenario analysis that backs climate disclosure.

5. "IFRS Sustainability Disclosure Standard, Climate-related Disclosures," IFRS S2, International Sustainability Standards Board, June 2023.

Considerations by use case

Investment activities

Investment teams in institutional front offices have a long history of using scenario analysis for strategic asset allocation, portfolio construction and security selection. Fundamental analysts in particular use scenario analysis to set a base case, upside case and downside case for a specific investment, as well as to deepen insight into a range of possible investment outcomes.

At the same time, investment teams have tended to resist the use of climate scenario analysis, contending that standard climate scenarios focus on too long a horizon to inform investment decisions, do not capture short-term climate effects that drive returns over the investable horizons and lack granularity sufficient to capture the particulars of their investments.

This dichotomy suggests a need to recalibrate the use of climate scenario analysis within investment firms, with a focus on boosting the relevance of scenarios, presenting them in the language of portfolio managers and making the limitations of outputs clear.

Complementary climate scenario frameworks offer improvement on each of these fronts. Compared with typical model-driven scenarios, fully narrative and quantified narrative scenarios can be more quickly and flexibly adjusted to help understand the impact of continually evolving short-term risks. They should be used in this capacity to augment more-rigid model-driven scenarios.

Complementary frameworks also allow a better understanding of the range of possible outcomes, which can help centralized functions to more confidently create and pass output to analysts that presents relevant upside, downside and base cases for individual assets and portfolios. Investment teams can be given pilot examples in which quantitative outputs are shown side-by-side against standard fundamental analysis performed by analysts. This comparison more clearly shows the levers that a quantitative climate model does and does not capture, showing how investors can use such models within the investment process.

Often, quantitative investors seek to have a more mathematical forecast of the distribution around an expected return. As noted, the current state of climate modeling means practitioners likely will have to use assumptions about baseline variance and covariance to build distributions around a scenario's deterministic climate shocks.

Practitioners might also consider pulling together the output of individual scenarios to form a single distribution representing all potential outcomes. The efficacy of doing so, however, remains the subject of debate within the field of climate scenario analysis. As such, practitioners who do so should familiarize themselves fully with the limitations of such output.

Risk management

Risk management activities cover a broad range of use cases, from assessments of enterprise-level risk to market- and credit-risk analysis of individual securities. As the scope of analysis narrows to the entity level, practitioners' considerations will tend to resemble scenario analysis in investment activities.

One key risk management use case with a high level of climate exposure is calculating solvency capital for property insurance. Such analysis evolved long ago into fully stochastic modeling techniques designed to help risk managers understand the tail losses associated with low-probability physical events, buoyed by the large amount of data on historical events and losses.

Climate hazard forecasting models (called General Circulation Models) can create probabilistic scenarios that are well-positioned to integrate with existing physical event modeling frameworks.[6] Risk managers can also adapt these models where possible to understand physical risk to real estate, corporate and government-backed assets.

6. General Circulation Models are numerical models for simulating the response by the climate to growing concentrations of greenhouse gas. See "What Is a GCM?" Data Distribution Center, Intergovernmental Panel on Climate Change.

Stewardship and engagement

The results of climate scenario analysis can be a useful resource in corporate engagement. Investors can use such information to educate corporate managers on the risks of business models and influence plans by management to mitigate them.

Investors may choose to present such information with an emphasis on clarity. Optimally, such data will match the financial analysis performed by analysts with the investor's institution. Hence the discussion in the investment use case applies here as well. Quantitative scenario analysis may not form the most granular portion of output shown to corporate managers, but it provides an important objective benchmark.

Conclusion

Scenario analysis can sharpen the robustness and relevance of climate risk assessments. By instituting frameworks that leverage fully narrative, quantified narrative, model-driven and, in some cases, probabilistic scenarios, institutions can address the limitations of each approach and deepen their understanding of potential climate impacts. The holistic approach suggested here can improve decision-making and add resilience to financial planning.

Investment practitioners may find value in a range of approaches, including starting with simpler methods and progressively incorporating more-complex scenarios. Regardless of how they approach the task, scenario analysis, if integrated into investment workflows, can enhance practitioners' ability to manage climate risks and capitalize on opportunities.

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