MORNINGSTAR | SUSTAINALYTICS

Physical Risk Intelligence & Scenario Modeling

Methodology Description

November 2026

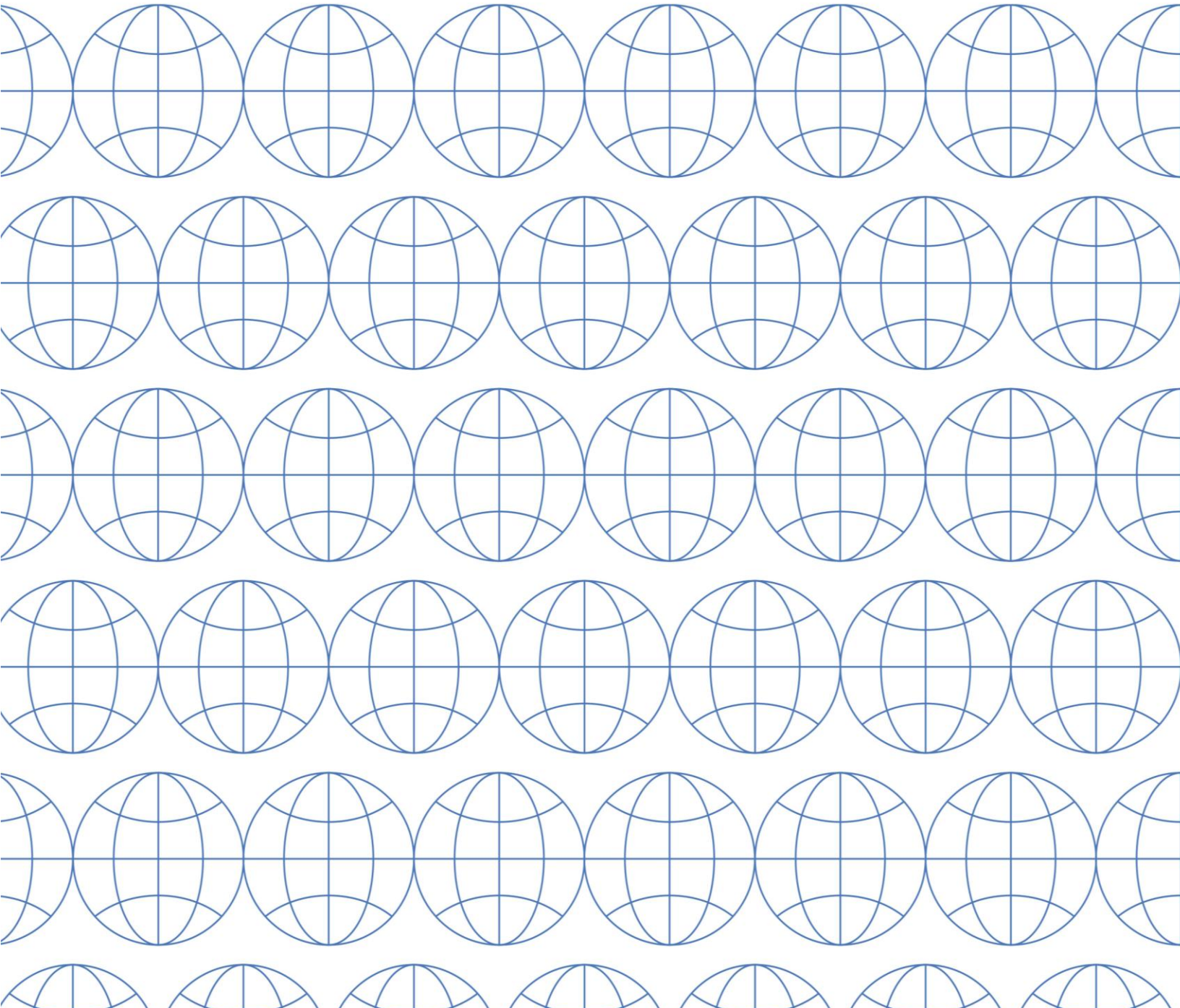


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Methodology Summary

November 2026

Version 1.0

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This document is provided for external consultation purposes only. The final methodology may differ from the version described here.

Highlights

- Morningstar Sustainalytics physical risk metrics assess environmental and financial exposure to physical climate risks.
- The methodology supports the calculation of financial losses associated with physical climate change for multiple hazards and scenarios, covering direct and indirect risks.
- The core of the methodology is focused on business disruption at material assets and takes asset-level hazard exposure to determine asset damage, business interruption losses as a function of revenue, and indirect losses through value chain bottlenecks.
- The methodology calculates average perceived losses based on third-party hazard data related to global hazard model outputs, and climate shocks.

Note: Terms highlighted in bold gray are listed in the Glossary at the end of this document.

Purpose

This document describes a prototype methodology and is intended for consultation and feedback purposes. It does not represent the final product design.

The increasing concentration of greenhouse gases in the atmosphere from human activities is altering the global climate, resulting in changes to weather patterns and long-term climatic conditions. Consequently, extreme weather events are occurring more frequently and with greater severity, creating growing challenges for economies, businesses, and communities.

While the impacts of physical climate change are increasingly evident at the macroeconomic level, they are often less visible at the company level. Historically, **physical climate risks** have primarily been viewed through the lens of **asset damage**, which may be mitigated through insurance and therefore not fully reflected in traditional financial analysis. This can make it difficult for investors to understand how physical climate risks may affect company performance and investment outcomes.

The purpose of this prototype methodology is to identify and assess material physical climate risks from an investor perspective by evaluating the operational and financial consequences of disruptions at key assets. By linking physical climate **hazards** to **business interruption** and the resulting impacts on output, revenue, and profitability, this document provides a framework for understanding the financial relevance of physical climate risk.

Methodological Approach

The physical risk metrics represent Morningstar Sustainalytics assessment of a company's environmental and financial exposure to physical climate hazards.

Third-party hazard and asset data are utilized to determine the damage and business interruption a company may face due to climate-related weather events, long-term changes in climate, and one-off climate shocks.

The assessment is based on the measurement of exposure and revenue losses, according to Morningstar Sustainalytics' methodological framework.

Scope & Limitations

Climate Hazard Modeling

- Climate hazard data and model outputs are obtained from a third-party provider and form a key input to the calculation framework. Consequently, the resulting risk estimates are subject to the assumptions, methodologies, coverage limitations, and uncertainties inherent within third-party hazard models and datasets.
- Climate hazard models may exhibit varying levels of granularity across geographies. Markets with more mature climate modeling ecosystems, more frequent model updates, and greater availability of historical climate observations may provide more detailed outputs than regions where such datasets and modeling approaches are less developed.
- Climate risk estimates are derived from Global Climate Models (GCMs) and downscaled climate datasets. This approach is inherently subject to uncertainty arising from modeling assumptions, scenario selection, climate pathways, and statistical methodologies.
- Hazard model parameters have not been calibrated at the individual asset level. Certain assumptions are based on global averages and may introduce bias or reduce accuracy for specific locations, particularly for extreme heat assessments.
- Asset-specific characteristics, including building envelope, elevation, construction type, and engineering features, have not been incorporated into the hazard modeling approach and may influence actual levels of risk.

Asset and Company Data

- The analysis incorporates all assets available through the third-party asset data provider and may include assets that are not financially material to a company's operations.
- Coverage may be constrained where companies do not publicly disclose sufficient, complete, or verifiable information regarding operations, assets, or geographic locations.
- Asset-level revenue allocations are estimated by the third-party provider and subsequently aligned to Morningstar financial data. These estimates may differ from company-reported allocations.
- Data quality, coverage, and completeness may vary across companies, industries, and regions.

Industry and Comparability Considerations

- Comparability across industries may be limited due to differences in regulatory environments, geographic distribution of operations, business models, supply chain structures, and physical asset intensity.
- Variations in industry exposure profiles may influence both the magnitude and distribution of climate-related financial impacts, limiting direct comparisons between sectors.

Methodology and Sample Constraints

- Data associated with this methodology are based on a limited sample universe and should be considered illustrative. Benchmarking against a broader peer group is not currently possible.
- The outputs presented are intended to demonstrate the initial methodology concept and should not be interpreted as final production-ready results.
- Certain hazard provider assumptions and model parameters used within this sample are expected to evolve and may not be representative of future commercial deliverables.
- The underlying calculations, assumptions, and resulting metrics remain subject to refinement as additional data, asset-level information, and validation activities are incorporated by the ESG Methodology Team.
- As the methodology continues to mature, future iterations may produce results that differ from those shown within this sample due to enhancements in data coverage, model calibration, and methodological development.

Methodological Description

Prioritization of asset level data

The overall approach takes asset-level **hazard exposure** data and translates this into financial loss.

There is a hierarchal approach to assets to assess "primary" assets for companies in the first instance. These are classified as priority assets that are fundamental to a company's revenue generation capability, and that in turn helps produce manufactured or knowledge capital that drives revenue.

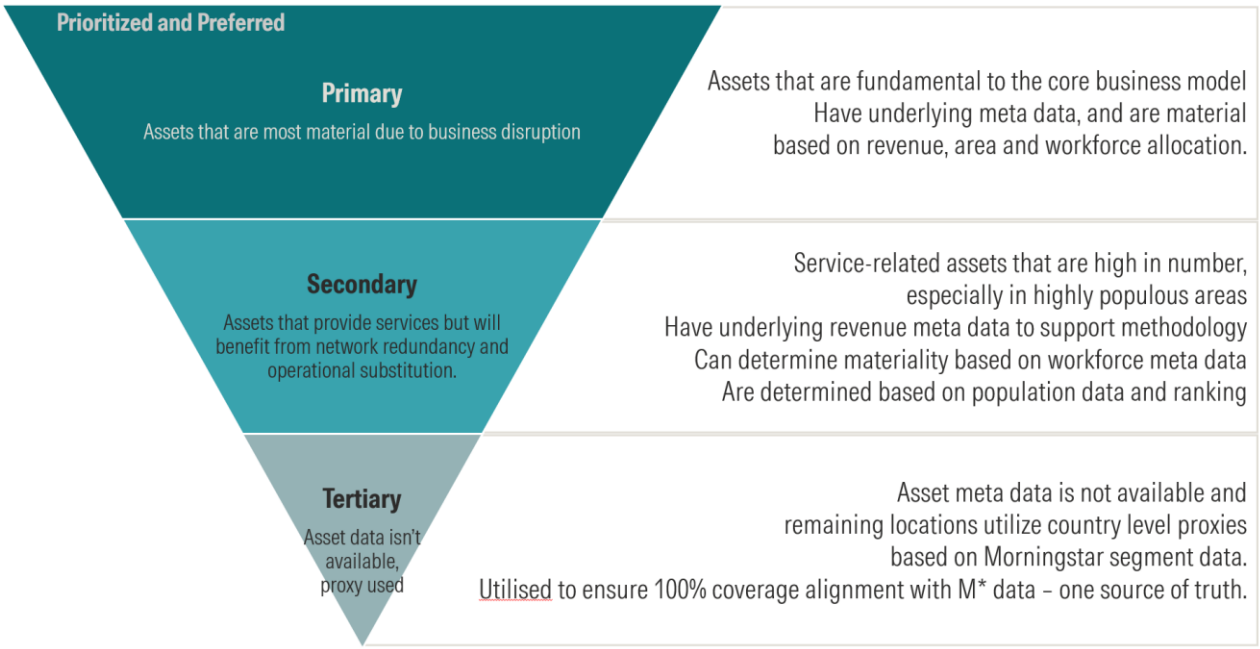
Primary assets that should be prioritized over others speak to those classified based on an internal taxonomy that identifies asset activity relative to business model and expected business activities.

Assets of this nature are only assessed where there is associated revenue and other useful meta data to ensure that a full end-to-end assessment can take place. It is assumed that where revenue data cannot be provided, the asset is not material to the business model.

Secondary assets are considered based on their location in highly populous, high-density areas, or high populous, high-urban spread. Any asset that does not have revenue data will not be considered, and higher revenue generating assets are prioritized. It is assumed that no single secondary asset will have a large contribution to company-level risk, but the cumulative impact in single geographies for service-related companies in certain regions could be material as a whole.

A country-level approach will be taken for remaining revenue not covered by the asset data to understand potential gaps in the asset-level data aligned to regionally reported financial data collected by Morningstar.

Exhibit 1 Hierarchy of Asset Data



Source: Morningstar Sustainalytics.

Primary Asset Data

The purpose of this approach is to ensure that business interruption remains at the core of the physical climate risk assessment. This requires identifying which assets are most material to meeting business model needs, as well as those **asset types** that are cited for specific logistical or resource access reasons and are often operational over a longer lifecycle.

These assets have been classified based on core sector-level business activity and primary-level asset data taxonomy, based on assets that are most likely to cause business-level interruption if impacted by a given climate hazard.

Primary asset data typically represent the most **material assets** that are central to a company's core business model; this prioritizes assets that are responsible for the creation of manufacturing capital and are core areas where a company's financial capital is allocated and generated.

Morningstar Sustainalytics created an **asset archetype taxonomy** based on **material asset archetypes** that meet the requirements of Primary Asset Data aligned to key activities and subindustries applicable to Morningstar Sustainalytics.

Exhibit 2 Primary Asset Archetype Taxonomy

Activities	Asset Types Included
Extraction & Resources	Quarry and extraction locations; Raw material and raw energy sources (owned)
Manufacturing & Processing	Assembly plants; Engine production plants; Gigafactories and battery facilities; Processing plants; Recycling facilities; Milling plants; Casting plants; Semiconductor manufacturing facilities; Manufacturing and machinery facilities; Midstream assembly and production plants.
Energy & Utility Infrastructure	Generation plants and assets; Transmission assets; Distribution assets; Fuel and energy centres
Oil & Gas Infrastructure	Drilling rigs; Offshore platforms; Wellhead plants; Pipelines; Refineries; Petrochemical plants.
Logistics & Distribution	Storage facilities; Warehouses; Distribution centres; Transportation yards; Maintenance areas.
Commercial, Technology & Service Infrastructure	Office buildings; Stores; Data centres; Technology parks and campuses; R&D facilities; ATM network infrastructure.

Source: Morningstar Sustainalytics.

Physical Risk Hazard Exposure

Physical Risk Hazard Exposure is presented as an **Exposure Probability**, which is calculated at the asset level for all covered assets, and assesses the probability, as a percentage, of a given hazard's contribution towards losses at an asset relative to our global asset base, for a given scenario.

This exposure is calculated for the hazards and **climate scenarios** listed in Exhibit 3 (see glossary for more information).

Exhibit 3 Hazards and Climate Scenarios

List of Hazards	List of Climate Scenarios
Extreme Heat	RCP 2.6
Extreme Wind	RCP 4.6
Riverine Flooding	RCP 8.5
Coastal Inundation	
Surface Water Flooding	
Forest Fire	
Tropical Cyclone Wind	
Tropical Cyclone Storm Surge	
Freeze Thaw	
Soil Movement	

Source: Morningstar Sustainalytics.

Hazard-related **productivity loss** metrics are provided by a third-party provider, at the individual asset level. These metrics are utilized to determine global-level probabilities to determine the overall exposure to climate events and chronic long-term climate change.

These metrics are calculated using a min-max normalization reflecting the distance to modeled extremes under a given scenario and relate to severity, not frequency or rarity. They address the

question, based on global extremes, of how probable it is that this asset will experience disruption because of a given hazard.

The outcome is expressed as a percentage between 0 and 100. **Hazards contribution**s are split-up in terms of individual hazards and into **Acute Hazards** and **Chronic Hazards** to understand the contribution of immediate climate events and longer-term changes in climate.

Physical Climate Risk Losses

The financial losses associated with physical climate risk are based on asset-level damage and disruption, i.e., **direct loss**, and the disruption to the value chain, i.e., **indirect losses**.

Both types of losses are calculated over a given time, at the asset level, for all hazards, and aggregated to determine [or tabulate] company losses. The final loss values demonstrate the revenue-related losses that represent value at risk due to the business disruption associated with physical climate-related weather events and longer-term climatic changes.

Business Interruption

The core methodological approach concentrates on business interruption resulting from direct asset-level impacts, with a focus on how assets recover within the systems and networks in which they operates, rather than as standalone entities affected by a hazard event.

Asset repair is necessary, but full operation depends on the recovery of the surrounding energy, transport, regulatory, and financial system, when a climate event or shock is experienced at an asset. The surrounding system on which that asset relies is also impacted and slows the ability of an asset to become fully operational. The underlying methodology is designed to replicate the system-level constraints that may occur in each system, a high level representation is demonstrated in Exhibit 4.

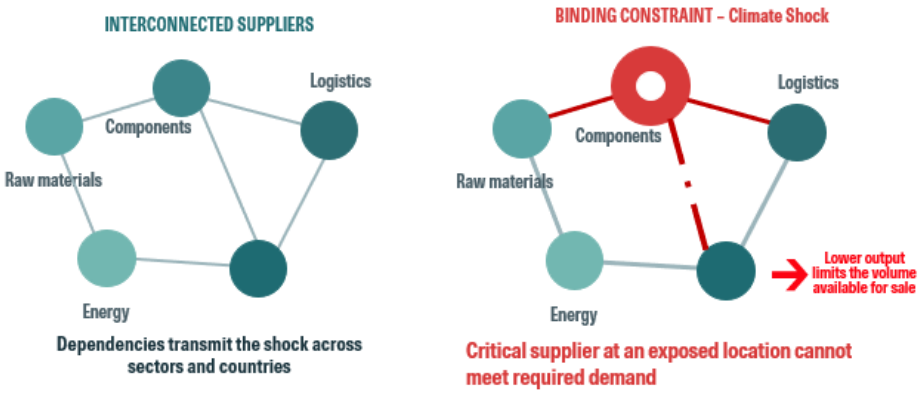
Exhibit 4 System Constraints at the Asset



Source: Morningstar Sustainalytics.

Indirect loss impacts the value chain bottlenecks that may occur due to broader global events and the sector-level impacts that may cause supply and demand related constraints, leading to reduced outputs and revenues. Exhibit 5 conceptually highlights the bottleneck methodology outlined more fully later in this document. It is intended to measure disruption anywhere in the wider production system that can constrain a critical input, reduce throughput, and ultimately lower company revenue.

Exhibit 5 Indirect Bottleneck Concept



Source: Morningstar Sustainalytics.

Direct Loss

Direct risk-related losses represent the financial value at risk associated with material asset level interruption. Direct loss at the asset level due to given hazards is calculated in two parts:

1. Damages, which are the cost of damage repair or replacement due to physical climate change are calculated based on the perceived asset productivity infrastructure losses. These are multiplied by the asset level **allocated property, plant and equipment (PPE)** value attributed to the asset based on underlying meta data. PPE represents the long term, tangible assets a company uses in its core business operations at that asset.

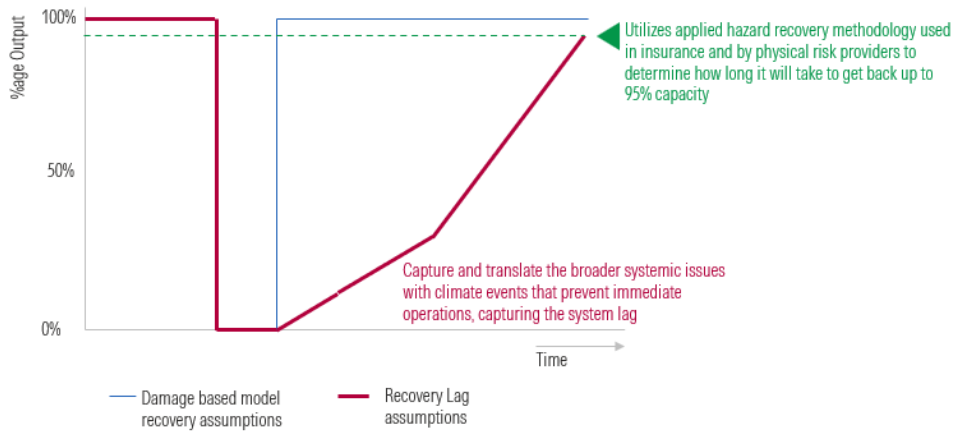
$$Asset\ Damage = Asset\ Productivity\ Loss_{hazard} * Asset\ PPE$$

The broader asset direct risk is associated with **recovery time** due to climate hazards.

For each hazard, the recovery time is calculated at the asset level to determine how long an asset will experience **downtime**, and as a result be unable to generate goods and services critical to the company business model. This is based on increasing business interruption posed by physical climate change, and that damage alone is not the main risk for investors.

2. In addition to damage, the Morningstar Sustainalytics calculation of direct loss relating to physical climate risks considers the system an asset sits within, and produces a recovery time, to calculate the wider business interruption an asset may face because of a climate event or longer-term climatic event. The high-level concept is demonstrated in Exhibit 6.

Exhibit 6 Recovery Time Concept



Source: Morningstar Sustainalytics.

The recovery time does not constitute “repair time” (or the time it takes to carry out repairs at an asset). It is based on restoration times used across insurance-related business interruption calculations and goes beyond repairing damages. Utilizing the theory of business interruption calculations, the underlying approach answers the question: How long will it take for an asset to get back to 95% operations after a climate shock or consistent climate changes for a given hazard?

The durations associated with recovery time are intended to capture physical repairs, debris removal, utility restoration, regulatory approvals and permitting, contractor shortages and reopening delays. Like many other models of this nature, the restoration times used in determining recovery times are not derived from large empirical databases; they are based on expert judgement parameters that are universally utilized in hazard models. The FEMA HAZUS approach forms the basis for the recovery time approach.

The output is the number of days to recover, or Recovery Time, which is the cumulative downtime, expressed in days, resulting from physical climate hazards that reduce asset output below 95% of normal production.

Utilizing hazard-related recovery times, the model then adjusts the base recovery period using a **sovereign factor**, which can reflect broader economic and adaptive capacity considerations such as GDP stress, insurance penetration, recovery capability, and institutional resilience.

Asset exposure is incorporated as a proxy for the probability that a hazard results in significant operational disruption, representing both the vulnerability of the asset itself and the susceptibility of surrounding systems on which the asset depends.

These inputs are used to calculate a **recovery curve** through a hazard-specific recovery parameter (lambda), generating a progressive restoration pathway rather than assuming an immediate return to normal operations.

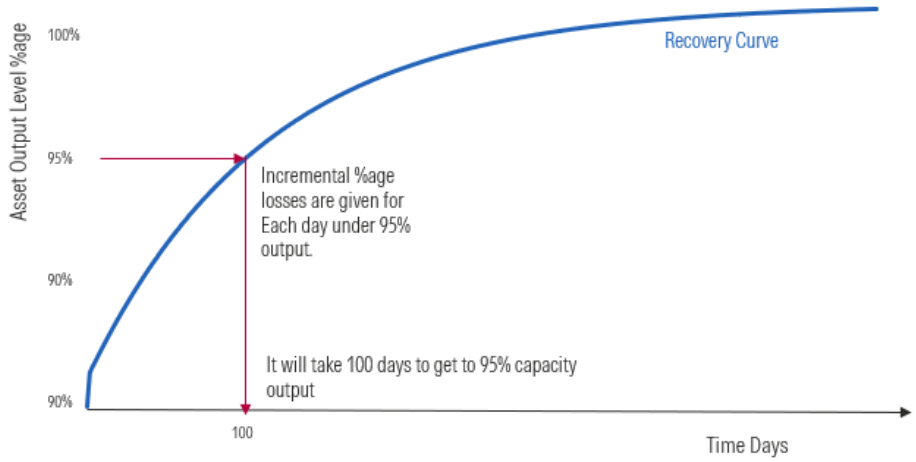
The resulting recovery curve estimates the average daily capacity shortfall experienced throughout the recovery period and translates this into a system recovery lag, which captures the ongoing economic consequences of reduced operational performance.

The final output is a **recovery lag factor**, which is combined with revenue and productivity loss estimates to quantify the additional business interruption impacts associated with delayed restoration.

By modeling recovery as a gradual restoration of **operational capacity**, rather than a binary asset failure and repair process, the methodology captures the broader economic consequences of climate hazards and provides a more realistic estimate of the duration and severity of disruption experienced by companies.

Exhibit 7 demonstrates a recovery curve, through which the underlying data allows a loss factor to be determined, based on the number of days out of the given year that the asset is not able to operate at a minimum of 95% output, relative to revenue. (For details of the formulaic approach, please see Appendix.)

Exhibit 7 Coastal Inundation Hazard Recovery Curve



Source: Morningstar Sustainalytics.

The recovery curve is used to estimate the proportion of operational disruption experienced each day following a hazard event. These disruptions are aggregated to determine annual downtime, which is applied to revenue to quantify business interruption losses.

In addition, the recovery curve is converted into a recovery duration measured in days, providing insight into the total business days at risk from physical climate hazards across a company's asset base. Total undiscounted direct loss is calculated by combining asset level losses, as a function of revenue loss, and combined with all material asset losses, plus country-level proxies where material asset revenue has a delta with Morningstar reported revenue figures.

Indirect Loss

Indirect losses are the total value at risk to a given company based on their value chain.

The approach is based on input-output flows and determining physical climate-related bottlenecks that will impact the flow of goods or capital.

A bottleneck methodology is applied that assesses how physical climate hazards may constrain economic activity beyond the directly affected location or industry. This is done by considering the interconnected nature of global supply chains.

The assessment begins by identifying reductions in productive capacity associated with physical climate impacts and by tracing how these disruptions propagate through the network of industries and countries represented within the OECD Inter-Country **Input-Output model** framework. Rather than focusing solely on direct losses, the approach assesses the extent to which industries depend on inputs from climate-exposed suppliers and whether those suppliers can continue to meet demand following a disruption.

Industries that experience significant climate-related reductions in productive capacity and play an important role in supporting other sectors are more likely to create bottlenecks that restrict economic activity across the wider system.

The full methodology is available in the appendix, but the output is a factor that determines the revenue reduction as a result of supply or capital flows.

This value is applied to country-level revenue, to determine limitations in ability to produce output as an undiscounted value, and is projected out to the future.

Discounted Losses

Both undiscounted direct and indirect losses are applied to a discount cashflow model to give **total losses** as absolute value at risk, which can be aggregated to the direct and indirect level to understand the difference between the loss type contribution.

The **Discounted Cash Flow Model (DCFM)** estimates the present value impact of physical climate risk on a company's future financial performance by projecting and discounting future revenue streams.

The approach considers Morningstar geographic segment revenue data, which is allocated to individual assets using asset-level revenue weights based on underlying asset meta data provided by a third party.

Baseline revenues are then forecast using a common long-term economic growth assumption derived from IEA World Energy Outlook GDP projections, creating a forward-looking revenue pathway that is independent of climate hazards.

Future revenues are discounted to present value using the **Weighted Average Cost of Capital (WACC)** or a standardized 7% **discount rate**, in lieu of WACC. A terminal value is also calculated using a long-run GDP growth assumption to capture value beyond the explicit forecast horizon.

The resulting **risk-adjusted revenues** are discounted in the same manner as the baseline scenario to calculate a risk-adjusted present value. Losses expressed as Value at Risk are then calculated as the difference between the baseline and risk-adjusted present values, expressed both in absolute monetary terms and as a percentage of enterprise value. This approach provides investors with a forward-looking estimate of how physical climate hazards may affect long-term company value by reducing future cash-generating capacity.

Tail-end Risk

Tail-end risk captures the potential financial impact of extreme climate events by focusing on losses at the 95th percentile of the loss distribution. This represents low-probability but high-impact outcomes, providing an indication of the potential severity of climate-related shocks beyond expected or average losses.

The approach is based on the same underlying productivity loss methodology used to calculate expected losses. However, rather than assessing average outcomes, the analysis isolates extreme loss scenarios. Third-party productivity loss estimates are calculated at the asset and hazard level using the 95th percentile of projected impacts, representing the potential consequences of severe climate events. These asset-level and hazard-level tail-end loss estimates are then aggregated to produce a company-level assessment of extreme climate risk. The resulting metric is expressed as a value-at-risk measure, providing an indication of the losses a company could experience under severe but plausible **climate shock scenarios**.

Methodology Context

- This methodology is based on underlying hazard and asset data provided by third parties.
- This is not a rating and considers physical climate risk alone.

Data Sources

- This prototype methodology uses data from third-party sources and Morningstar financial data.
- Input data selection criteria are based on the needs of the signals, i.e., the underlying calculation requirements.
- No data is sourced from sustainability statements required under Directive 2013/34/EU [financial statements] or from information disclosed under Regulation (EU) 2019/2088
- Data is not derived from the sustainability reporting standards developed pursuant to Articles 19 and 29b of Directive 2013/34/EU concerning sustainable economic activities and disclosure of information pursuant to Regulation (EU) 2020/852 [framework to facilitate sustainable investment] and Regulation (EU) 2019/2088.
- Assessment criteria for the data used in the methodology is set out in line with our processes and procedures and are evaluated based on their reliability. Where relevant data is not available, proxies are used to measure potential exposure.
- Data that is incomplete or deemed unreliable is removed from the calculation approach.
- AI is utilized in the processes applied by third-party providers.

Categories

The outcomes of this methodology are not expressed as categories.

Research Approach

This prototype methodology is based on calculation-driven outputs utilizing accepted methodological approaches to calculating losses associated with physical climate change and the scenario assumptions that sit within global hazard models.

Governance, Review and Market Consultation

This methodology, once complete, will be subject to all Governance, review and market consultation processes and procedures.

Revisions

This is not a final methodology and will be updated in line with our internal processes and procedures.

Appendix

Recovery Formulaic Approach

Step 1: Determine Base Recovery Period

For each physical climate hazard h, a baseline recovery duration is assigned:

$$R_h$$

Where:
R_h= Hazard-specific recovery period (days)
Values are derived from empirical disaster recovery literature and restoration frameworks
Recovery periods reflect the time required to restore approximately 95% of operational capacity
The recovery period includes both direct repair activities and broader operational constraints such as utility restoration, supply chain recovery, permitting requirements, contractor availability, and workforce disruptions.

Step 2: Apply Sovereign Factor
The baseline recovery period is adjusted to reflect the adaptive and recovery capacity of the country in which the asset operates:

$$R_{adj} = R_h \times SF$$

Where:
R_{adj}= Resilience-adjusted recovery period
SF= Sovereign Factor
The sovereign factor captures differences in recovery capability arising from economic development, institutional effectiveness, infrastructure quality, insurance penetration, and emergency response capacity.

Step 3: Estimate Asset Disruption Probability

An exposure factor is used as a proxy for the likelihood that a physical hazard results in material operational disruption:

$$E_i$$

Where:

E_i= Exposure factor for asset i

$$0 \leq E_i \leq 1$$

This factor reflects both direct asset vulnerability and the dependency of the asset on surrounding infrastructure systems.

Step 4: Define Recovery Curve

Recovery is modelled as a continuous process rather than a step change, using a recovery parameter:

$$\lambda = \frac{1}{R_{adj}}$$

The proportion of operational capacity restored at time $t$is expressed as:

$$C_t = 1 - e^{-\lambda t}$$

Where:

C_t= Operational capacity restored at time t

t= Days following the event

λ= Recovery rate parameter

This formulation assumes recovery is initially slow following the event and gradually improves over time as restoration activities progress.

Step 5: Calculate Average Daily Disruption

The average operational disruption experienced throughout the recovery period is calculated as:

$$ACL = \frac{1}{R_{adj}} \int_0^{R_{adj}} (1 - C_t)\, dt$$

Where:

ACL= Average Capacity Loss

This value represents the mean reduction in operational capability experienced across the recovery period.

Indirect Bottleneck Approach

The **Bottleneck Factor** is designed to identify industries that may transmit physical climate impacts through supply chains and the broader economy. The methodology combines estimates of climate-related economic losses, economic dependencies between industries, and the resilience of industries to disruption. Together, these components provide an indication of how disruptions originating in one industry may affect downstream sectors, geographies, and economic activity.

The first step is to estimate the direct impact of physical climate hazards on an industry. This is represented by Climate Loss, which reflects the projected reduction in industry output resulting from hazards such as flooding, extreme heat, drought, storms, or wildfires.

$$\text{Climate Loss (\%)} = \text{Projected Industry Output Loss}$$

The second step is to measure **Economic Dependency**. This assesses the extent to which other industries rely on the goods and services produced by a given industry. Using input-output data, dependency is calculated as the proportion of downstream demand supported by the industry's output. Industries that provide essential inputs to a large number of downstream sectors receive higher dependency factors.

$$\text{Dependency} = \frac{\text{Downstream Demand for Industry Outputs}}{\text{Total Industry Output}}$$

The third step is to assess Capital Resilience. This represents the ability of an industry to absorb, adapt to, and recover from climate-related disruptions. Indicators such as available investment, financing capacity, insurance coverage, or other measures of financial resilience may be used. Industries with greater access to capital are generally better positioned to maintain operations and recover following an adverse event.

$$\text{Capital Resilience} = \frac{\text{Available Capital or Recovery Capacity}}{\text{Industry Size}}$$

The Bottleneck Factor is then calculated by combining the direct climate impact with the industry's economic importance and adjusting for its resilience capacity. Industries with high climate losses,

strong economic linkages, and limited resilience will generate higher bottleneck factors, indicating a greater potential to disrupt economic activity beyond the directly affected industry.

$$\text{Bottleneck Factor} = \frac{\text{Climate Loss} \times \text{Dependency Factor}}{\text{Capital Resilience Factor}}$$

Where relevant, the analysis may be enhanced through the inclusion of cross-border capital flows. This adjustment accounts for the importance of investment, financing, ownership structures, and strategic economic relationships between countries. Industries supported by concentrated sources of international capital may have a greater influence on global value chains than is captured through supply chain linkages alone.

The capital flow adjustment is represented by a **Capital Flow factor**, which measures the significance of capital relationships supporting an industry.

$$\text{Capital Flow} = \frac{\text{Capital Flows Supporting the Industry}}{\text{Total Capital Flows to the Industry}}$$

The dependency factor can then be adjusted to incorporate these international economic linkages:

$$\text{Adjusted Dependency Factor} = \text{Dependency Factor} \times \text{Capital Flow}$$

Finally, the adjusted dependency factor is incorporated into the Bottleneck Factor calculation to produce a measure of **systemic vulnerability** that captures both physical climate risk and capital-linked economic dependencies.

$$\text{Final Bottleneck Factor} = \frac{\text{Climate Loss} \times \text{Dependency Factor} \times \text{Capital Flow I}}{\text{Capital Resilience Factor}}$$

Glossary of Terms

Acute Hazard	A sudden climate-related event, such as flooding, storms, wildfire, or tropical cyclones, that can cause immediate operational disruption and financial loss.
Allocated Property, Plant and Equipment (Allocated PPE)	The share of a company's physical assets allocated to a specific location or asset for the purpose of assessing physical climate risk.
Asset Damage	The direct physical damage to an asset resulting from a climate hazard event.
Asset Archetype Taxonomy	The classification framework used to identify and categorize assets according to their role within a company's operations and business model.
Asset Type	The category assigned to a material asset based on its function or operational activity, such as a manufacturing facility, mine, data center, refinery, warehouse, or retail location.
Bottleneck Factor	A measure of how disruption in one industry, region, or supply chain can constrain production and activity in other dependent industries.
Business Interruption	Any reduction in operational activity, production capacity, or revenue resulting from climate-related disruption.
Capital Flow Factor	A measure of the importance of financing and capital market relationships to the functioning of an industry or economic system.
Capital Resilience	The ability of a company, industry, or economy to absorb climate-related disruption and recover using available financial resources.
Chronic Hazard	A long-term climate-related change, such as increasing temperatures, changing precipitation patterns, or water stress, that gradually affects operations and asset performance.
Climate Scenario	A future climate pathway used to assess physical climate risks under different levels of global warming and emissions trajectories.
Climate Shock Scenario	A severe but plausible climate event used to estimate extreme or tail-risk outcomes.
Direct Loss	Financial losses arising directly from physical asset damage and operational disruption caused by climate hazards.
Discount Rate	The rate used to convert future financial impacts into present-day values.
Discounted Cash Flow Model (DCFM)	The valuation framework used to estimate the present value of future climate-related losses and impacts.
Downtime	The period of time when a business is non-operational.
Economic Dependency	The extent to which industries rely on goods, services, or inputs from other industries or regions.

Exposure Probability	A normalized measure indicating the likelihood that an asset will be exposed to a specific climate hazard.
Hazard	A physical climate phenomenon, such as flooding, heat stress, wildfire, water stress, or tropical cyclones, that has the potential to cause financial loss.
Hazard Contribution	The proportion of total physical climate risk attributable to a specific hazard.
Hazard Exposure	The extent to which an asset is subject to a particular climate hazard.
Indirect Loss	Financial losses arising from supply-chain impacts, economic disruption, or broader systemic effects associated with climate hazards.
Input-Output Model	An economic framework used to assess dependencies between industries and estimate indirect climate-related impacts.
Material Asset	An asset considered significant enough to contribute meaningfully to company operations, value creation, or climate-related risk.
Material Asset Archetype	A standardized asset classification used to represent groups of similar assets within the assessment.
Operational Capacity	The ability of an asset to perform its intended function and generate output relative to normal operating levels.
Physical Climate Risk	The potential for financial loss resulting from acute weather events and chronic climate changes that affect a company's assets, operations, or value chain.
Primary Asset	An asset that is fundamental to a company's core operations and revenue generation, such as factories, mines, power plants, data centers, or refineries.
Productivity Loss	The reduction in an asset's ability to generate goods or services as a result of climate-related disruption.
Production Constraint	The maximum achievable level of production after accounting for the effects of climate hazards.
RCP or Representative Concentration Pathways	Representative Concentration Pathways are climate change scenarios to project future greenhouse gas concentrations. **RCP 2.6 (Low Emissions Scenario):** A future where governments, companies, and societies take strong action to reduce greenhouse gas emissions. Global warming is kept relatively low, with temperatures expected to stay below 2°C above pre-industrial levels. **RCP 4.5 (Moderate Emissions Scenario):** A future where emissions continue to rise for a period but are gradually reduced through climate policies and technology improvements. Warming is higher than in RCP 2.6 but remains more controlled than in a high-emissions future.

	RCP 8.5 (High Emissions Scenario): A future with little action to reduce emissions and a continued reliance on fossil fuels. Greenhouse gas emissions remain high throughout the century, leading to the highest levels of warming and the most severe physical climate risks.
Recovery Curve	A representation of how operational capacity is restored over time following climate-related disruption.
Recovery Lag Factor	A measure of cumulative operational disruption that considers both the duration and severity of reduced operating capacity during recovery.
Recovery Time	The cumulative downtime, expressed in days, resulting from physical climate hazards that reduce asset output below 95% of normal production, relative to each asset's contribution to company revenue and is calculated based on the Recovery Lag Factor. Related to downtime.
Risk-Adjusted Revenue	Projected future revenue after accounting for expected climate-related losses.
Secondary Asset	An asset that supports core business operations but is not the primary source of production or revenue generation.
Sovereign Factor	A country-level adjustment reflecting macroeconomic conditions and resilience characteristics relevant to climate risk.
Systemic Vulnerability	The susceptibility of interconnected industries, supply chains, or economies to cascading climate-related disruptions.
Tail-End Risk	The financial impact associated with severe but plausible climate-related events represented by high-percentile outcomes.
Total Loss	The combined value of direct and indirect financial losses resulting from physical climate risk.
Weighted Average Cost of Capital (WACC)	The average cost of financing a company through debt and equity, used within valuation calculations.

Endnotes

1. NGFS Scenarios Explanatory Note on Damage Functions (Network for Greening the Financial System).
2. Improving Catastrophe Modeling for Business Interruption Insurance Needs (Rose & Krausmann).

Change Log

Version	Administrative Iteration	Date	Initiator	Main items that changed	Rationale
1.0	1	02/10/2026	ESG Methodology	Created Document	N/A
	2	11/11/2026	ESG Methodology	Updated to for structure and formatting	Alignment to Methodology documentation

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