frank bold

Climate Risk Assessment Guidance

This guidance has been published as a public consultation draft. We welcome feedback from the business and expert community and will update the document accordingly.

For more information, please visit www.frankbold.org.

June 2026

Table of contents

Introduction

Climate risk is the possibility that assets, sites, and business activities – in your own operations and across your value chains – are affected by climate-related changes. These may be physical, such as floods or droughts, or linked to the transition to a low-carbon economy, including new regulations, carbon pricing, and shifting legal or market conditions. Such risks can significantly affect business viability: companies dependent on fossil fuels may become unviable as decarbonisation accelerates, while assets in high-risk locations – such as areas prone to flooding or water stress – face growing exposure to damage and disruption.

This guidance is intended for professionals responsible for delivering climate risk assessments, such as sustainability officers and ESG managers, as well as for decision-makers who rely on climate risk information to inform strategy, including department directors and board members.

It supports the development of a robust assessment process by helping organisations apply appropriate methodologies, focus the scope effectively, and translate results into actionable insights. For larger organisations, it is particularly valuable in mapping and screening activities against climate risks, prioritising mitigation and adaptation measures, and demonstrating risk exposure and its effective management to investors. The aim is to move beyond a tick-box exercise and embed climate risk assessment into core strategic and operational processes.

Climate risk assessment and its importance for business

Climate risk is a crucial issue for both financial management and regulatory compliance. Financial institutions are increasingly aware of their exposure to climate risk and are integrating related expectations into their financing criteria and client engagement – lenders and investors, for example, typically expect identified risks to be addressed through mitigation and adaptation measures.

At the same time, climate risk disclosure is increasingly mandated by regulations across major jurisdictions, most notably the EU, UK, and California, as well as Japan, Australia, and China.

Climate risk assessment is a structured process to identify, analyse, and evaluate the climate risks to which an organisation, sector, or community is exposed.

A well-designed assessment creates value across the organisation by enabling:

- **Understanding risk and exposure:** Build a comprehensive view of risk by identifying exposures and data gaps, assessing data quality, and mapping known risks and uncertainties across short-, medium-, and long-term horizons.
- **Risk evaluation:** Assess the vulnerability of assets, sites, and business activities under different climate scenarios to estimate the magnitude of potential financial effects and inform decision-making (see Diagram 1).
- **Integration of results and prioritised action:** Embed findings into risk management, inform capital allocation and resilience planning, support transition strategies, meet regulatory and investor expectations, and drive action where risks are most concentrated.
- **Monitoring:** Continuously update the assessment with new data, track emerging risks, and feed insights into planning cycles.

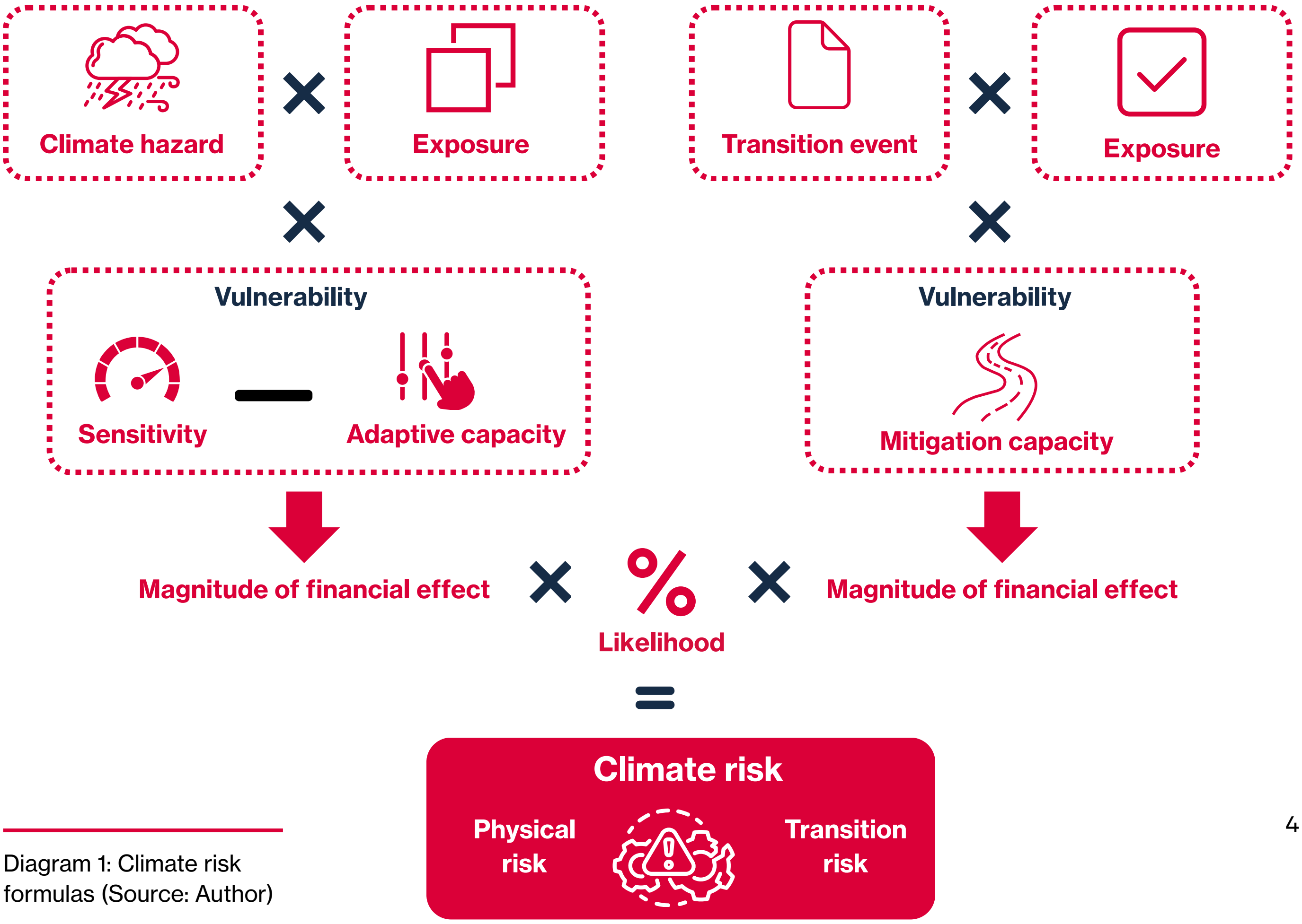


Diagram 1: Climate risk formulas (Source: Author)

For businesses, climate risk assessment is a means of generating decision-useful data on the current and future resilience of their business model. To be accurate and actionable, however, the assessment must be closely integrated with internal knowledge and decision-making at every stage.

Climate risk is assessed using spatial data, regulatory intelligence, market analysis, and detailed information on assets, sites, and economic activities, alongside scientific data on climate hazards and transition events. Specific methodologies are prescribed by a number of standards and frameworks, including the European Sustainability Reporting Standards (ESRS) and the International Organization for Standardization (ISO).

Navigating complexity in climate risk assessment

Climate risk assessment should be approached as a progressive and proportionate process, where the level of complexity and precision is carefully managed to maximise usability and decision value. A key success factor is gradual prioritisation and refinement: starting with a high-level screening to identify the most material risks and increasing the level of detail only where necessary. This incremental approach helps avoid unnecessary complexity and keeps efforts focused on decision-relevant insights.

Although climate risk assessment can involve complex statistical and scientific methodologies, it is becoming increasingly accessible to non-specialists. A growing number of expert organisations and research initiatives have translated complex climate data into user-friendly tools and platforms that enable companies to visualise and interpret risks without requiring advanced technical expertise. As a result, while companies have traditionally relied on external consultants, many are now able to conduct at least parts of the assessment in-house.

Climate risk assessment can be delivered at different levels of sophistication and should be tailored to the specific characteristics of the organisation. Those with simpler business models, limited asset exposure, or lower-risk profiles may rely on high-level screening approaches. Companies with more complex operations, geographically dispersed assets, or significant exposure to high-risk sectors are likely to require more detailed assessments. Applying proportionality in this way ensures the assessment remains both efficient and fit for purpose.

It is also important to balance the pursuit of precision with the inherent uncertainty of climate data and scenarios. Transparent assumptions and a focus on decision-useful outputs are more valuable than false accuracy. Emerging digital and AI-based tools can further support data processing, scenario analysis, and insight generation – enabling more efficient, scalable, and iterative assessments and helping to embed climate risk assessment into ongoing strategic decision-making.

Assessment process

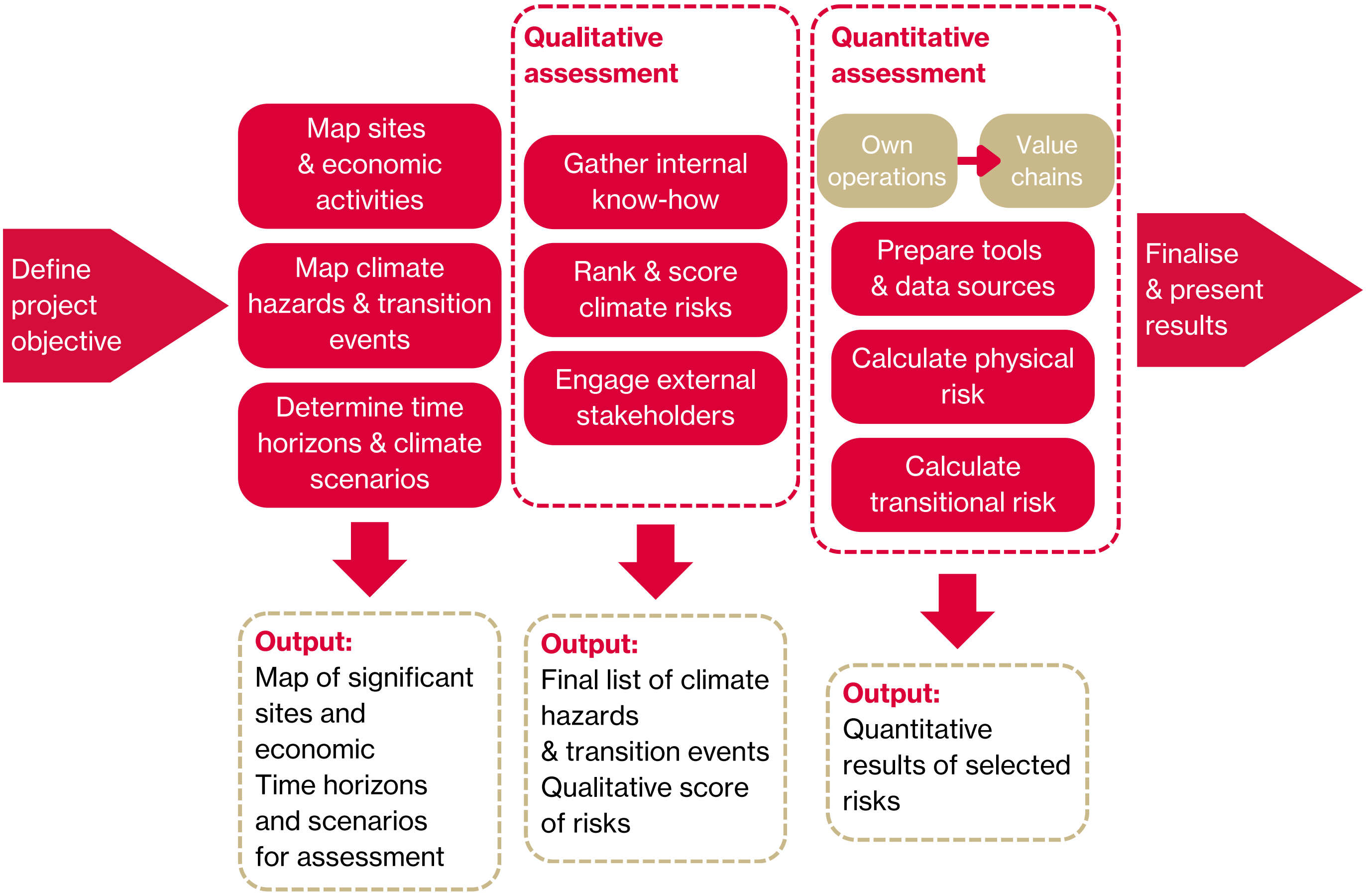


Diagram 2: Climate risk assessment process (Source: Author)

1. Definition of project objective and plan

Purpose: To define the rationale, scope, and ambition of the assessment – including the desired quality and depth of outputs – and clarify its relationship with other business functions and processes.

- The need for a climate risk assessment can be motivated by a range of factors – regulatory requirements, access to finance, planned investments, or internal management review – much like any other risk assessment. An assessment may also reveal that climate risk is a significant blind spot, which should be monitored alongside related issues such as medium- to long-term energy price forecasts that influence the likelihood and magnitude of climate-related impacts on the company.
- The objective determines key characteristics of the assessment, such as the business functions involved and the appropriate focus and depth. For example, a reporting assessment covers the full entity across all operations and value chains; an investment-focused assessment narrows to specific options with greater depth; and a supply chain due diligence assessment typically takes the form of a broad screening across multiple locations and sectors.
- Climate risk assessment is an ongoing, iterative exercise. Objectives and sub-objectives may evolve at different stages of the process and change over time.

- Every climate risk assessment should be embedded in business decisions and serve a clear purpose, which also determines the roles and responsibilities of those involved. It is most effective when it both informs and is informed by the processes for which it is directly relevant. For this reason, the exercise works best as an iterative process which engages all relevant internal stakeholders and includes a clear plan for updates and follow-ups.

In practice, this means that for many in-depth assessments, direct contact with smaller business partners may still be necessary – and, if conducted meaningfully, can serve as an entry point for constructive engagement throughout the due diligence process.

Output: A defined objective of the assessment, its rationale, and its relevance to broader business functions and processes.

2. Scoping

2.1 Mapping of sites and economic activities

Purpose: To prioritise and select key sites and economic activities across own operations and value chains, ensuring the assessment remains focused, manageable, and fit for purpose.

The assessment scope is not fixed: it can be broad and high-level, narrow and detailed, or combine both approaches. The right scope depends on the purpose – a first reporting iteration or blind-spot mapping calls for breadth; assessing financial exposure at specific high-risk sites requires depth.

Own operations

- Physical risk assessment focuses on selected site locations and assets; transition risk assessment focuses on economic activities, including their sector and jurisdiction. Specific assets may be selected for more detailed assessment of both physical and transition risk.
- Sites and economic activities in own operations are to be selected based on their significance – their financial value, contribution to the company's value creation process, and ease of replacement – using a pre-defined methodology and thresholds. Assets, sites, and economic activities that are not financially significant or that can be easily replaced may be excluded from the assessment scope.
- Economic activities should be identified in line with the company's primary activity and any other activities that contribute to value creation; for transition risk, they may also be aggregated into clusters, given that transition events typically apply across an entire jurisdiction or market segment.
- Where the list of sites and/or economic activities is extensive and resources are limited, prioritise the most significant assets, sites, and economic activities. Ensure, however, that no site, asset, or activity on which overall strategy, value creation, or key operational processes depend is excluded.

Output: A list of significant sites and assets, each with GPS/geolocation data (GPS-level where possible, country level as a minimum), and significant economic activities with a classification (ISO/NACE or equivalent).

Value chains

- Compile a list of all known suppliers and customers (or their relevant segments) and group them by location and any other relevant characteristic (e.g., supplier tier).
    - Material risks will often not be concentrated in Tier 1 – the most immediate suppliers or customers – so the broader value chain should be mapped accordingly.

- Select the most relevant suppliers and customers (or segments and groups as identified above) based on the significance of their contribution to business value and their ease of replacement.[1]
- Where sufficiently detailed data on suppliers or customers are lacking, map them at country or regional level and adjust the assessment accordingly. Where climate hazard data cannot be meaningfully aggregated at country level, apply a simplified but transparent estimation method. In subsequent updates, consider whether individual suppliers and customer segments warrant more detailed identification and assessment.

Output: A list of significant suppliers and customers or their segments with location (country level minimum; greater detail improves results) and each supplier's economic activity.

2.2. Selection of climate hazards and transition events

Purpose: To narrow the assessment scope by identifying the climate hazards, transition events, and trends most relevant to own operations and value chains, and mapping available data sources for each.

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water) Heat stress Temperature variability Permafrost thawing	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice) Precipitation or hydrological variability Ocean acidification Saline intrusion Sea level rise Water stress	Coastal erosion Soil degradation Soil erosion Solifluction
Acute	Heat wave Cold wave/frost Wildfire	Cyclone, hurricane, typhoon Storm (including blizzards, dust and sandstorms) Tornado	Drought Heavy precipitation (rain, hail, snow/ice) Flood (coastal, fluvial, pluvial, ground water) Glacial lake outburst	Avalanche Landslide Subsidence

Table 1: Classification of climate-related hazards (Source: Regulation EU 2020/852, 2020)

[1] Abandoning certain suppliers or geographies can have adverse socio-economic impacts, including job losses and weakened local economies. This risk should be considered as part of supply chain due diligence, with engagement or managed transition preferred over abrupt termination.

Type	Climate-related risks	Potential financial impacts
Transition risks	**Policy and Legal** • Increased pricing of GHG emissions • Enhanced emissions-reporting obligations • Mandates on and regulation of existing products and services • Exposure to litigation	• Increased operating costs (e.g. higher compliance costs, increased insurance premiums) • Write-offs, asset impairment, and early retirement of existing assets due to policy changes • Increased costs and/or reduced demand for products and services resulting from fines and judgements
	Technology • Substitution of existing products and services with lower emissions options • Unsuccessful investment in new technologies • Costs to transition to lower emissions technology	• Write-offs and early retirement of existing assets • Reduced demand for products and services • Research and development (R&D) expenditures in new and alternative technologies • Capital investments in technology development • Costs to adopt/deploy new practices and processes
	Market • Changing customer behavior • Uncertainty in market signals • Increased cost of raw materials	• Reduced demand for goods and services due to shift in consumer preferences • Increased production costs due to changing input prices (e.g. energy, water) and output requirements (e.g. waste treatment) • Abrupt and unexpected shifts in energy costs • Change in revenue mix and sources, resulting in decreased revenues • Re-pricing of assets (e.g. fossil fuel reserves, land valuations, securities valuations)
	Reputation • Shifts in consumer preferences • Stigmatization of sector • Increased stakeholder concern or negative stakeholder feedback	• Reduced revenue from decreased demand for goods/services • Reduced revenue from decreased production capacity (e.g. delayed planning approvals, supply chain interruptions) • Reduced revenue from negative impacts on workforce management and planning (e.g. employee attraction and retention) • Reduction in capital availability

Table 2: Classification of transition events and trends (Source: TCFD Implementation Guidance, 2021)

For each location or activity in own operations and value chains, select applicable climate hazards and transition events (see Tables 1 and 2 above) based on their general exposure and resource dependencies of those locations and activities. This determination should be based on informed judgment and kept proportionate – a quick review rather than an in-depth assessment.

Where relevance is clear – such as known patterns of extreme weather, existing legislation, or established customer expectations – the judgment can rely entirely on available internal knowledge. Where it is less obvious, a review of dedicated literature and tools specific to the relevant hazards and transition events should be carried out (see page 12).

For climate hazards, consider exposure and potential financial effects both today and across multiple future time horizons (at least to 2050), taking into account the vulnerability of sites and key assets based on their characteristics – such as their nature, long operational lifetime, or high value.

For example, the relevance of heatwave or flood exposure for buildings may not be immediately apparent, but the magnitude and likelihood of such hazards is projected to increase significantly in the coming decades.

For transition events, companies typically have good existing knowledge of their regulatory, technological, and market context. However, even well-informed organisations often underestimate climate-related risks, particularly those arising from value chains or expected to materialise over longer time horizons.

For each identified climate hazard and transition event, determine the available data sources and tools, and assess internal capacity to carry out quantitative analysis.

Data resources differ in nature between the two risk types:

- For climate hazards, relevant resources primarily consist of quantitative spatial data available through dedicated online databases and tools (see page 12).
- For transition events, resources are more varied – ranging from qualitative sources such as policy and regulatory documentation, to mixed sources such as market and technology analyses by specialist agencies such as the International Energy Agency, to quantitative data on modelled carbon and energy prices for specific sectors and jurisdictions (see page 12).

Output: A list of climate hazards, transition events, and trends to which key sites, assets, and economic activities are exposed, including the dependencies explaining that exposure, data sources used, and an indication of whether quantitative analysis is feasible. This list, together with all supporting information, feeds into both the qualitative and quantitative assessment stages.

Physical risk data resources

Raw climate hazard data consist of complex quantitative time series spanning multiple variables, percentiles, years, and scenarios. To make this data accessible for practical use, scientists and expert organisations have developed online tools that process, structure, and visualise it spatially or in diagram form.

The following are among the most reputable resources presenting data across key climate hazards in an accessible way:

- European Climate Data Explorer by EEA Climate ADAPT – online platform for visualising climate hazards across time horizons and scenarios; EU data at NUTS-2 regional level, with access to source data.
- Copernicus Interactive Climate Atlas – analytical tool providing access to a wide range of climate hazard variables, covering historical data and all climate scenarios by the Intergovernmental Panel on Climate Change (IPCC) for individual EU countries and global regions; spatial data and numerical time series available for export.
- Global Resilience Index (GRI) Risk Viewer – global visualisation tool covering selected climate hazards as well as some exposure and vulnerability data; data downloads available for some hazards and countries.
- NGFS Climate Impact Explorer – visualisation tool presenting a range of climate hazard indicators by map and diagram, covering most countries and some provinces globally across Network for Greening the Financial System (NGFS) climate scenarios; data available for export.

Examples of tools and platforms covering specifically water-related climate hazards:

- EEA Flood Risk Areas Viewer – EU map of flood risk areas by river, with access to national-level data.
- WRI Aqueduct Floods and Aqueduct Water Risk Atlas – global visualisation tools for flood and water risk across time horizons and scenarios, with access to source data.
- WWF Water Risk Filter – global water risk data across time horizons and scenarios, with access to source data.

Other climate hazards are covered by dedicated platforms. Several EU member states also have localised tools – for example, CLIMRISK covers the Czech Republic and the broader Central European region.

Transition risk data resources

Policies and regulations in EU jurisdictions:

- EU Green Deal webpage – a cross-cutting resource covering sustainability-related laws, policies, and funding programmes across sectors and policy areas.
- National Energy and Climate Plans (NECPs) – database of climate plans for all EU Member States for 2021–2030, covering national climate targets, progress assessments, and implementing policies and measures; first versions submitted in 2019, updated in 2025.
- National Long-Term Strategies (LTS) – database of EU Member State strategies for achieving climate neutrality by 2050, covering targets, policies and measures, progress assessments, and expected socio-economic impacts; to be read alongside NECPs, with which they are required to be consistent.

Policies and regulations globally:

- Climate Policy Database – database of over 6,700 policies from 198 countries, searchable by policy name, sector, type (e.g. renewables, energy efficiency), country, and decision date; includes policy summaries, key characteristics, and source links.
- Oxford Climate Policy Monitor – annual assessment of climate policies from 37 jurisdictions and their alignment with global goals, across six domains (carbon credits, climate-related disclosure, green prudential rules, methane abatement, public procurement, and transition planning); each policy and domain assessed for ambition, stringency, implementation, and comprehensiveness.

Quantitative data, including carbon and energy prices:

- NGFS Phase 5 Scenario Explorer – analytical tool providing diagram visualisation and data export for modelled carbon prices, energy market variables, and other macroeconomic indicators across NGFS climate scenarios; registration required but free of charge.
- World Bank Carbon Pricing Dashboard – current and historical carbon market data, including pricing and market characteristics, across carbon markets globally.
- Trading Economics – current and historical EU carbon permit prices, alongside a broad range of other macroeconomic data.

Data on market and technology-related transition risks tend to be jurisdiction- and sector-specific and are often available through commercial providers.

*All resources are free of charge

2.3 Selection of time horizons and climate scenarios

Purpose: To select time horizons and climate scenarios against which risks will be assessed.

- Based on available data on climate hazards and transition events, and the nature and expected lifespan of assets, sites, and economic activities, determine the time horizons and scenarios to be applied in the assessment.
- Climate risk is typically assessed across short (e.g., 1 year), medium (e.g., 2030–2035), and long (e.g., 2050–2055) time horizons. This approach is standard for physical risk. For transition risk, qualitative assessment may focus on a shorter timeline, as transition events can be difficult to predict beyond a five-year horizon; however, quantitative transition risk data — such as carbon prices — are generally available over longer horizons as well. Physical hazards are most material over 20+ year time horizons, so long-term horizons must be included in physical risk assessment.
    - Where greater precision is needed, time horizons should be aligned with the expected lifetime of sites, assets, and economic activities, as required by some regulatory and market standards. For example, an asset expected to retire before 2050 need not be assessed for climate hazard exposure beyond 2050.
- Select climate scenarios from those established by the IPCC and the NGFS.
    - Physical risks are to be assessed using at least the IPCC high-emission scenario equivalent to RCP 8.5 or SSP5-8.5, which provides a high-impact stress test for physical hazards. Transition risks are to be assessed using at least a 1.5°C-compatible scenario such as the NGFS Net Zero 2050 scenario, which reflects the most demanding decarbonisation trajectory and far-reaching policy, market, and technology shifts.

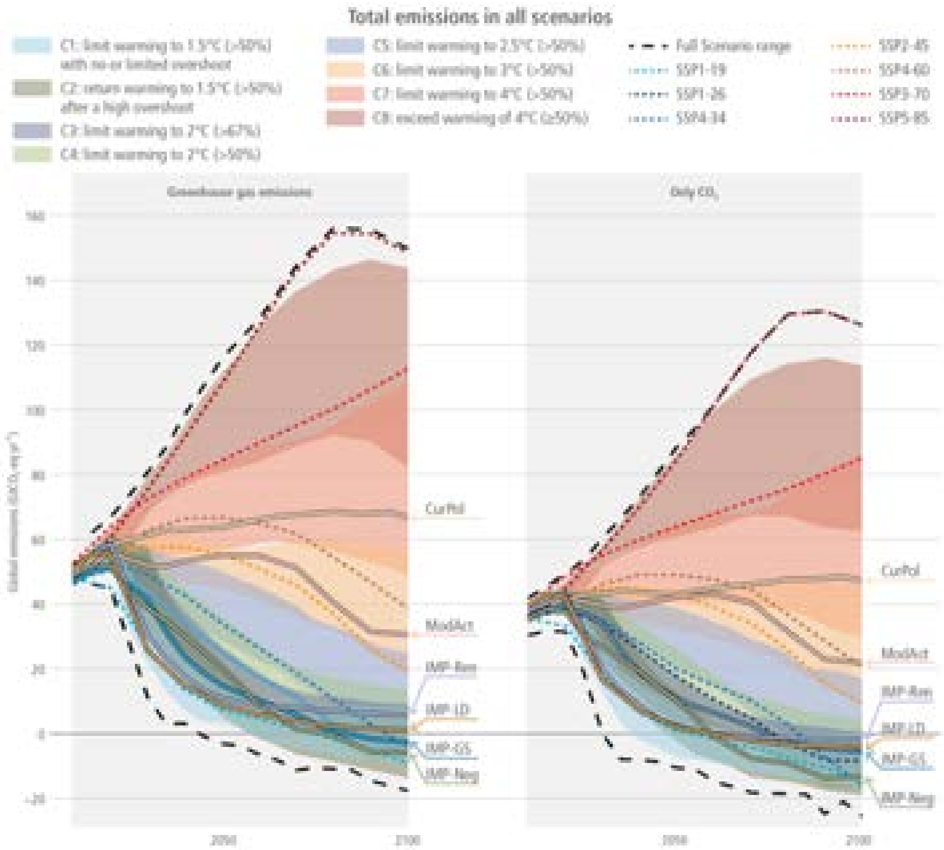
Output: The time horizons and climate scenarios against which risks will be assessed.

Climate scenarios

Climate scenarios model possible futures based on varying levels of greenhouse gas concentrations in the atmosphere, shaped by political decisions, international cooperation, and economic and technological development. They range from low-emission pathways — such as SSP1/RCP 2.6*, which limits warming to below 2°C by 2100 — to high-emission ones such as SSP5/RCP 8.5, which projects a rise of up to 5°C above pre-industrial levels. Higher-emission scenarios are associated with more severe physical hazards and greater physical risk; more policy-ambitious scenarios reflect more demanding decarbonisation trajectories and carry higher transition risks.

Market and regulatory standards typically prescribe which climate scenarios should be used to ensure a credible climate risk assessment. For instance, the European Sustainability Reporting Standards (ESRS) require the use of the high-emission scenario (RCP 8.5 / SSP5-8.5) for physical risk assessment, and a high policy ambition scenario targeting net zero by 2050 for transition risk assessment. In practice, the choice of scenario directly shapes the level of climate hazards and transition events reflected in the assessment. Higher-emission scenarios translate into higher mean temperatures and more severe floods or droughts; policy-ambitious scenarios translate into stricter decarbonisation policies, faster technological change, and higher carbon prices. Most data resources allow users to switch between scenarios to obtain the relevant data for each assessment.

The primary scenario frameworks are established by the IPCC – which <u>publishes</u> the RCP and SSP pathways used across scientific and regulatory contexts – and the NGFS, which *<u>translates</u>* these into policy-economic scenarios tailored for risk assessment by companies and financial institutions.



(Source: IPCC AR6, 2022)

** Each scenario is characterised by a combination of Representative Concentration Pathways (RCPs), Shared Socioeconomic Pathways (SSPs), technological advancement trajectories, climate policy projections, and consumer behaviour trends.*

3. Assessment

3.1 Qualitative assessment

Purpose: To apply internal expertise to validate and prioritise the list of climate hazards and transition events, identify blind spots, and score each item according to the assessment methodology.

Engaging internal stakeholders at this stage is critical, as their involvement determines how effectively assessment results are taken up across the organisation.

1 Gathering internal know-how

- Convene relevant internal stakeholders, including colleagues from Finance, Risk, Sustainability, and others with specific knowledge of relevant climate hazards, transition events, and trends, as well as representatives of senior management.
- Engagement may take the form of a single multi-stakeholder meeting or separate sessions by stakeholder group. Meetings may also be organised separately for physical and transition risks, to involve the most relevant colleagues for each area.
- Together with internal stakeholders, review the list of selected climate hazards and transition events, gather insights on potential blind spots, and identify any items that may be irrelevant.

Output: Feedback from internal stakeholders on the list of selected climate hazards and transition events, including identified blind spots.

2 Scoring of climate hazards and transition events

- Using the calculation variables from the quantitative assessment methodology (see 3.2. Quantitative analysis) and drawing on internal knowledge, assign scores to all identified climate hazards and transition events in own operations and value chains. Scores may be assigned to the overall risk, to magnitude and likelihood separately, or to each individual risk component separately (sensitivity, adaptive/mitigation capacity, exposure, hazard/event, and likelihood), depending on data quality, resources, and capacity.
- Where possible, score climate hazards and transition events comparatively rather than in isolation – benchmarking against each other helps organisations with limited prior experience arrive at more meaningful and consistent results.
- Record any relevant internal knowledge, previous experience, and existing mitigation and adaptation measures.

Output:
A scored list of climate hazards and transition events, with notes on past experience and existing adaptation and mitigation measures.

3 External stakeholder engagement

- Where useful, the results of the internal stakeholder review may be shared with relevant external stakeholders for additional input and review.
- Relevant external stakeholders may include, among others, academic researchers, policy experts, technical practitioners (such as engineers or legal specialists), NGOs, and local communities.

Output: Additional feedback from external stakeholders.

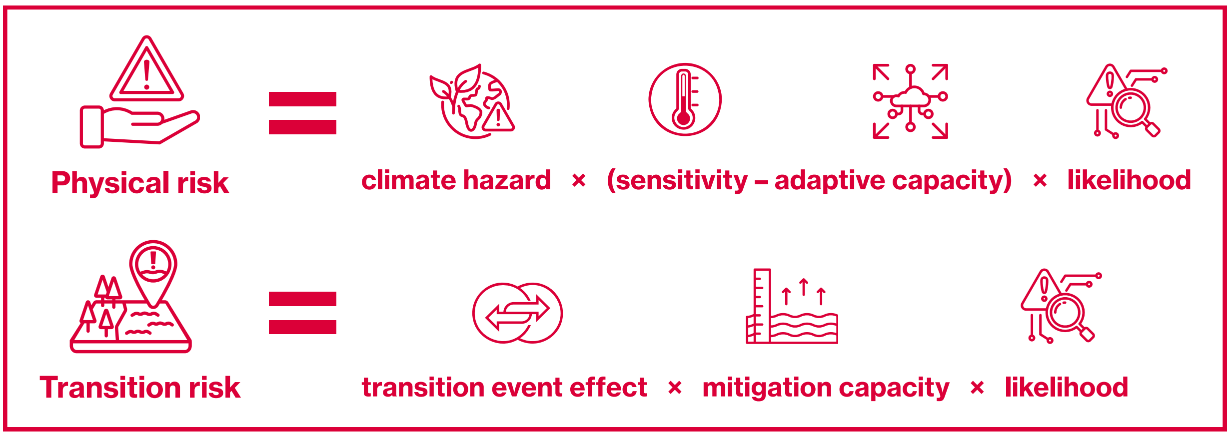


Diagram 3: Calculation formulas for physical and transition risk (Source: Author)

3.2 Quantitative analysis

Purpose: To estimate the financial effects of climate hazards and transition events that can be reasonably quantified. The feasibility of quantification depends on the availability of data and tools for each hazard and transition event.

Own operations

1 Preparation of data resources and tools

- Draw on the data resources identified in 2.2. Selection of climate hazards and transition events. Some resources cover multiple hazards or transition trends, but several will typically be needed to cover all identified items.
- Ensure data granularity matches the level at which the assessment is meaningful:
  - Physical risks in own operations are to be analysed at site level where possible, or at least at local regional level (e.g. NUTS-3).
  - For transition risks, jurisdiction-level granularity is typically appropriate for policy and regulatory developments (both national and EU level for companies operating in the EU), while market-segment level applies to technology and market trends – reflecting the fact that transition events generally affect an entire jurisdiction or market segment.
  - Where data are unavailable at the required granularity, either proceed with available data and document the limitations, or exclude that hazard or transition event from this iteration and revisit data availability in the next update.
- A complete analysis will typically draw on the following tools and resources:
  - *Asset, site, and economic activity data* – location, nature, technical characteristics, financial and/or production value, and any other information needed to determine exposure and vulnerability.
  - *Online data platforms* – websites offering processed, structured data that can be used directly without further statistical analysis. For physical risks, this includes spatial data on climate hazard and their location across time horizons and scenarios. For transition risks, qualitative data such as policy documentation is available via dedicated databases, while quantitative data will typically require some level of statistical exercise.
  - *Statistical analysis software* – required where online tools are unavailable, or where a more advanced assessment is needed at a finer spatial resolution than online tools provide (which are often limited to NUTS-3 or coarser).
  - *A calculation spreadsheet* – incorporating risk calculation formulas and capturing outputs alongside supporting information such as site coordinates, data sources, and limitations.

2 Calculation of physical risk for each climate hazard

- Physical risk calculations are to cover the exposure of assets and sites to each climate hazard, the potential magnitude of that hazard at the relevant location, and vulnerability – comprising the sensitivity of assets and their capacity to adapt – in line with ESRS, ISO 14091:2021, and other applicable standards.

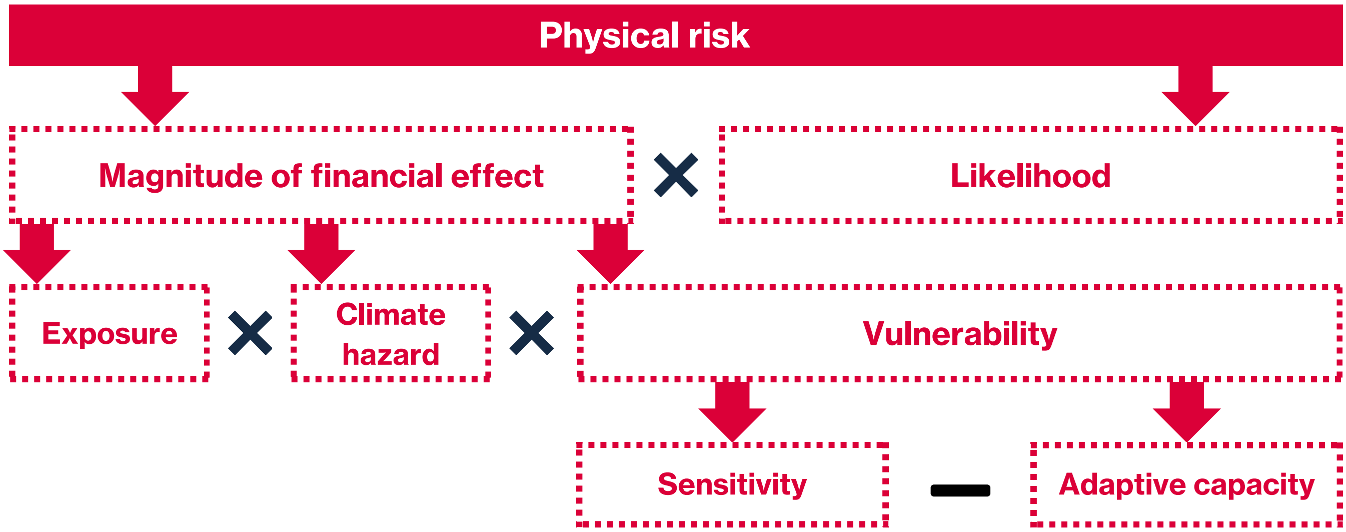


Diagram 4: Calculation of physical risk (Source: Author)

a. Calculation of exposure and climate hazard

- *Climate hazard* – the magnitude of the climate hazard at the relevant location, expressed in a unit specific to that hazard (e.g. heatwaves measured as number of days above 30°C); to be taken directly from a dedicated data resource or derived through statistical analysis.
- *Exposure* – the proportion of a site's area or value expected to be affected by the climate hazard, expressed as a percentage; to be measured using the spatial overlap between the site and the hazard-affected area, incorporating any additional information needed to determine exposure at asset level and account for asset value.

Calculations are to be carried out across the time horizons and scenarios selected in the previous step, in order to capture expected physical risk across a range of possible futures (see Section 2.3).

b. Estimation of vulnerability

Vulnerability is to be calculated as sensitivity reduced by adaptive capacity:

- *Sensitivity* – the extent of harm or financial loss expected if a site is affected by one additional unit of the climate hazard (e.g. one additional metre of flooding), typically expressed as a proportion of asset value lost; to be estimated based on informed judgment or asset-specific technical information.
- *Adaptive capacity* – the degree to which a site or asset is protected against a climate hazard by existing adaptation measures, including measures implemented by external parties (e.g. flood barriers constructed by local government); expressed as the proportion by which sensitivity is reduced, and estimated based on informed judgment or measure-specific technical information.

c. Estimation of the likelihood of climate hazard materialisation

- Likelihood is to be estimated by informed judgment, taking into account the level of certainty of data inputs and expert consensus on the probability of different climate scenarios materialising.

3 Calculation of transition risk for each transition event

- Transition risk is generally more complex to quantify than physical risk, owing to the wider variety of transition events, the differing ways in which they affect a company, and the varying feasibility of quantification.

Assessment of some transition risks will therefore rely on qualitative scoring rather than quantitative analysis.

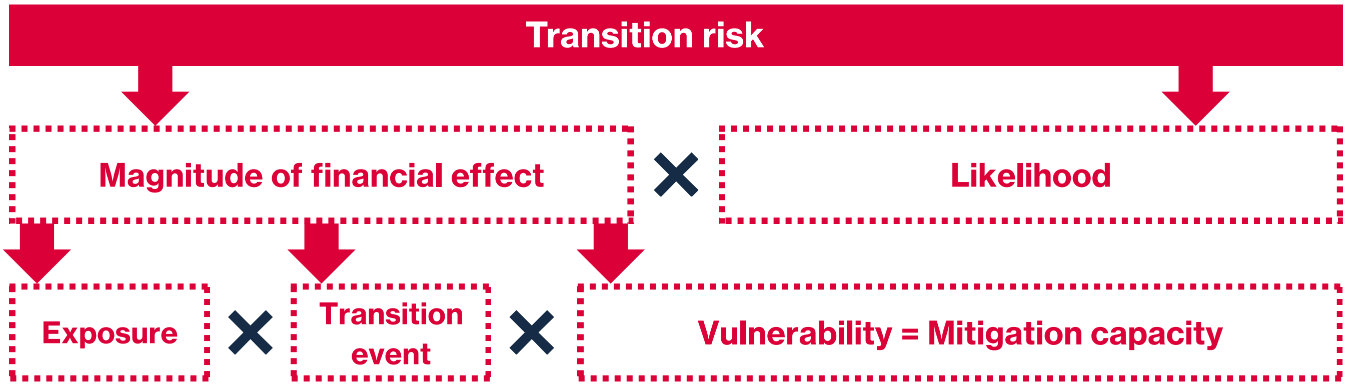


Diagram 5: Calculation of transition risk (Source: Author)

a. Calculation of exposure to and effect of a transition event

- *Effect of the transition event* – the financial impact of a new policy, regulation, technology, or shift in consumer behaviour, expressed as a cost or change in market value and position (e.g. cost of GHG emission permits, litigation penalties, cost of adopting new technology, or lost revenues due to changed customer or end-user perception). The effect can be quantified using a composite carbon price reflecting the combined impact of policy, technological, and market changes as modelled for a given sector and jurisdiction – as provided by the NGFS Scenario Explorer (see page 12). This approach captures the financial effects of transition risk in both own operations and value chains.
- *Exposure* – the extent to which a transition event applies to a given economic activity, which will vary by event type: policies apply across entire jurisdictions, market changes affect the market segment as a whole, while exposure to carbon costs is determined by the volume of the company's GHG emissions.

A more detailed analysis may also be conducted by examining the specific facts and circumstances of the company's assets or activities that give rise to carbon-related costs – such as emission permit prices, energy prices, or commodity prices. For instance, for own operations, direct emission permits are the primary applicable cost (e.g. ETS I for the EU market).

Calculations are to be carried out across the time horizons and scenarios selected previously, in order to capture expected transition risk across a range of possible futures.

b. Estimation of vulnerability

- Vulnerability to transition risk equals mitigation capacity[2]:
  - *Mitigation capacity* – the extent to which the effect of a transition event is reduced by existing mitigation measures[3], expressed as the proportion of the effect being reduced (e.g. reduced GHG emissions within the scope of emission permit payments); to be quantified using dedicated methods or estimated by informed judgment.

c. Estimation of the likelihood of transition event materialisation

- Likelihood is to be estimated by informed judgment, taking into account the level of certainty of data inputs and expert consensus on the probability of different climate scenarios materialising.

Value chains

The quantification of financial effects from climate risk in value chains follows the same principles as for own operations. The key difference is that less precise and reliable data are typically available, and the assessment should be designed accordingly.

1 Preparation of tools and data resources

- The same set of tools used for own operations may be applied to value chain analysis.
- Given that the geographies and jurisdictions involved in value chains are likely to differ from those in own operations, different climate hazards and transition events may be relevant, and different data resources may be needed. Physical risk analysis in value chains does not require the same level of granularity as in own operations – sub-regional or country-level data will often be sufficient, depending on the company's needs.

2 Calculation of physical and transition risks

- Physical risk exposure in value chains is to be assessed at a less detailed level of granularity than for own operations.
- Transition risk calculations may take into account emission permits on Scope 2 and/or Scope 3 emissions (e.g. ETS II for the EU market), energy costs, cost of capital (e.g. financing spreads or insurance premium increases due to transition risks), and import levies on carbon-intensive commodities (e.g. the Carbon Border Adjustment Mechanism for the EU market).
- As the estimation of vulnerability requires detailed knowledge of assets, sites, and economic activities, a precise analysis requires data from suppliers. Where such data are not readily available, secondary information and generalised assumptions based on sector and jurisdictional averages and expert resources should be used.

Output: A spreadsheet of quantitative results, presented per variable and aggregated across climate hazards and transition events in own operations and value chains, including key assumptions and limitations.

4. Finalisation and presentation of results

Purpose: To synthesise assessment results into a clear and structured final format, tailored to the intended audience and use.

- Physical and transition risk results may be aggregated or disaggregated across the variables used in the calculation methodology (e.g. magnitude and likelihood), depending on the intended use. For example, results included in a sustainability report may be aggregated or, conversely, presented in disaggregated form – but only to the extent that relevant information remains visible to the intended audience.

[2] Sensitivity to transition risk is disregarded. Once an asset or activity is exposed to a transition event, its effect transmits entirely – i.e. sensitivity always equals 100%. This is consistent with the TCFD framework.
[3] As with adaptive capacity for physical hazards, mitigation capacity is to be measured in "gross" terms – only measures already implemented are considered relevant for the calculation; planned measures are excluded.

Climate-related opportunities

While climate risk assessment focuses primarily on identifying and assessing threats to business strategy and financial performance, the process naturally brings to the surface climate-related opportunities. The TCFD framework recognises five opportunity categories – resource efficiency, energy source, products and services, markets, and resilience – each with potential to generate cost savings, new revenue streams, or improved market positioning.

In practice, the same analysis used for transition risks will reveal where a company is well-positioned relative to shifting market demand, favourable policy incentives, or the growing need for low-carbon solutions.

Opportunities are therefore not a separate workstream but an innate output of a rigorous risk assessment: understanding where a business is exposed also clarifies where it stands to benefit. Market and regulatory standards encourage companies to disclose material opportunities alongside risks, though the depth of opportunity analysis will naturally reflect the sector and business model in question.

Use of climate risk assessment results

For climate risk assessment to deliver real value, its findings must be actively used and the assessment integrated into broader organisational processes and decision-making (see Diagram 6). It both informs and is informed by strategic planning, materiality assessment, GHG accounting, and transition planning, creating strong interlinkages across risk, strategy, and sustainability functions.

- It is a signpost for risk and ESG management: it enables identification of blind spots and supports monitoring of risks over time. Climate risk assessment is first and foremost a prioritisation exercise, and on its own is not expected to produce precise figures for financial gain or loss. For example, a company may discover through the climate risk assessment that its supply chain has significant untracked climate exposure in certain sourcing regions – a blind spot that, together with other inputs, triggers a structured review of supply chain management.

- Climate risk assessment informs resilience analysis – that is, assessing the robustness of the business strategy under different climate scenarios. For example, the results can help management decide on the right moment to commit capital to new low-carbon technologies: investing early enough to remain competitive, but with clarity on what triggers that decision.

- The results inform mitigation and adaptation strategies: findings can be translated into concrete transition (decarbonisation) and adaptation plans to manage risks and capture opportunities, and support the long-term resilience of the business. For example, if the climate risk assessment identifies significant physical risk to the company's building stock under future climate conditions, this can directly inform a prioritised building modernisation and adaptation plan – determining which sites to upgrade first and to what standard.

- Climate risk assessment is shaped by the materiality assessment for reporting purposes and vice versa: the identification of material climate-related risks and opportunities determines the focus areas and serves as an initial input into the identification of climate risk; climate risk results in turn help refine the identification and prioritisation of material information. For example, if water stress emerges as a significant risk in the climate risk assessment, this may elevate water as a material topic, warranting greater focus and detail in disclosures and in the next materiality assessment.

The process is iterative and cyclical: monitoring of climate targets and performance feeds back into the materiality assessment and triggers regular updates of the climate risk assessment, ensuring alignment with evolving risks and strategy.

Diagram 6: Business functions working with climate risk (Source: Author)

Acronyms

CSRD = Corporate Sustainability Reporting Directive
ESG = Environmental, Social and Governance
ESRS = European Sustainability Reporting Standards
ETS = Emissions Trading System
EU = European Union
GHG = Greenhouse Gas
GPS = Global Positioning System
IPCC = Intergovernmental Panel on Climate Change
ISO = International Organization for Standardization
NACE = Nomenclature of Economic Activities
NGFS = Network for Greening the Financial System
NGO = Non-Governmental Organisation
NUTS = Nomenclature of Territorial Units for Statistics
RCP = Representative Concentration Pathway
SSP = Shared Socioeconomic Pathway
TCFD = Task Force on Climate-related Financial Disclosures
UK = United Kingdom

frank bold

Authors:
David Němeček, *Senior Sustainable Finance Expert*
Filip Gregor, *Head of Responsible Companies Section*

Acknowledgements:
We would like to thank Jakub Červenka from Theia Finance Labs for his contribution to this guidance.

Supported by:

Federal Ministry
for the Environment, Climate Action,
Nature Conservation and Nuclear Safety

European
Climate Initiative
EUKI

on the basis of a decision
by the German Bundestag