



From risk to resilience: managing physical climate risks

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EXECUTIVE SUMMARY

Current Practice: Climate change is often treated as a compliance issue rather than a critical business risk with cost implications.

Key Challenge: The lack of probability data makes it difficult to prioritize climate risks using conventional risk management methods.

Our Solution:

- Selection of risks that are currently rated high or very high or which are expected to be high or very high in the near future
- Estimation of probability for the selected risks, where feasible
- Financial assessment of the selected risks
- Integration of the selected risks into the Enterprise Risk Management (ERM) system for integrated management of all business risks

Benefit:

- Holistic assessment of all business risks (including climate risks)
- Targeted and efficient resource allocation
- Identification and prioritization of effective measures for risk mitigation



TABLE OF CONTENTS

1

Embedding Climate Resilience into Corporate Strategy
PAGE 4

1.1 Climate Resilience as a Strategic Imperative
PAGE 5

2

The Challenge Associated with Applying Climate Risk Analysis Results
PAGE 6

2.1 Definition of Physical Climate Risk
PAGE 8
2.2 The Challenge
PAGE 8

3

Managing Climate Risks
PAGE 9

3.1 Climate Risks versus Other Corporate Risks
PAGE 10
3.2 Prioritization of Climate Risks for Integrated Risk Management
PAGE 11

4

From Risk Management to Resilience
PAGE 12

4.1 Identification of Risk Mitigation Measures
PAGE 12
4.2 Distinction from conventional Risk Management
PAGE 13

5

Outlook
PAGE 14



1

Embedding Climate Resilience into Corporate Strategy

1.1 Climate Resilience as a Strategic Imperative

The climate crisis is increasingly becoming a central economic challenge. Climate change is resulting in weather events, such as heatwaves and droughts, which will become more frequent and more severe, while also driving long-term changes to the Earth's physical environment, such as sea level rise. For businesses that are not resilient to climate change, these changes will increasingly result in business costs, disruptions or even business failure. At the same time, stakeholder expectations and regulatory requirements are intensifying.¹ Organizations are under growing pressure not only to disclose climate-related risks but also to demonstrate their ability to withstand and adapt to them. In this context, resilience is no longer optional – it is a strategic necessity to safeguard long-term value creation and maintain competitiveness.²

Climate resilience refers to a company's ability to anticipate, absorb, and adapt to climate-related shocks while continuing to operate.³ Yet many organizations have not achieved this level of resilience due to substantial challenges.⁴ To build true resilience, companies must begin by placing climate risks alongside other material risks, whether within an existing enterprise risk framework or through a structured comparison. Resilience depends on a holistic view of all relevant risks, enabling organizations to evaluate, prioritize, and allocate resources effectively.

Unlike other corporate risks, climate risks are determined over longer time horizons based on complex scenarios, are characterized by higher uncertainty and can escalate rapidly due to tipping points. In addition, limited resources force companies to make difficult choices about which risks and risk mitigation measures to prioritize.

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Businesses that fail to adapt to climate risks could lose up to 7% of earnings every year by 2035.⁴

¹ Cadez, S., Czerny, A., & Letmathe, P. (2018). Stakeholder pressures and corporate climate change mitigation strategies. *Business Strategy and the Environment*, 1-14.

² Huiskamp, U., ten Brinke, B., & Kramer, G. J. (2022, January 25). The climate resilience cycle: Using scenario analysis to inform climate-resilient business strategies. *Business Strategy and the Environment*. 1763-1775.

³ EcoMap Research Team. (2025, April 2024). EcoMap. *What Is Climate Resilience? Understanding Carbon Cost Exposure and Performance Under Climate Risk*.

⁴ Chen, D., & Einhorn, G. (2025, June 24). World Economic Forum. *The resilience imperative: Why companies must adapt to a +1.5 degrees world*.

To address these challenges, this paper seeks to answer two key questions:

1

How can organizations effectively compare climate risks to other corporate risks, so that they can be managed in an integrated fashion?

2

How can organizations effectively select, prioritize, and implement climate risk mitigation strategies – and in what ways does this identification process differ from conventional risk mitigation approaches?

To answer these questions, we first focus on physical climate risks and their integration into enterprise risk management, providing a structured approach to identifying and prioritizing risks. Building on this foundation, we then move from risk identification to action: selecting, prioritizing, and implementing mitigation strategies that transform risk management into resilience – emphasizing the differences in identifying mitigation measures in conventional risk management and climate risk management.



2

The Challenge Associated with Applying Climate Risk Analysis Results

2.1 Definition of Physical Climate Risk

There are two types of climate risks:

physical risks and transition risks.

In this white paper, we focus exclusively on physical climate risks.

Unlike conventional risks, physical climate risks are not commonly estimated based on probability and impact, even though some disclosure standards imply that this may be the case (refer for example to ESRS E1, AR11 c) or IFRS S2 25 (a) iii). Rather, physical climate risks are defined as:

Climate Risk = Hazard × Exposure × Vulnerability

Hazard

refers to the climate-related event itself, such as drought and flooding (acute, short-term) or sea-level rise (chronic, long-term).

Vulnerability

refers to the propensity of human beings and assets to suffer adverse effects when impacted by hazard events.⁶

Exposure

refers to the presence of people, assets, infrastructure, or ecosystems in locations that could be adversely affected by climate-related hazards.⁵

⁵ IPCC. (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. Cambridge: Cambridge University Press.

⁶ Cardona, O.-D., van Aalst, M. K., Birkmann, J., & Fordham, M. (2012). *Determinants of Risk: Exposure and Vulnerability*. IPCC. Cambridge: Cambridge University Press.

The climate risk assessment process usually begins with defining the locations for which the climate risks are to be determined and with identifying the hazards to be investigated, i.e. the hazards that are likely relevant to the location. In Germany, for instance, relevant physical hazards include droughts, heatwaves, and flooding.

To understand the hazard level at a specified location, one or more scenarios are then selected. With the help of computer models, the level of the selected hazards at the specified location can then be determined. This step relies on the quality of the underlying data and models. While many data providers offer tools for this purpose, it is essential

to understand how these models work and what assumptions they make. Simplified models may significantly misrepresent actual risk levels, underscoring the need for careful evaluation and expert guidance. A recent study found significant variation in both hazard and damage estimates across physical risk data vendors.^{7,8}

Once the hazard level is known, the exposure of the relevant elements at the location in question (assets, people etc.) can be determined. Once exposure is understood, the vulnerability to the hazard can be determined. As per the formula shown above, the risks at a specified location can now be calculated for each hazard.

2.2 The Challenge

The above approach does not provide an indication of the likelihood of a hazard occurring. Climate models are based on future scenarios. However, these climate models typically do not provide annual frequencies of events. Converting model outputs into estimates of frequencies for complex climate hazard events isn't trivial.⁹ This white paper provides a simplified method to deal with this challenge.



⁷ Paisley, J. & Nelson, M. (2025). *A Risk Professional's Guide to Physical Risk Assessments*

⁸ EY has developed its own, third party reviewed, climate risk tool, the "EY Climate Analytics Platform" (EY CAP). We use EY CAP to help clients assess climate hazards and analyse climate risks.

⁹ Wong, T. & Switzer, P. (2024). *Estimating future local climate hazard probabilities*

3

Managing Climate Risks

3.1 Climate Risks versus Other Corporate Risks

According to the World Economic Forum, the failure to mitigate climate change and the insufficient adaptation to its consequences are among the two greatest global risks in the coming years.¹⁰ Despite the growing relevance of climate risks, many companies face significant challenges in addressing them.

In many organizations, the assessment of climate risks is handled within sustainability or compliance departments, where they are primarily treated as reporting obligations. This often overlooks the fact that climate risks go far beyond regulatory requirements: they affect nearly all areas of business and are closely linked to operational, financial, strategic, and reputational risks. Moreover, climate risks can amplify existing risk types, for example when floods disrupt supply chains and thereby intensify operational risks.

Conceptual and structural differences between climate-related and conventional business risks also make it difficult for organizations to translate climate threats into quantifiable business impacts.

To manage climate risks alongside other corporate risks (e.g., through integration into an Enterprise Risk Management framework), it is useful to understand the similarities and differences between climate and other business risks. Both types of risk typically refer to events that negatively affect a company's financial, operational, compliance, or strategic performance and ultimately threaten its stability, objectives, or reputation. However, conventional business risks are often discrete, quantifiable, and assessed over short to medium time horizons (one to five years), and may be evaluated based on historical events and probabilistic models. In contrast, climate risks are often systemic rather than isolated,

affecting entire regions, sectors, or supply chains, and require scenario-based modeling to account for complex and evolving climate dynamics. They are also typically assessed over longer time horizons (e.g., 2050 and beyond). These differences complicate direct comparison and integration into existing risk management systems and highlight the need for a practical approach.

These conceptual differences also influence how each type of risk is approached in practice. Both types of risks consider financial and operational consequences. However, corporate risk management typically focuses on estimating the probability and impact of specific events. In contrast, climate risk management, as explained in the previous chapter, requires an understanding of the hazard, the exposure of assets or people to the hazard, and their vulnerability.

¹⁰ *The Global Risks Report 2023, World Economic Forum*

3.2 Prioritization of Climate Risks for Integrated Risk Management

Given the lack of probability associated with climate risks (refer Chapter 2.1 above), the next challenge lies in determining which climate risks should be prioritized. Prioritizing risks is important because companies operate with limited resources and typically cannot address all risks simultaneously. A structured prioritization process ensures that attention is focused on the most immediate threats, allowing for efficient allocation of mitigation efforts.

It also helps to avoid overlooking risks that may not yet be fully understood but could escalate rapidly.¹¹ However, unlike other risks, climate risks are typically not determined by multiplying impact and likelihood. As a result, it is not possible to prioritize risks simply on the basis of these factors. In particular, it is not easily possible to associate likelihood with a specific climate risk. This makes it difficult for a business to identify the most critical climate risks to address first.

To enable this prioritization process, we present a decision tree that helps narrow down the list of climate risks to those that require immediate attention (see the figure on page 10). This approach is similar to the prioritization of corporate risks, however, unlike corporate risk assessments that focus on likelihood and impact, the climate risk evaluation emphasizes vulnerability and exposure.



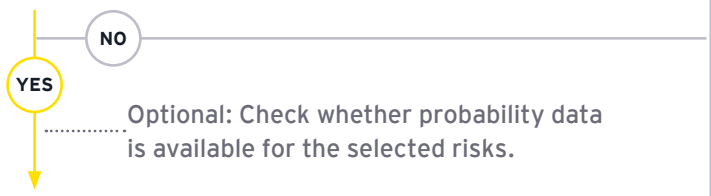
¹¹ Ioannou, I., Cadena, J., Aspinall, W., Lange, D., Honfi, D., & Rossetto, T. (2022). *Prioritization of hazards for risk and resilience management through elicitation of expert judgement*. Springer.

Decision tree for climate risk prioritization and integration with corporate risks

1 | Is the risk at the location classified as severe?^A
(high or very high)



2 | Is the risk horizon short-term?^B
(i.e. max. 5 years/until 2030)



3 | Conduct a financial assessment of the selected risks.
Does the risk exceed the risk appetite?



Synergy between climate risk management and enterprise risk management
Combination of selected climate risks with other corporate risks as well as evaluation and prioritization of suitable strategies for risk mitigation

4 | Would the considered risk mitigation strategies reduce the risk to an acceptable level?
i.e., calculation of the theoretical net risk



Implementation of risk mitigation strategies

Monitoring of the risk
(including new hazard data/modeling)

The decision tree begins with a focus on the climate risk level and uses a set of criteria to prioritize these. This helps determine which climate risks are currently critical to address or are expected to be critical in the near future and should be considered with other corporate risks, and those which may just be monitored for now. The prioritization process begins by

1 evaluating whether a climate risk is considered “high” or greater at a given location.¹²

While this initial filter ensures that only risks with potentially significant implications for the organization are considered, special attention should be paid to the exposure and vulnerability dimensions, particularly if they involve human health or safety. In such cases, even risks with lower severity ratings should be included in the prioritization process, as the potential impact on individuals may justify a more cautious approach. Furthermore, it is also important to consider cumulative risks, as individual risks that may initially appear moderate can escalate to a high-risk level when they occur simultaneously or interact with one another. Therefore, beyond focusing solely on high-risk items, attention should also be given to lower level risks that may compound and significantly impact the overall risk profile. Climate risks that do not meet these thresholds do not require immediate action but should be continuously monitored and reassessed as new risk related data or models become available. This approach allows for early detection of changes in risk profiles and ensures that emerging threats are not overlooked.

^A If people are affected, medium or lower risks can also be included.

^B This typically applies to acute risks, however, chronic risks approaching a potential tipping point can also fall into this category.

¹² The definition of what constitutes a high risk depends on the rating scale being used. The above guidance is based on a five-point scale which includes the categories: very low, low, medium, high and very high.

For risks deemed serious, the next step

2 is to assess the time horizon in which these climate risks are expected to materialize.

This distinction is critical for aligning climate risk management actions with strategic planning and operational timelines. If a climate risk is considered high at present or in the near term, it should be considered further (e.g., where near term refers to the next five years or the respective timeframe of the scenario – at the time of writing typically the period to 2030). This usually includes acute climate risks, such as extreme weather events but may also encompass chronic climate risks that are approaching a tipping point where this is known. Conversely, climate risks with a longer time horizon should be considered in the context of long-term investment decisions, such as the development or relocation of sites. These risks should also remain under observation to ensure timely response if their hazard level, the exposure or the vulnerability increases. However, even long-term risks may require early action if adaptation measures are time intensive. These risks should also remain under observation to ensure a timely response.

For the selected risks, it is now possible to check whether reliable probability data is available for the respective locations. While most climate risk tools cannot provide probabilities for many hazards, a key obstacle in assessing climate risks, such data may be available for certain combinations of location, hazard, and scenario. If this is the case, the climate risk can be calculated in a way that is comparable to other business risks, i.e., by multiplying the expected probability with the potential impact. If no probability data is available, the remaining part of the prioritization model (see decision tree) can be applied.

If a climate risk is considered serious in the short term,

3 a financial assessment should be conducted.

This process typically begins with a definition of the organization's risk appetite, which establishes the threshold of monetary value associated with the risk that is considered acceptable in pursuit of strategic objectives. Risks that exceed this threshold are flagged for risk mitigation and can be considered together with other corporate risks (e.g. integrated into the ERM system) so

that the risks can be managed jointly. This integration of relevant and financially quantified climate risks ensures that they can be managed alongside other corporate risks, enabling consistent evaluation, reporting, and mitigation planning. Further details of this process and step 4 are provided in Chapter 4.

Overall, the decision tree provides a structured approach for prioritizing climate risks based on severity, the company's specific exposure and vulnerability, the time horizon and the financial impact of the risk. This supports the assessment of selected climate risks alongside other corporate risks using consistent parameters. Each step is designed to narrow the focus to those risks that require immediate action, while ensuring that less urgent risks remain under observation. Prioritizing climate risks ensures that critical climate-related threats are addressed respectively and collectively with additional risk types. This approach supports a holistic and balanced risk assessment across the organization, enabling informed decision-making and long-term resilience.

4

From Risk Management to Resilience

In light of growing climate-related threats, organizational resilience is increasingly viewed as a strategic necessity. A solid risk analysis framework, as previously outlined, forms the cornerstone of this resilience by enabling organizations to anticipate disruptions and respond proactively. Once relevant physical climate risks have been identified, prioritized and are being considered alongside other corporate risks (e.g. through integration into an ERM system), the next step involves selecting targeted mitigation strategies.

4.1 Identification of Risk Mitigation Measures

When identifying measures to mitigate climate risks, companies can adopt a range of strategic approaches. These may be split into three categories – avoidance, reduction, and transformation, each with distinct structural and operational implications. Avoidance seeks to eliminate exposure to relevant climate hazards but may involve high costs. Reduction focuses on minimizing both exposure and vulnerability through adaptive technologies and contingency planning, potentially offering a more balanced and scalable approach. Transformational strategies go further by embedding resilience into core business models and processes, fostering long-term adaptability. Additionally, there is the option of risk transfer, such as insurance. Risk transfer provides financial protection but does not tackle the root causes of climate risk.

Following the identification of potential risk mitigation measures,

avoided damages, co-benefits, and strategic alignment. The goal is to ensure that resources are allocated efficiently and that the selected measures are proportionate to the risks and aligned with strategic objectives. Final decisions should be guided by organizational priorities, budgetary constraints, and operational feasibility. Throughout this process, the organization's defined risk appetite should be considered to ensure that the proposed strategies reduce the risk to an acceptable level. This requires calculating the net risk, which reflects the residual exposure after mitigation. If the net risk is acceptable, implementation can proceed; otherwise, additional mitigation strategies may need to be explored. This decision-making process results in a prioritized implementation plan tailored to the organization's capabilities. The process then transitions into continuous risk monitoring, incorporating updated hazard data and modeling to maintain effective risk control and respond to emerging threats.

4 the degree to which these measures reduce the risk to an acceptable level can be determined using cost-benefit or cost-effectiveness analyses.¹³

This involves comparing implementation costs with expected benefits, such as

¹³ Cost-Benefit Analysis compares total monetary costs and benefits of a mitigation strategy to assess its overall economic impact, while Cost-Effectiveness Analysis evaluates which measure achieves a specific goal most efficiently based on cost per unit of outcome.



4.2 Distinction from conventional Risk Management

While the general approach to identifying mitigation measures is similar for both conventional corporate risks and physical climate risks, there are important distinctions that merit attention.

In conventional corporate risk management, where risks other than climate related risks are being addressed, mitigation efforts are primarily aimed at reducing the probability and the impact of risks. This is typically achieved through internal controls, compliance mechanisms, and operational safeguards designed to prevent disruptions before they occur. The underlying assumption is that risks are largely controllable and can be managed through procedural or technological interventions. In contrast, climate risk mitigation operates under a fundamentally different paradigm.

Climate-related hazards tend to be systemic, external and cannot be prevented. Consequently, mitigation strategies in this domain focus on reducing exposure and vulnerability. This involves identifying physical assets, operations, or communities that are at risk and implementing measures to enhance their resilience. Examples include relocating facilities, reinforcing infrastructure, or adapting supply chains to withstand climate disruptions.

Another key difference lies in the role of insurance. In certain locations with historically high exposure to severe weather-related events the availability of insurance is limited already and both the real as well as perceived increase in risk due to climate change further limits the availability and affordability

of insurance.¹⁴ Insurers have already begun withdrawing coverage from regions known to be vulnerable to climate-related risks or increasing premiums in response to heightened exposure.¹⁵ This constraint underscores the importance of proactive mitigation strategies that extend beyond financial instruments and address the physical and operational dimensions of climate resilience.

¹⁴ *Sousounis, P (2024). Availability, Affordability, and Adequacy of Insurance in Areas Impacted by Climate-related Risks.*

¹⁵ *Crugnola-Humbert, J. (2025). From Risk to Resilience. Closing the Climate Insurance Protection Gap. CEP council on economic policies.*

5

Outlook

Against the backdrop of increasing climate risks and rising investor expectations, we recommend no longer treating climate resilience merely as a compliance issue but embedding it as a strategic core element in corporate governance. This whitepaper introduces a simple, structured framework for integrating physical climate risks into enterprise risk management (ERM), enabling companies to identify, prioritize, and mitigate these risks through targeted and efficient measures.

By incorporating climate risk considerations into both operational and strategic planning, organizations can safeguard daily operations while securing long-term value creation. As outlined in Chapter 4, climate risk mitigation strategies can vary significantly and must be carefully evaluated.

Looking ahead, climate resilience should encompass not only physical risks but also transition risks. Organizations should adopt a holistic approach that systematically prioritizes climate-related risks and aligns mitigation strategies with broader corporate risk management efforts.

Resilience is not a fixed destination, but a dynamic capability – one that demands ongoing investment, cross-functional coordination, and adaptive leadership. By embedding climate resilience into core business strategy, companies position themselves not only to endure disruption, but to thrive amid growing uncertainty.



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