

WHITE PAPER

Avoiding the unmanageable by **adapting to** the inevitable

How to make science a lever for transformation, not resignation.

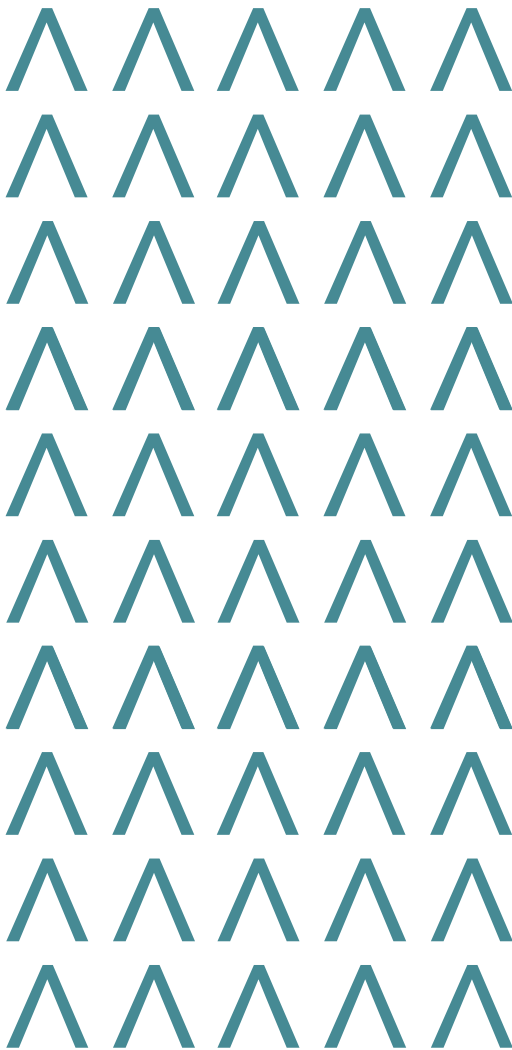
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Editorial



THEOPHILE BELLOUARD,
ALTITUDE VICE-PRESIDENT

Current events are a constant reminder that climate risks are increasing in both intensity and frequency. Cyclone Chido in Mayotte, the Los Angeles wildfires and extreme rainfall in Valencia — to name but a few examples — are stark reminders of an unavoidable reality we can no longer ignore, whether as individuals or as businesses.

The human toll is always high. According to the WHO, 3.6 billion people live in areas that are highly exposed to climate change.

The economic consequences are just as dire. In 2024, natural disasters caused \$320 billion in losses, with only \$140 billion covered by insurance — less than half. The bill keeps rising, while at the same time, the insurability of assets is declining, as costs become incompatible with companies' business models. It is only natural, therefore, to ask how we can change this model, because risk transfer and self-insurance alone, as we know them, are not sustainable solutions.

Some companies may be tempted to reduce climate issues to a box to be ticked in a CSR report. Regulatory pressure in recent years has focused efforts on measuring, reducing and publishing greenhouse gas emissions. Yet adapting to climate change is a major strategic challenge because it determines the very sustainability of business models.

On the one hand, infrastructure alone is not enough to effectively protect the population and companies. On the other hand, the impacts of climate change are multiple — sometimes indirect — and require a systemic approach: energy crises, health risks, raw materials shortages, cyber-attack threats, social conflicts, etc.

Building a resilience strategy is a complex challenge that goes beyond the analysis of risks on production sites alone. A factory in perfect condition in an area that employees can no longer reach or find accommodation will be of little interest. Companies must undergo a paradigm shift and change the way they look at risk. Governance and collaboration between public and private players at a local level are key to building land and business resilience at the same time.

In the age of artificial intelligence, it is tempting to believe that technology will hold the solution. This is not the case. However, AI is a powerful tool that can be used to measure risks and widely share knowledge. Over the past three years, I have observed the ways in which technology can facilitate decision-making by enabling experts to focus on issues with higher added value.

Let's take an example: software solutions can now be used to accurately model the risk of water stress, integrating both the increasing scarcity of this resource and changes in demand. But while these tools help to understand the problem, it is up to human ingenuity to invent new ways of operating — whether in a factory or any other system — while preserving water resources.

Without resorting to simplistic narratives about AI and fake news, Altitude's mission leverages technology to amplify scientific voices. Climate is a science.

What should you do with it? This is an important question after modelling the impacts of climate change and obtaining data: number of days above 35°C, wind speed, probability of flooding, etc. There are many indicators, but they are not enough on their own.

To adapt, companies must understand how to transform, who to turn to and which levers to activate.

Let's go back to the example of water consumption at an industrial site — knowing the water stress forecasts is not enough. You have to look at the company's production processes, look for losses, explore alternative solutions, understand what other players are doing and who else is consuming water in the area, know how the watershed management agency is adapting, and so forth.

This is our core belief at AXA Climate and the cornerstone of Altitude — to look beyond the numbers and provide actionable recommendations.

As you will discover while reading this report, adapting to climate change is, first and foremost, about understanding and taking action. Our mission with Altitude is to make both possible!

Enjoy your reading!

Foreword

The Earth has warmed by at least 1.3°C globally compared with the preindustrial era, with a 1.7°C increase for France. 2024 was the first year with an average temperature above 1.5°C compared to the preindustrial era.

This average increase is causing a number of disruptions, including extreme temperature variations and changes in rainfall patterns. Global warming is already a reality. For organisations, the impacts of climate change have economic and financial consequences:

- On operating expenses (cost of raw materials, increase of insurance costs, etc.)
- On capital expenses (cost of repairing equipment or buildings, adaptation costs, etc.)
- On revenue (operational shutdowns due to extreme events, reduced productivity due to heatwaves, decreased crop yields, etc.)
- On the value of assets (buildings damaged by the shrinking and swelling of clay soils, landslides or flooding, relocation of activities, etc.)

As this report shows, no sector is exempt.

Two complementary approaches must be considered to address the issue of climate change: mitigation and adaptation. This report provides a practical guide to help companies adapt to climate change and limit its impacts.

The first step is to understand and measure the impacts of climate change on the company. The aim is to pinpoint what aspects of the value chain — resources and raw materials

consumed, buildings and infrastructures used, and implemented processes — could be affected by climate conditions and what is sensitive to changes.

Based on these insights, companies can then initiate an adaptation approach.

This involves a two-pronged approach. Firstly, to assess the company's vulnerability to the hazards to which it is exposed. Secondly, to define an adaptation governance, by fostering dialogue at a local level between the various business lines. Companies must identify and prioritise tangible actions once the materiality is clear for everyone and the adaptation approach has been launched. This involves selecting adaptation actions, preferably nature-based solutions. The measures are prioritised according to their feasibility and effectiveness, in line with the risk profile and operational risk mapping.

The adaptation measures should be 'no regret', scalable measures incorporated into an action plan, with monitoring indicators to measure their progress over time. All these measures, ordered by priority, make up the adaptation plan.

A good adaptation plan ticks the following three boxes: it limits the risks of maladaptation, it combines adaptation and mitigation to address the causes and the consequences of climate change, and it adopts a systemic vision. A systemic approach is key to tackling environmental challenges while taking into account the nine planetary boundaries.



INTRODUCTION

Why adapt to climate change?

Climate change is amplifying the hazards that can severely impact businesses. In 2023, natural disasters such as floods, wildfires and heatwaves caused an estimated \$280 billion in global economic losses. In 2024, natural disasters led to \$320 billion in losses, with only \$140 billion covered by insurance — less than half.

Understanding climate change

The end of the 19th century was marked by the industrial revolution. This period, defined by the widespread use of fossil fuels, sparked the beginning of anthropogenic greenhouse gas emissions, i.e., emissions due to human activities, in addition to the gases already naturally present in the atmosphere. These greenhouse gases are changing the climate and making it warmer.

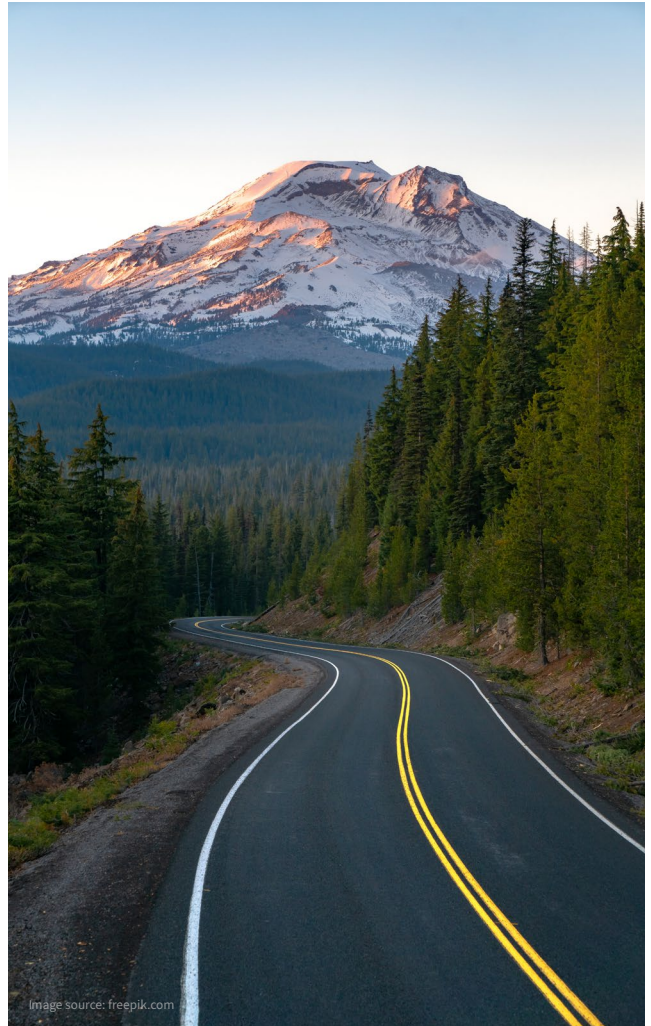
Warming is currently estimated at +1.3°C compared with the pre-industrial era.

The average temperature of the Earth has already increased by 1.3°C. Scientific consensus unanimously attributes global warming primarily to human activity.

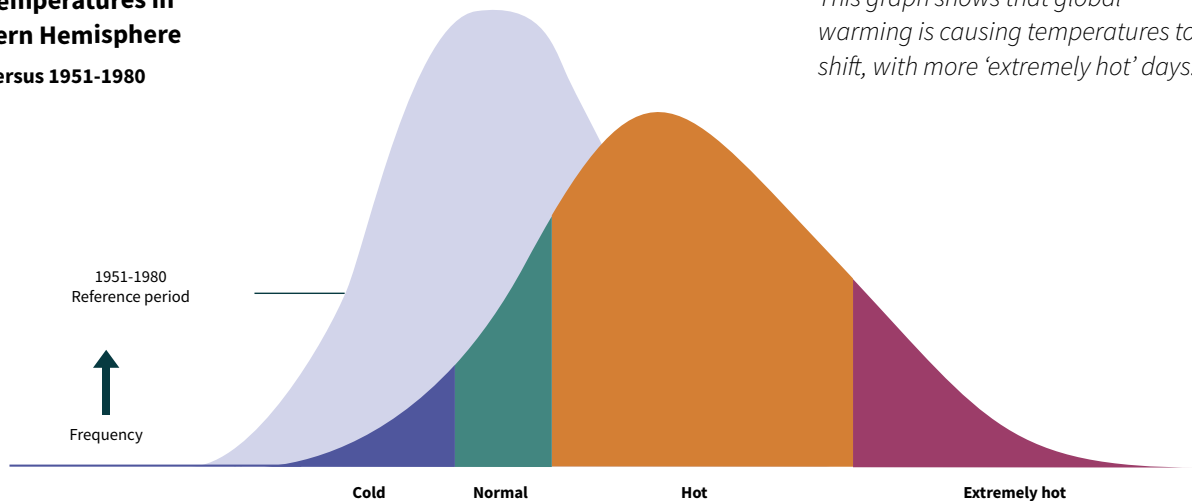
This average warming of 1.3°C has disrupted the climate system, causing significant spatial and temporal variations. The Earth is experiencing new extremes, as seasonal temperature peaks reach several degrees higher than previous ones. The number of ‘particularly hot’ days is also on the rise.

Global warming does not have the same impact everywhere. For example, despite a global rise of 1.3°C, France is already experiencing warming of around 1.7°C, while temperatures in Russia have risen by 2°C to 3°C, according to the IPCC.

Global warming is therefore already a reality.



Summer temperatures in the Northern Hemisphere
2005-2015 versus 1951-1980



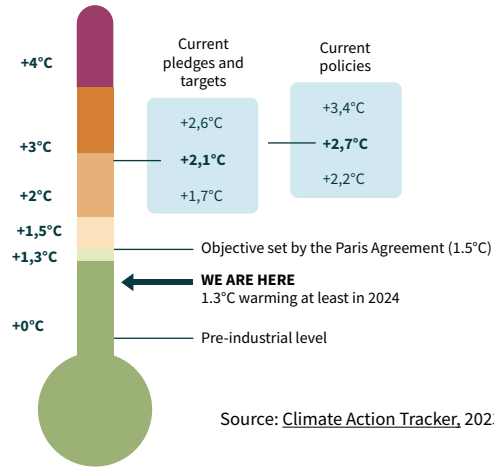
This graph shows that global warming is causing temperatures to shift, with more ‘extremely hot’ days.

Source: [The New York Times](#), 2018

What scenario are we moving towards?

In 2015, with the Paris Agreement, countries around the world committed to adopting measures to limit warming to well below 2°C and, if possible, 1.5°C by 2100. In reality, given current climate policies, warming is expected to rise between 2.2°C and 3.4°C. And that is only if current policies are maintained, which is by no means guaranteed.

Increase in global temperatures by 2100

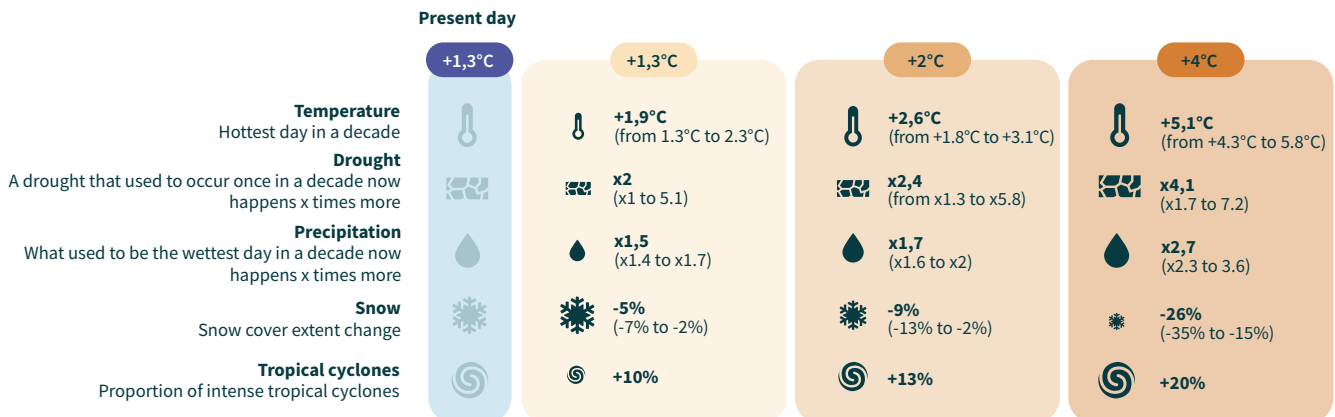


Global warming has multiple consequences. Extreme weather events are expected to increase in intensity and frequency. In other words, as the climate gets warmer, floods, droughts, heatwaves and other so-called ‘acute’ risks will become more severe and frequent. But that’s not all — so-called ‘chronic’ risks, i.e., gradual changes such as rising sea levels, are also on the uptick. The more global warming intensifies, the more severe its consequences will be.

For example, if the global average temperature rises by 1.5°C, episodes of extreme drought (or droughts with a one-in-ten chance of occurring each year) are expected to increase twofold, with cascading effects on human activities and ecosystems (decline in crop yields, risks to human systems in terms of food supply and security,

loss of habitats and biodiversity, etc.). Drought is only one example — extreme rainfall, tropical cyclones, heatwaves and other extreme weather events are also expected to increase in frequency and/or intensity.

For example, extreme temperature events (i.e., the maximum temperature reached over a ten-year period) currently occur around 3 times a decade. With an average warming of 1.5°C, they would occur around 4 times a decade. If warming reaches 2°C, they are expected to occur 5 to 6 times per decade, and more than 9 times per decade at +4°C! The same goes for other hazards. For example, the number of droughts would increase twofold with a rise of 1.5°C, by 4 with a rise of 2°C, and so forth.



Source: IPCC, 'Climate change 2021, Summary for all' Version 3, 2022

Tackling climate change

Two complementary approaches can be implemented to address climate change — mitigation and adaptation.

- **Mitigation** refers to efforts to limit climate change, in particular by reducing greenhouse gas emissions. Mitigation thus means addressing the causes of climate change.
- **Adaptation** refers to actions taken to adjust to the current or expected climate and its impacts (IPCC). It is about minimising harmful effects. **Adaptation thus means tackling the consequences, the tangible impacts of climate change and the physical risks¹.**

Should companies choose between mitigation and adaptation?

Limiting climate change is only possible if we address the **causes**. Mitigation is therefore an essential part of climate action. However, mitigation alone is not enough — even if we manage to significantly reduce greenhouse gas emissions, no part of the world will be spared from climate change. Hence the need for companies to start thinking about the impacts of climate change on their activities, whether flooding, droughts, cyclones, heatwaves and so on.

However, adaptation does not mean **giving up** on mitigation. It is essential to act on both fronts.

This white paper will focus on adaptation, and more particularly the adaptation levers that companies can activate. Companies are already feeling the effects of climate change through supply disruptions, operational shutdowns, employee health risks, etc. Adaptation is an essential part of addressing these risks and must be implemented as soon as possible.

¹The TCFD (Task-Force on Climate-related Financial Disclosure) has defined another category of risks related to climate change: **transition risks**. These risks arise from the uncertainties associated with the transition to a low-carbon economy. For example, policy or legal risks due to regulatory, market and technology changes, or reputational risks..

Companies faced with flooding in Thailand in 2011

Most companies are not sufficiently prepared for natural disasters, whether they result from climate change or not. This lack of preparation is not only an issue for future disasters — natural disasters are already impacting businesses' day-to-day activities.

In 2011, for example, flooding in Thailand led to a collapse in sales for many companies. Several car manufacturers, including Toyota, Honda and Nissan, were forced to close their factories for almost a month.

This can be explained by several factors — the location of some of the companies' suppliers in flood zones, or transport disruptions after railway and road closures. It is difficult, if not impossible, to anticipate all the effects of a natural disaster. Yet, as climate hazards become more intense and frequent, anticipation by prioritising key operating activities is essential.



This white paper focuses on the physical risks that are threatening companies and forcing them to adapt.

It should be noted, however, that adaptation is not driven solely by these physical risks. Regulatory changes constitute another major reason to act. In Europe, for example, regulatory frameworks such as [CSRD \(Corporate Sustainability Reporting Directive\)](#) are placing growing emphasis on the integration of mitigation and adaptation principles. More broadly, leading reporting frameworks

such as TCFD (Task Force on Climate-related Financial Disclosures) also include adaptation.

Through these reporting frameworks, stakeholders (clients and investors) could encourage companies to address adaptation issues (beyond mitigation), which is increasingly becoming a competitive advantage for organisations.

Regulatory requirements and reporting frameworks for adaptation

1. CSRD: Corporate Sustainability Reporting Directive

CSRD is an EU directive aimed at standardising reporting through a new reporting system called ESRS (European Sustainability Reporting Standards). EFRAG (European Financial Reporting Advisory Group) was appointed as technical advisor to the European Commission to draft the ESRS standards. These standards first came into effect during the 2024 financial year, with reports to be published in 2025.

2. The European Taxonomy

The European Taxonomy is a classification system defining what qualifies as an environmentally sustainable economic activity. This classification is based on 6 objectives – climate change mitigation, adaptation, water, circular economy, pollution and biodiversity. The European Taxonomy helps finance the transition, by enabling investors to identify environmentally sustainable activities, and by helping companies align their activities with climate goals. The Taxonomy defines which activities are ‘green’ so that companies can calculate their ‘green share’. These activities should also not harm any other objectives, otherwise referred to as DNSH – Do No Significant Harm.

3. Task Force on Climate-Related Financial Disclosures (TCFD)

The TCFD is a voluntary reporting framework. It is intended to provide investors with information about how companies are addressing climate change. It was created in December 2015 by the Group of 20 (G20) and the Financial Stability Board (FSB).

Companies that comply with TCFD must provide details of:

- The processes and measures used to:
 - 1) determine which risks and opportunities could have a significant financial impact
 - 2) manage and prioritise climate-related risks
- The goals set by the organisation to manage these risks and opportunities.

4. UK Guidance for developing an environment management system

In addition to ISO 14001/2015 standards for adaptation planning, the UK government provides guidance for integrating climate change adaptation to entities’ management systems, including the risks that climate change pose to businesses, the risks that businesses pose on climate change, and how to integrate controls. The UK Environment Agency operates compliance checks and audits on these risk assessment and adaptation plans, with proportionate attention given based on the level of risk associated with a business in regard to extreme weather threats and pollution events.

part 1

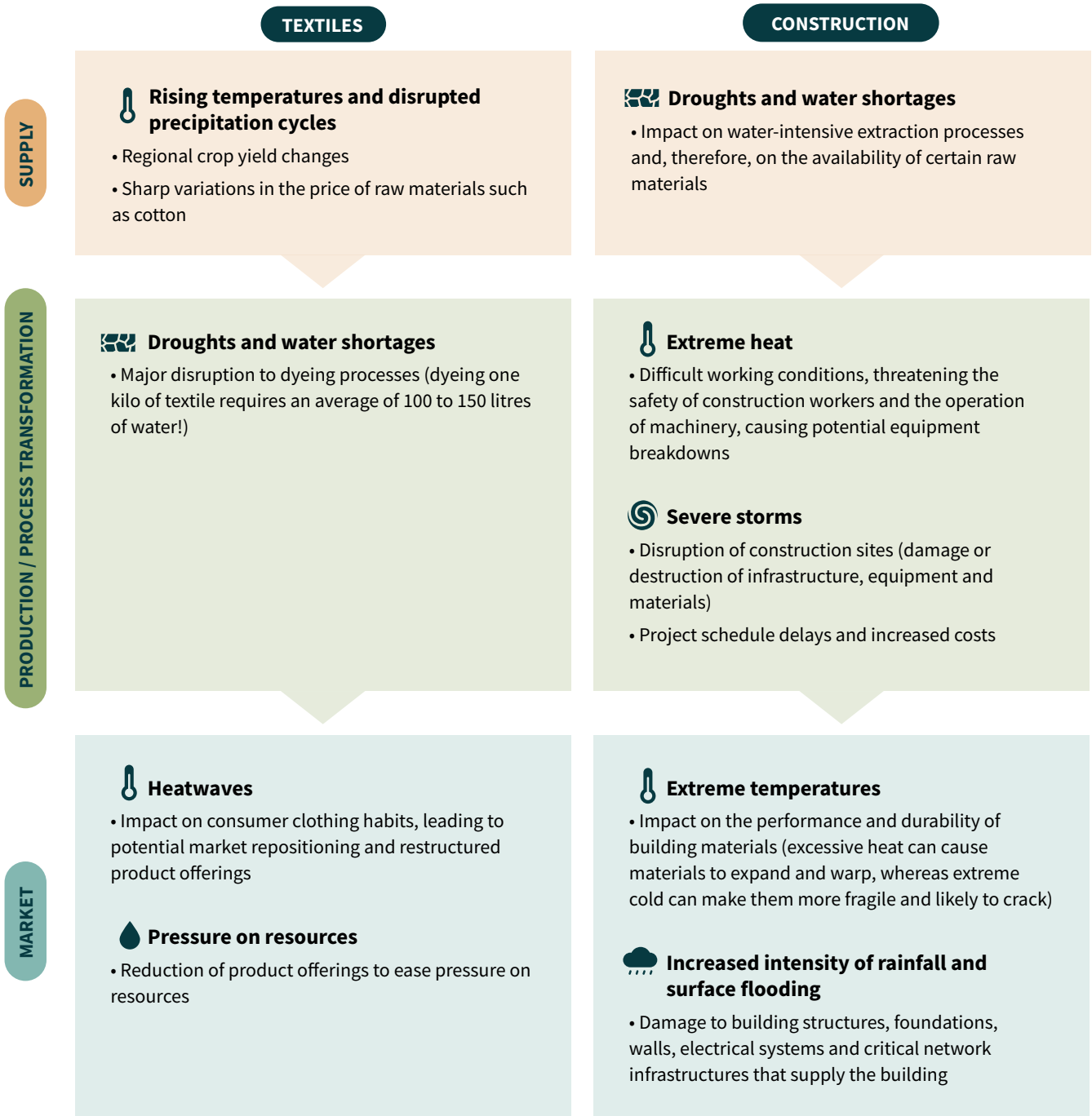
PART 1

Understanding the impact of climate change on organisations

As flooding, extreme rainfall, heatwaves, etc. increase in frequency and intensity, what concrete impact will climate change have on businesses? What are — and will be — the consequences for physical infrastructure (factories, warehouses, data centres, etc.), business continuity and, more generally, economic performance? How will employees be affected?

Impacts across the entire value chain

To answer these questions, it is important to take a look at the value chain. The risk analysis scope is key to avoiding overlooking or underestimating certain impacts.




ELECTRONICS

LOGISTICS AND TRANSPORT


SUPPLY

 **Droughts and water shortages**


- Impact on supplies of rare earths (essential components of semiconductors which require water-consuming processes for extraction)

 **Extreme weather events (flooding, storms, etc.)**


- Damage to production facilities and essential supplier transport infrastructures

 **Increasingly intense rainfall**

- Flooding of access roads and railways linking to ports, causing disruption to port operations and the supply chain

 **Reduced water levels in navigable rivers and streams**

- Reduction of freight transport by inland waterways

 **Very high or very cold temperatures with snowfall**

- Reduced train speeds, leading to delays in the rail network


PRODUCTION / PROCESS TRANSFORMATION

 **Water shortages due to drought**

- Interruption of semiconductor manufacturing process dependent on water availability

 **Heatwaves**


- Rationing of electricity to meet demand may lead to operational shutdowns in semiconductor factories

 **Extreme events**

- Damage to factories, disrupted production processes, project schedule delays and additional costs to fix damage


 **Increased rainfall intensity and rising water levels**

- Threats to port infrastructure and equipment from surface and coastal flooding, potentially leading to operational shutdowns


 **Extreme heat**

- Threats to port cooling, refrigeration and freezing systems, leading to increased energy consumption and associated costs


MARKET

 **Impacts on the supply chain**

- Semiconductor production shortages or delays
- Disrupted product deliveries, including smartphones, automobiles and renewable energy systems, with repercussions for various sectors and markets

 **Severe storms**

- Threats to crews and merchant vessels, with an increased risk of loss or breakdown
- Increased fuel consumption and delivery times due to detours

 **Heavy rainfall / water depth variations**

- Sedimentation problems
- Disruption of ship access to river ports

Economic and financial impacts caused by physical risks

The impacts of climate change have economic and financial consequences for organisations:

- On operating expenses (OpEx): increased cost of raw materials, rising insurance costs (alongside reduced insurability of certain assets), etc.
- On capital expenses (CapEx): repair costs for equipment or buildings, adaptation costs, etc.
- On revenue: business losses following extreme events (shop closures, etc.), reduced productivity due to heat waves, lower agricultural yields, etc.
- On the value of assets: buildings damaged by the shrinking and swelling of clay soils, landslides, flooding, etc.

These various economic impacts must be assessed. Quantifying these losses can help to convince people internally of the importance of taking action.

This leads us to an important point. Climate risk insurance can complement an adaptation strategy. New insurance products specialising in climate risks, and using parametric models, are now available. These models enable compensation to be paid out very quickly, thereby limiting damage. However, insurance merely limits short-term financial impacts, rather than helping the company to adapt its activities to a changing climate. Insurance cannot, therefore, replace an adaptation strategy — it is a risk transfer solution, not an adaptation solution.

The rising cost of climate change has also prompted insurance companies to increase their prices, restrict coverage or even withdraw from certain markets altogether. In California, for example, several insurers have already announced that they will no longer offer new insurance policies³ following the rise of wildfires and droughts.



Image source: Lex Daily News

No sector is exempt

When considering the entire value chain, it becomes clear that no sector is exempt, although some are more vulnerable than others. The agricultural sector and its crops, for example, have already been suffering the effects of climate change for years. The same goes for any sectors involving outdoor or physical work, such as the [construction industry](#).

In reality, climate change is a threat to all sectors (tourism, energy, finance, etc.) and all types of activities, to a greater or lesser degree. The risks should not be minimised. For example, IT services are often perceived as dematerialised (and therefore

exempt from material impacts). Yet, they can also be affected — in the summer of 2022, Atom Bank's app and the WordPress hosting platform went down for several hours due to a heatwave. The air conditioning systems in Google and Oracle's data centres were unable to cope with the high temperatures and stopped working, causing the servers to shut down⁴.

Certain situations are common to various sectors and can help organisations identify risks. These typical situations make certain business activities particularly vulnerable.

FIRST TYPICAL SITUATION

Do the company's activities depend on climate-sensitive resources?

Agricultural resources used for food and textiles, as shown in the previous graph, are sensitive to climate change. But they are not the only ones. Water, for example, is also sensitive to the climate and its changes, particularly droughts. In Chile, during the drought of 2019, Anglo American, a mining company, did not have enough water to produce copper. Processing ore requires vast amounts of water, leading to a drop in copper production of around 28%.



SECOND TYPICAL SITUATION

Do the company's activities depend on climate-sensitive buildings or infrastructures?

Buildings and infrastructures are sometimes exposed to climate hazards that can threaten a company's activities. Some cases are obvious — e.g., when buildings are located in flood zones. However, other risks are more indirect. For example, if a company uses rail transport for its activities, extreme temperatures can cause railway tracks to expand or lead to power outages. If rail transport is a central part of a company's activities, its product distribution, as well as travel for employees and customers may be at risk.

THIRD TYPICAL SITUATION

Do the company's activities rely on climate-sensitive equipment, processes or products?

Here are a few examples. Cooling systems are designed to operate within a specific temperature range. Very high temperatures can render them unusable. For example, in 2022, a number of supermarkets in the UK were forced to stop selling fresh food after the heat caused their refrigerators to stop working. That year, for the first time in history, Britain recorded temperatures in excess of 40°C. But these risks do not only affect technical equipment, nor are they specific to certain sectors. Even mobile phones can be impacted! Apple recommends using smartphones at temperatures between 0°C and 35°C... a threshold that is largely exceeded during a heatwave! And what about the equipment companies use, or the products they sell? Have they been adapted to changes in the climate where they are sold? It is certainly a question worth asking.

Shrinkage and swelling of clay soils

All around the world, climate change is expected to intensify alternating droughts and heavy rainfall. This will worsen the **shrink-swell** phenomenon in clay soils, causing vertical movements that could damage buildings with shallow foundations, as well as road infrastructure. The French public agency Cerema notes that in France, this phenomenon could present a high risk for **more than 50% of detached houses**.

Unexpected impacts

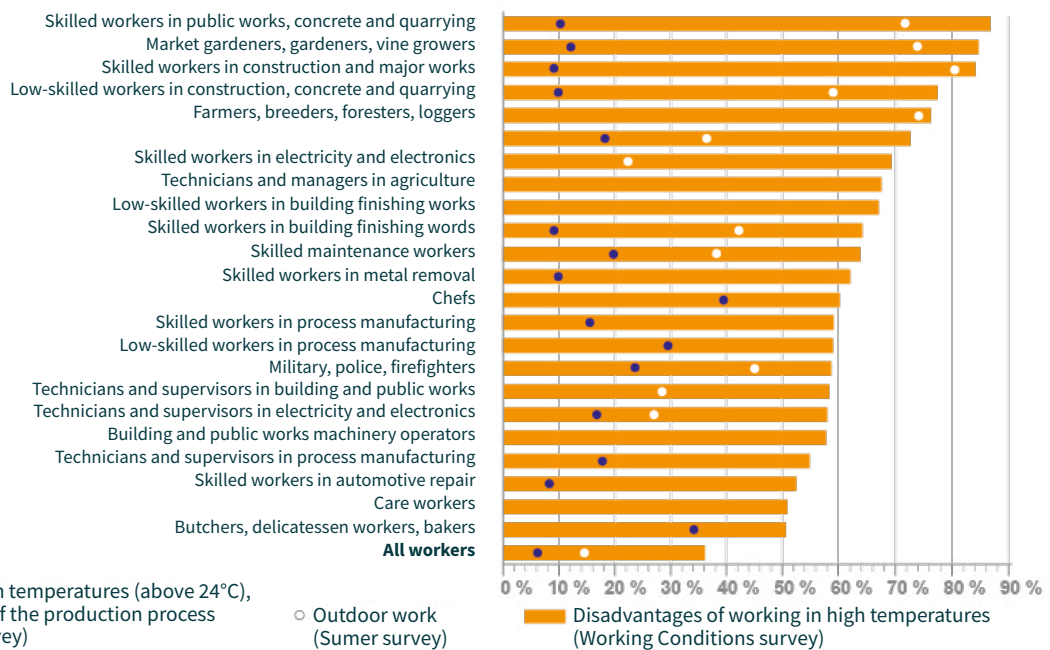
- Kansas is the third largest beef producer in the USA. Heatwaves in the state have become three times more frequent and three times longer than in the 1960s. In 2022, a severe heatwave killed thousands of cattle. The facilities for disposing of animal carcasses were completely overwhelmed. They were simply not prepared to deal with so many carcasses in just a few days. The industry was forced to turn to the public health agency for urgent help with this unprecedented problem.
- In 2021, heatwaves in Taiwan and a severe drought led to power cuts, affecting semiconductor production. Water restrictions were also put in place in the affected regions to tackle the subsequent water shortage. A study showed that 97% of facilities operated by Taiwan's 10 semiconductor companies were exposed to mandatory freshwater-withdrawal restrictions, ranging from 5% to 17% between October 2020 and June 2021.

The examples listed above are by no means exhaustive. Climate change has many, sometimes unprecedented, impacts. It can also affect other aspects of a business, such as the company’s reputation or human resources.

Other corporate aspects, that have not been mentioned here, will also be affected, such as the company’s reputation or human resources... In Italy, for example, two construction workers died while working during the 2023 heatwave, as a result of the high temperatures. They were not the only victims — five heat-related deaths were reported at that time. This example underlines the very real issue of climate justice (see graph below) due to unequal exposure to climate hazards.

In summary...

Part of the task at hand involves identifying what aspects of a company may be affected by weather conditions, or be sensitive to climate variations in general. Activities that must be preserved at all costs should be prioritised.



Scope: France (excluding Mayotte), employed individuals.

How to read: in 2019, 84% of market gardeners, gardeners and vine growers reported that their work (or workplace) is inconvenient because of high temperatures. In the 2017 Sumer survey, 73% declared that they ‘work outdoors’ and 12% ‘work in high temperatures, above 24°C, as a result of the production process’.

Source: France Stratégie, based on based on the survey [Conditions de travail 2019 \(Dares\)](#), [Sumer survey 2017 \(Dares\)](#)

part 2

PART 2

Initiating an adaptation process

To overcome these climate risks, companies will have no choice but to adapt. But with such diverse activities and a wide array of hazards, the challenge is knowing where to begin! Let's take a look at some of the key concepts in terms of adaptation.

Risk: a geographical concept

Risk is a combination of hazard, exposure and vulnerability. Assessing a company's climate risks therefore means assessing its vulnerability to the hazards it is exposed to.

To carry out a risk assessment, you need to know the hazards. However, these may vary depending on where the company operates or does business.

The first step is therefore to identify these geographical areas — office buildings, production, storage and sales sites, data centres, supplier and client sites, etc. The adaptation strategy will then be rolled out in all these places. In some cases, it may be useful to go as far as identifying essential transport networks or key infrastructures, such as those linked to energy supply or telecommunications.

Michelin: an example of initiating an adaptation approach within a company



Bertrand Pigeat
Group Audit Director & Risk
Manager, Michelin.

Why did you start working on climate-related risks?

Michelin has a history of exposure to climate hazards — tornadoes for our factories or suppliers in the USA, flooding in Thailand, water shortages in Brazil, etc. We have major manufacturing facilities in all three of these countries. We have included these types of risks in our Group-wide risk mapping. Meanwhile, future climate change will lead to changes in sourcing, for natural rubber for example, and in our transport flows.

How do you identify your priority sites?

We use several criteria to identify our priority sites. In addition to revenue, we look at margins or whether we have a single supplier for certain key products. We've been auditing and assessing BCM (Business Continuity Management) risks for over 10 years. The Group's Audit and Risk teams are constantly working on this topic. We know how sensitive we are to supply disruptions, or disruptions of any kind across the entire physical chain, whether to our suppliers, factories, customers, or even our data or shared service centres. We use a calculation chain to classify each of these points and sites into three categories:

- BCM1, with a major impact on the Group
- BCM2, with a significant impact on business continuity
- BCM3, i.e., the lowest level of criticality

This provided a solid starting point for shaping our adaptation strategy.

When choosing which assets to carry out a risk analysis on, companies should focus on the sites where **their most critical activities are located**. It therefore depends on how the company is organised.

All the sites operated by an industrial company, for example, do not share the same level of importance.

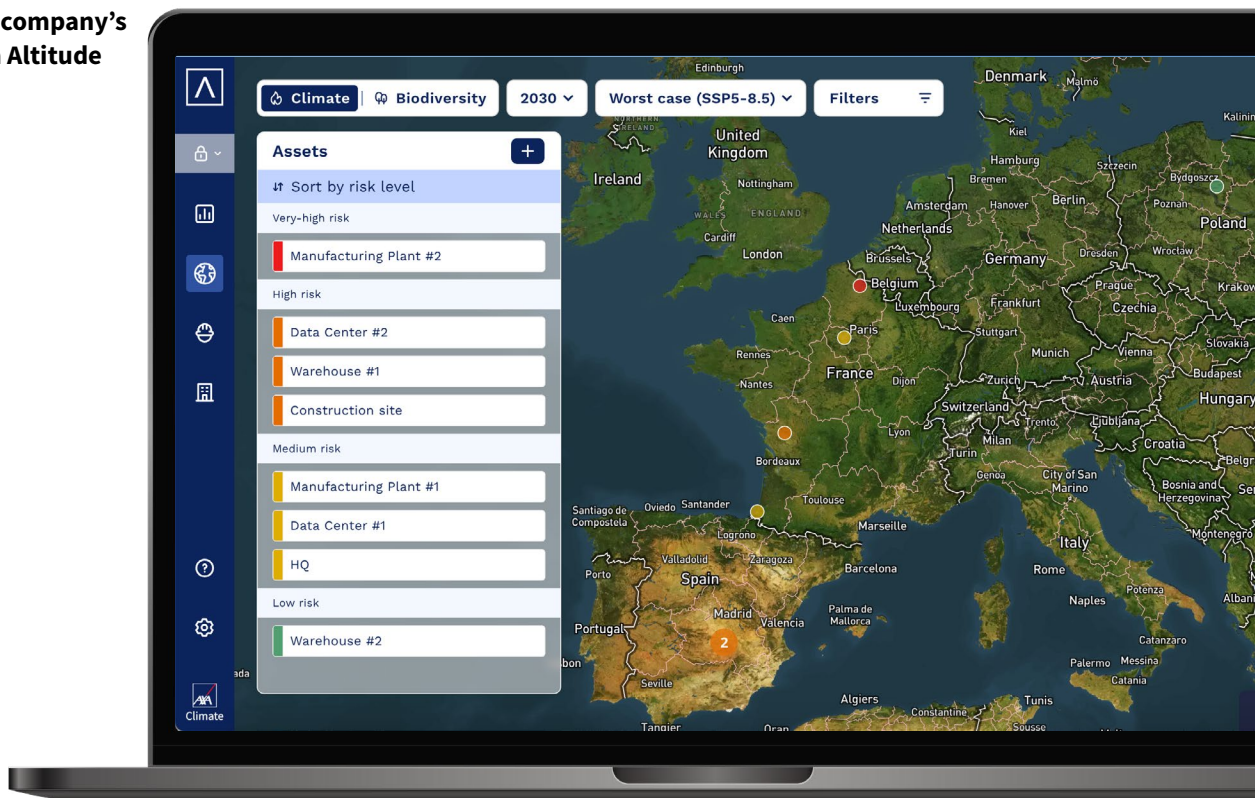
One option is to order these sites according to their level of importance for business continuity, like Michelin.

This classification allows to focus on priority sites first, and then, depending on the time and budget available, address the others in order of importance. Similarly, companies should identify and prioritise their most strategic suppliers. Strategic suppliers are those with the highest financial value or single suppliers (the only ones in their field of expertise). They are critical to business continuity.

But there are other ways of working. Companies could, for example, conduct interviews to identify their business-critical activities. One of the world’s leading catering companies opted for this approach. They conducted interviews within various departments and sites to identify their most critical activities. In this case, it turned out to be the supply of fruit and vegetables, disrupted by climate change, and the storage of dishes and ingredients, threatened by cooling systems that are not always designed to withstand high temperatures.

In other words, there is no single right answer to define the adaptation scope. It all depends on how the company is organised, its maturity in terms of adaptation, the financial resources available and so forth.

Visualisation of a company’s various assets via Altitude



Adaptation governance

Adaptation is most effective when integrated at different levels of the company.

The purchasing department, production team or even site managers can all identify risks within their own scope. However, not everyone will be as detailed. The ideal solution is therefore to carry out risk analyses at different levels: by business line, by site, by company, etc.

However, combined approaches are not always enough. Climate change adaptation calls for a multidisciplinary approach. Hence the need to **break down silos** when exchanging information within the company. When a company is organised into silos, with zero dialogue between business lines, departments, sites, etc., the risk increases as the same incidents are likely to occur at different sites.

Fostering dialogue whenever possible between different sites and departments — production, legal, CSR, finance, marketing, etc. — is key to avoiding this pitfall.

This collective approach could also involve periodic meetings or a standardised method for listing incidents throughout the organisation. The aim is to share and replicate best practices. Generally speaking, building a solid risk culture within the organisation will make all the difference to your adaptation strategy.

Finally, to implement an adaptation strategy, you need to decide who will take charge of it internally. A dedicated team can then be tasked with defining the right strategy and coordinating its implementation. This team could also rely on **'adaptation experts'** such as health and safety representatives, for example.

These experts can provide a local perspective on the challenges. They will be primarily made aware of adaptation issues, and help implement the adaptation strategy within their scope of responsibility, fostering a genuine **adaptation culture** throughout the organisation.

Cooperating with local players

Players located in the same geographical area often face similar risks. To address these risks, cooperation is a recommended method, to share viewpoints and approaches. This could include getting local players in the public and private sectors involved or organising work groups to share the risks identified, for example. Collective intelligence can help to pinpoint any additional vulnerability factors and even lead to common adaptation measures. Jointly implementing these measures can help to share costs, thereby reducing costly investments. This cooperation can also be organised at a sector or industry level, and even with competitors.



Eiffel Investment Group: implementing adaptation governance with a tool like Altitude



Pierre-Philippe Crépin
Head of Sustainability and Impact at Eiffel Investment Group

Can you present Eiffel Investment Group's investment strategy?

At Eiffel Investment Group, we manage more than 7 billion euros through two main strategies: financing the energy transition — with more than 4,500 renewable infrastructure projects funded — and financing French and European small- and mid-sized companies, with a continuous improvement approach, as reflected by our impact private debt strategy.

How does the issue of adaptation affect your organisation?

Adaptation to climate and biodiversity risks is an essential part of our approach. We are faced with three major challenges:

- The first is the need for a very detailed and granular analysis. We finance a lot of project portfolios, sometimes 10 or even 100, spread across different local areas, and we need highly precise, detailed measurements based on addresses and GPS coordinates.
- The second challenge is to have an action plan. We don't just want to measure; we want the tool to enable us to implement adaptation actions.
- The last challenge is reporting. We need to deliver aggregated portfolio-level metrics to our clients, and the tool (editor's note: Altitude) enables us to do this.

How does your governance facilitate adaptation?

One of our particularities at Eiffel Investment Group is that the directors conduct both financial and non-financial analyses themselves. In addition to training our teams in climate risk and adaptation, we use intuitive tools that enable the directors to easily identify the climate and biodiversity risks associated with each investment.

The Altitude tool meets this exact need. It enables our directors to quickly assess the risks across a large number of sites by identifying the main challenges and suggesting adaptation measures suited to the specific infrastructure.

What tangible benefits have you gained from this governance?

We recently financed a hydrogen production infrastructure that consumes a lot of water. The tool enabled us to detect an increasing water stress threat in coming years, which could disrupt its production.

By identifying this risk early on in the pre-investment phase, we were able to hold discussions with the counterparty and draw up an action plan. Solutions were implemented to limit exposure to water stress, reducing the risk associated with this investment, and making it viable.

This governance model has also allowed us to move from simply assessing the risks to taking a proactive and integrated adaptation approach that we apply to all our investments.

part 3

PART 3

Assessing the risks

Once the scope has been defined, the next step is to identify the risks to which the company is **exposed**. This is known as a **risk assessment**. This step makes it possible to identify the **hazards** to which the company is **exposed**, and to assess its **vulnerability** to them. The aim is twofold:

- To highlight the major risks faced by the company now and in the future
- To analyse the company's strengths and weaknesses in the face of these risks

This risk assessment can be carried out in four steps.

Using climate projections

The first step is to list all the climate hazards that have impacted the company in the past. The second step is then to analyse future climate projections, as defined by climatologists. It is worth noting that, within the framework of the European Taxonomy, authorities encourage the use of climate models developed by the IPCC, the leading body on climate change, to ensure a sound scientific basis⁷.

These climate projections allow to answer the following questions: which hazards may pose a threat to future activities? What is the likelihood that these hazards will occur? How will they evolve over time?

Climate scenarios and projections

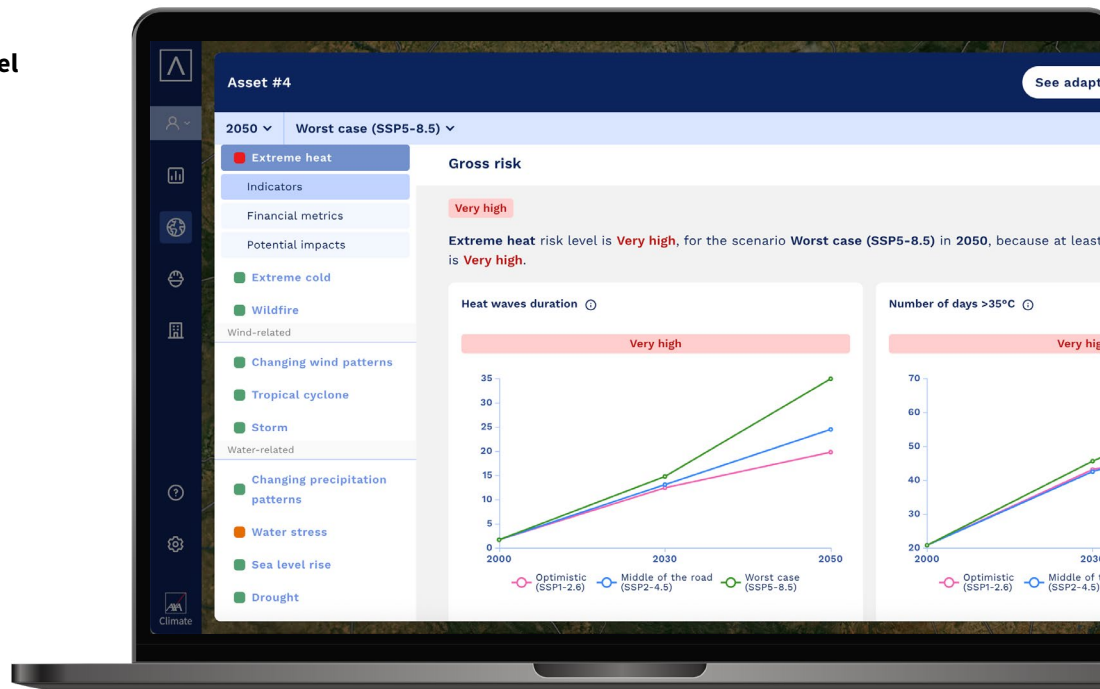
IPCC SCENARIOS

The IPCC’s scenarios describe possible future climates based on the socioeconomic factors driving current climate change. In other words, socioeconomic choices will lead to the emission of a certain amount of greenhouse gases, and depending on the volume emitted, the level of global warming will be more or less high.

CLIMATE PROJECTIONS

The next step is climate projections. Based on a scenario (e.g., warming of 2°C), these projections help assess the behaviour of specific climate indicators (e.g., flooding or heatwaves) across various geographic scales and time horizons. Projections differ from weather forecasts, as they represent a statistical view of the long-term evolution of climate conditions (over several decades).

Altitude draws on concrete indicators and IPCC projection scenarios to assess the risk level of each hazard.



Multiple scenarios and time horizons can be used to analyse these projections. Here are the recommendations provided by the main standards and regulations mentioned earlier:

- **ESRS standards** require companies to assess climate-related physical risks, based on a high emissions scenario (IPCC SSP5-8.5) across the value chain (including suppliers), while specifying the likelihood, magnitude and duration of each risk.
- **The European Taxonomy** stipulates that climate projections and impact assessments must be based on best practices, and reflect up-to-date scientific knowledge when analysing vulnerability and risks, as per the most recent IPCC reports, peer-reviewed scientific publications and open-source or paid models. For activities with an expected lifespan of less than 10 years, climate projections should use the smallest possible spatial scale. For all other activities, climate projection scenarios can cover 10 to 30 years for major investments.
- **The TCFD** recommends the use of extreme scenarios up to 2030, and several scenarios between 2030 and 2050. It defines the 5-8.5 scenarios as the most relevant for risk assessment: ‘Physical risk scenarios generally identify extreme weather threats of moderate or higher risk before 2030 and a larger number and range of physical threats between 2030 and 2050’ (TCFD 2017), and ‘what is likely to be most helpful is to consider scenarios consistent with RCP8’ (TCFD 2017). The time horizon is defined according to the useful life of the organisation’s assets or infrastructures, and taking into account the fact that climate-related problems often manifest themselves in the medium to long term.

Scenario analysis

The analysis of strategic and financial scenarios is a key part of a company’s decision-making process. Companies tend to focus primarily on the most likely scenarios, which works well for risks that evolve gradually. However, this approach exposes them to risks associated with sudden disruptions.

Stress test

A stress test is a type of scenario analysis, using a similar methodology. The difference lies in the likelihood of the given scenario to occur. A stress test consists of looking at the least likely scenarios. It provides a different view, to help understand how a sudden shock would impact a company or a portfolio.



In practice, using the IPCC Interactive Atlas to analyse climate projections for the regions where a company operates provides a good starting point. However, companies often lack the tools and expertise to refine the analysis at the level of each specific site. Consulting adaptation specialists, who have the necessary tools and skills, can be an effective way to go one step further.

RGREEN INVEST: an example of using climate projections to secure investments



Julien Commarieu
Managing Director
at RGREEN INVEST

Why do you use climate projections in your investment process?

RGREEN INVEST is a mission-driven investment management company, which manages nearly 3 billion euros in private equity and private debt,

focused on infrastructure related to the energy transition in Europe and internationally. We finance, in particular, renewable energy and related projects (solar, wind, biomethane, batteries, electric vehicle charging points, etc.) and low-carbon infrastructure. These projects will often still be around in 20 or 30 years, hence the importance of developing projects that are not only adapted to climate risks today, but that will remain so throughout the entire lifespan of the assets.

Climate and biodiversity risks are major challenges for us. When we invest, these risks must be assessed before any decision is made, and be the subject of clear measures and an action plan implemented by the project developer. Altitude enables us to improve our understanding of biodiversity-related risks, and to analyse and anticipate the long-term impact of climate change on our assets.

What tangible benefits have you gained from this approach?

A concrete example is our investment in a French-Italian company specialising in renewable energies (solar, wind and biomethane). Altitude enabled us to:

- Identify a risk of drought at several sites around the biogas plants, and challenge the company on the supply of agricultural biomass inputs to the plants.
- Propose an alternative solution for certain solar projects — to use dry cleaning robots rather than robots that use water, to save this resource which could become scarce over time.

What have you learned from this approach?

By incorporating climate projections, we can better manage the risks associated with our investments, and ensure their long-term resilience.

This approach helps us to:

- Secure our assets against the impacts of climate change, thereby reducing the long-term operational risk
- Develop concrete adaptation strategies with our partners
- Guarantee a key stage in the compliance of our investments with the European Taxonomy, which we are firmly committed to

By structuring our approach around these analyses, we are able to finance sustainable and resilient infrastructures while anticipating future climate challenges.

Determining where to act first

The next step, after listing past and future risks, is to identify which ones to prioritise. Here are a few recommendations on how to select them.

- Work on the *type* of climate hazard by starting to identify the sites most at risk in terms of flooding, extreme heat, strong winds, water stress, etc.

This may concern weather events that occur every year, even if they cause little damage or, conversely, very rare events which, when they do occur, cause major damage. The latter are all too often ignored or even forgotten.

Identify an initial series of priority sites by focusing on the most frequent or intense risks in each category.

- In some cases, it is important to take into account events of average frequency and intensity which may seem, at first glance, less of a priority. This is particularly true when a number of hazards threaten one site. An overview of all the risks that could affect a site can help to limit risk.
- Similarly, it is important to take into account changes in weather conditions between now and 2030 or 2050. If these conditions change significantly, the company risks being less prepared and is therefore more likely to be caught off guard. In other words, the more risks evolve, the greater the need to anticipate. For example, industrial sites in Northern Europe could find themselves in difficulty in the event of a heatwave, because their technical equipment has not been designed to withstand such high temperatures. A site in England could therefore be more vulnerable to heat than a site in Morocco, where the equipment is already adapted to high temperatures!

100-year floods in Paris – an unexpected event

A 100-year flood is a flood that has a 1% chance of occurring. In Paris, the risk of a 100-year flood caused by the rise of the Seine's water levels is relatively underestimated by the private sector. However, global warming has increased this risk by 40%. A 100-year flood would inundate the French capital's main business district, threaten 430,000 jobs and result in losses of around €60 billion. Although public authorities are responsible for safeguarding the area, there are also a number of ways in which companies can limit the risks to their activities. Yet most companies do little to prepare for this type of event⁹.

Updating the risk assessment and recognising its limitations

A climate risk database must be continuously updated to remain relevant. Every employee should be able to contribute to this collective effort by sharing feedback from the field. This means being able to connect observed incidents with climate change, and to recognise that some of these incidents could happen again — potentially more often, or with greater intensity.

Hence the need to raise employee awareness of adaptation.

Raising awareness allows to encourage feedback, share existing best practices within the company and help employees better anticipate future risks. The more employees are aware of climate issues, the more robust the company's climate risk network will be.

However, a robust risk network does not mean that all risks can be anticipated — any risk forecast involves a degree of uncertainty. Especially since climate change points to a future of chronic instability. Adaptation should therefore be seen as a strategy for navigating a state of ongoing crisis¹⁰.

In other words, an adaptation strategy must be... adaptive!¹¹

Adaptation is not just about **anticipating** risks. Adapting also means learning to react to the **unpredictable**. Organisations must become more responsive and agile to deal with extreme weather events. No one knows exactly where, when or how these events will occur, so companies need to be able to act with speed and agility.

Crisis management plans or business continuity plans can be defined to address climate hazards. Some companies have already gone one step further by organising simulation exercises, for example, to train employees on how to react in the event of a climate crisis.

Adaptation is not just another project for a dedicated team to manage. A **culture of adaptation** should be fostered throughout the company on an ongoing basis. This culture must be established... and actively maintained. It is a key driver of resilience for the entire organisation.

Responding to the unpredictable: Japan and seismic risks*

Japan is particularly exposed to seismic risks. The country has therefore implemented a strategy that combines various approaches. First of all, Japan has very strict building codes to prevent earthquake damage. Japanese citizens are also trained on how to react through evacuation drills at work, and in schools and administrations... In other words, a culture of risk is embedded within the population.

*Disclaimer: seismic risks are not climate risks.



part 4

PART 4

Identifying and prioritising adaptation actions

Once the risks have been identified and prioritised, the next step is to define adaptation actions to counter them. But how do you identify measures for each risk? And how do you decide which ones to implement?

Exploring possible adaptation options

The first step is to identify the possible actions for each risk. In some cases, there may be limited realistic options, making adaptation difficult, or even impossible. In other cases, lots of measures could be adopted — the challenge is choosing the most effective ones.

For example, several solutions exist to reduce the impact of heatwaves on employees: insulating the building,

installing air conditioners, painting the roof white to reflect the heat, adapting their work clothes, introducing staggered hours or even relocating the offices. This list is far from exhaustive.

All ideas are welcome at this stage — the aim is to list as many options as possible. They will be narrowed down later.

Flood risks: protect, retreat, accommodate

In response to the risk of rising sea levels, the ‘PARA’ framework (Protect – Accommodate – Retreat – Avoid) sets out a typology of possible responses:

For a building that has already been built:

PROTECT

By building dykes, for example. In the Netherlands, dykes high enough to withstand floods with a 1 in 1,000 chance of occurring have been built. However, it is important to be wary of maladaptation — in some cases, dykes can lead to greater vulnerability over time by creating a false sense of security, and increase the exposure of vulnerable populations by further eroding nearby coastlines. Another option could be to resort to nature-based solutions, such as restoring the coastline.

RETREAT

At the other end of the spectrum, the risk could be entirely avoided by relocating activities to an area that is not exposed.

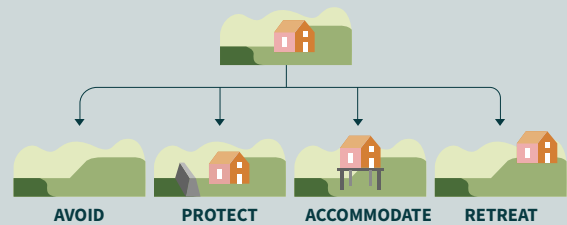
ACCOMMODATE

This option lies somewhere in the middle, and involves adapting to certain risk levels while accepting that you are less protected from others.

For a construction project:

AVOID

By stopping the development of new buildings in the at-risk area.



During this **exploratory phase**, combining various viewpoints can lead to a broad array of solutions. In order to achieve this, workshops can be organised with different departments. The aim is to ensure that the adaptation options come from those who are in contact with the risk, who are familiar with the situation, and who know what is feasible and what is not. This will increase the credibility of the adaptation actions.

Integrating climate risk into investment decisions: an infrastructure project avoided due to flood risk

What is the context?

While carrying out a due diligence process for a public infrastructure project, a fund's investment team identified a red flag linked to a potential climate risk. This red flag triggered a screening via Altitude to quantify the site's exposure to flooding and, above all, to model its evolution over time. Although initially perceived as a stable opportunity, the project turned out to be much more vulnerable than expected, an aspect the borrower had not fully anticipated.

How was the risk identified?

The investment team carried out a risk assessment, incorporating regulatory analysis and advanced climate modelling. In this case, an in-depth review revealed that a recent amendment to the local urban development plan had revised the delineation of the flood-prone area. Thanks to enhanced screening using the Altitude platform, it was possible to confirm the materiality of the risk over a shorter time horizon than the term of the debt.

Why was the project rejected?

The investor deemed that the exposure of the asset constituted too great a reputational risk. The borrower's lack of a clear adaptation strategy confirmed this decision. The investor's management team therefore decided not to finance a potentially failed asset.

What lessons were the investors able to draw?

This example illustrates the importance of integrating climate risks into the investor assessment process right from the beginning. An in-depth analysis can help avoid risky decisions, as well as strengthen the resilience of portfolios in the face of growing environmental challenges.

Assessing the feasibility and effectiveness of identified measures

After identifying adaptation options in the exploratory phase, the second step is to select those that are truly aligned with the company's objectives. The assessment is split into two parts: the feasibility of the measure on the one hand, and its effectiveness on the other.

FEASIBILITY OF THE MEASURE

The first sub-step consists of assessing the feasibility of the measure, i.e., asking whether the measure is achievable.

From an economic viewpoint, implementing an adaptation measure first requires ensuring that its cost is lower than the potential cost of the risk if it were to occur without the adaptation measure. For this purpose, a cost-benefit analysis is recommended. This involves identifying the costs (and potential gains) in the short, medium and long term, and setting them against the risks involved. The costs do not need to be 100% accurate — a rough estimate is sufficient.

However, feasibility is not only financial. The adaptation measure must also be feasible from a technical, regulatory and organisational viewpoint. For example, adjusting employees' working hours to cope with heatwaves may be economically feasible, but the measure must also be feasible legally and for the employees.



EFFECTIVENESS OF THE MEASURE

The second sub-step is to assess the effectiveness of the measure in addressing the initial problem. Does the identified measure really reduce the risk?

Often, the measure in question will reduce the company's short-term risk.

But in many cases, although it may not be apparent at first, an adaptation option can actually reinforce the risk.

A measure may reinforce the risk:

- If the solution **reinforces the problem or merely postpones it**. For example, some adaptation solutions emit large amounts of greenhouse gases, thus reinforcing the initial problem, i.e., climate change.
- If the solution **shifts the risk to other populations**.
- If it has **adverse effects on other aspects of the planet's ecological balance** — biodiversity, water resources, etc. If an adaptation solution amplifies an imbalance (other than the climate), it creates new risks. It is therefore essential to find, whenever possible, levers that reduce the pressure on all planetary boundaries¹².

Each of these cases are examples of **maladaptation**.

It is therefore essential to consider the negative external effects that may result from each adaptation measure.

¹²Climate is one of the processes that ensure safe and favourable conditions for humans and their environment — but it is not the only one. In addition to climate change, there are eight other 'planetary boundaries': loss of biodiversity, disruption of the biogeochemical cycles of nitrogen and phosphorus, land system change, ocean acidification, global freshwater use, stratospheric ozone depletion, increase in atmospheric aerosol loading and the introduction of new entities into the biosphere.

Is air conditioning an example of maladaptation?

Air conditioning in a building releases hot air outside, creating heat pockets. Air conditioning therefore exacerbates the risk for other locals, particularly those who do not have access to air conditioning... and who are among the most vulnerable to heatwaves. According to the French National Centre for Meteorological Research in Paris, this release of hot air could cause temperatures to rise by a further 2°C by 2030.

Some air conditioning units also release refrigerant gases. These gases have a high global warming potential, thus reinforcing climate change (in addition to the appliances' energy-related emissions, which are estimated to represent almost 10% of total electricity consumption worldwide¹³).

And that's not all. In the event of a power cut, air-conditioned buildings generally have no alternative means of cooling temperatures, thus facing a very high risk in case of a heatwave. In some cities, the electricity demand generated by air conditioners creates a risk of grid saturation, which in turn increases the risk of outages, and therefore blackouts, as seen during the heatwave in California in August 2020 or in Mexico in 2022.

Air conditioners can also create a false sense of security. In reality, relying on air conditioning means **relying on a solution that is highly vulnerable** to climate change. Like many electrical appliances, air conditioners have maximum operating temperatures, which are often limited to 45°C. Beyond this threshold, air conditioners may stop working.

However, this does not mean that air conditioning should be viewed as entirely negative. During periods of extreme heat (which we are likely to experience more and more often), air conditioning can be essential for the most vulnerable segments of the population (the elderly, children, people with health issues, etc.).

Another criterion to determine whether an adaptation measure will be effective, is to identify whether it is an **adjustment** measure, i.e., one that works in the short term and will have to be repeated again and again, or a truly **transformative** measure that will sustainably strengthen a company's ability to cope with climate risks.

According to the IPCC's sixth report, tackling risks one by one, and focusing only on short-term benefits, often leads to maladaptation if long-term impacts are ignored.

Favouring more structural measures, which promote better adaptation in the medium and long term, enables to better tackle short-term climate hazards, as well as anticipate a world that will be 2°C or 3°C warmer. In other words, the choice is also about resilience.

The example of mountain tourism

Let's take the example of a company in the mountain tourism sector. One adaptation option to tackle **reduced snowfall** could be to use snow cannons.

However, this solution requires a lot of water, i.e., a resource that will become increasingly scarce. **Conflicts over its use are likely to arise**, putting the company in competition with other water users. While the use of snow cannons may seem like a good solution in the short term, it is **likely to be ineffective** in the medium or long term. This is known as an adjustment measure.

A more lasting, and therefore ultimately more effective solution, would be to transform the company's offering, by diversifying its activities with hiking, mountain biking, etc.

Deciding on an adaptation plan

The final step is to decide which measures to implement. This involves drawing up an action plan in the short, medium and long term for each of the risks identified. This phase depends on the solutions agreed upon during the assessment phase.

We recommend favouring two types of solutions. The first is so-called **no-regret measures** — adaptation measures that are beneficial to the company, whatever the future climate. For example, one option to reduce the risk of water shortages is to reduce the organisation's dependence on water resources. It may be possible to reuse some of the water used in the production process, thus reducing vulnerability to the risk of water shortages, as well as water bills. These no-regret measures can therefore be persuasive when convincing internal staff of the benefits of adapting now.

The second type of measures to favour is **flexible measures**.

The aim is to avoid fixed solutions whenever possible, since no one knows precisely when and where climate events will occur.

The adaptation options chosen must, whenever possible, incorporate feedback and potential climate changes. Adaptation is often not a single solution — several measures can be combined to increase resilience. For example, in some cases, an adjustment measure may serve as a first step before securing the funds needed for a transformational solution.

Moreover, an action plan must specify who is responsible, and when and how each measure will be implemented. For example, the solutions could be tested on pilot sites before being rolled out on a larger scale. Any difficulties observed during this testing phase can then be adjusted before the wider roll-out.

Adaptation measures are not always 'successful'. Their success depends on a number of factors, in particular the size and complexity of the problem they serve to address. The larger and more complex the problem, the more detailed and specific the response must be.

Lastly, an action plan should include monitoring indicators for each adaptation measure, to assess the impact of the solution on risk reduction, as well as its impact on stakeholders and the environment... starting with the climate!

part 5

PART 5

Combining adaptation and mitigation

Maladaptation is one of the pitfalls to avoid when implementing an adaptation strategy. But it is not the only one. A good adaptation strategy should not ignore the broader interactions between adaptation and mitigation.

As explained earlier, it is important to ensure that the chosen adaptation solutions do not make climate change worse by emitting greenhouse gases. Otherwise, the problem is merely postponed, indirectly increasing the very risk the measure was intended to reduce. Just like when treating an illness, the adaptation solution should not cause side effects that are more harmful than the initial problem.

Adapting well — as opposed to maladaptation — is essential, but it is not enough. As the illness metaphor shows, adapting means treating the symptoms. However, if we only mitigate the consequences of climate change without tackling the root causes, the problem will only get worse. At some point, the symptoms will become too intense and the treatment will no longer work. The IPCC refers to hard adaptation limits — beyond a certain level of warming, it will no longer be possible to cope with climate events. This is why today's mitigation efforts will determine our ability to adapt in the future¹⁶.

Situations in which adaptation is no longer possible

Studies¹⁷ have shown that, in some areas of the world, temperature and humidity conditions could become unbearable if global warming becomes too intense. The warmer the climate, the more dangerous certain areas combining high temperatures and humidity will become. Indeed, the human body can only evacuate heat effectively below a certain level of humidity.

Mitigating, or limiting greenhouse gas emissions now, will limit the intensification of global warming. This, in turn, will keep the risks within a limit humans can adapt to. **Adaptation and mitigation are therefore inseparable.** The opposite is also true — focusing exclusively on reducing greenhouse gases, without also adapting to the impacts of climate change, could prove to be very costly. Not least because global warming is already a reality and will inevitably continue for years to come. The impacts are therefore inevitable. Hence the expression, **'avoiding the unmanageable and managing the inevitable'**, which reflects the inseparable nature of adaptation and mitigation approaches.

It is essential to tackle both the symptoms and the root causes of a disease — or the consequences and drivers of climate change.

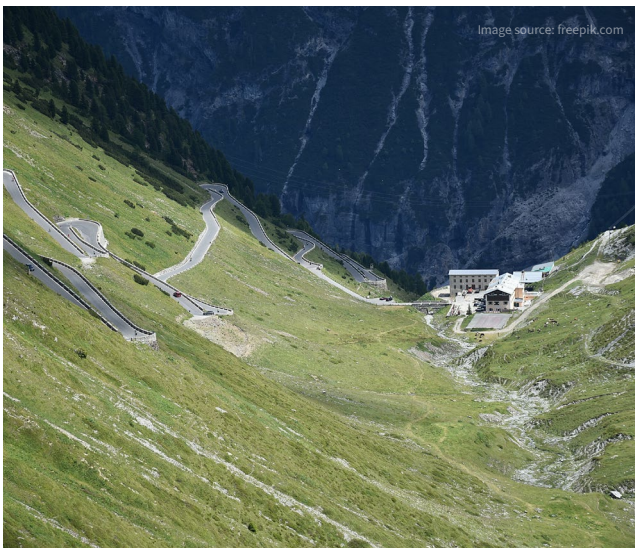
In some cases, adaptation can actually lead to mitigation. Here are some examples:

- In agriculture, adopting agroecological practices, such as planting permanent cover crops, reducing tillage and adding organic matter, helps to protect and improve soil quality. Improved soil quality increases its water reserves, thus protecting crops against water stress, and also enables it to store more carbon, thus reducing our emissions.
- In the transport sector, bicycles are both an adaptation and mitigation solution because they are more resilient to transport breakdowns and reduce emissions by replacing a more polluting means of transport.
- In housing, insulating buildings makes them less vulnerable to heat, while limiting the energy consumption needed to heat or cool them down, thus limiting greenhouse gas emissions.

Some solutions enable **synergies** between mitigation and adaptation, contributing to both at the same time.

Among these solutions are Nature-based Solutions (NbS), which play an essential role. They aim to protect, sustainably manage, and restore natural or human-made ecosystems, to promote biodiversity and human wellbeing¹⁸. In other words, these projects address societal challenges by contributing positively to mitigation objectives, as well as to the restoration of biodiversity and natural ecosystems. Behind this generic term lies an array of solutions that meet specific needs: Green Infrastructure, Natural-Climat Solutions (centred around mitigation), Ecosystem Disaster Risk Reduction, Nature-based Solutions for adaptation, etc. Whatever their primary goal, Nature-based Solutions generate remarkable **co-benefits**, making them particularly attractive.

For example, to counter intense flooding, such as the floods in Germany and Belgium in 2021, planting rain gardens and/or riparian plants along the riverbanks can help improve soil permeability and water retention, thereby limiting the amount of water that enters buildings. Another effective measure against flooding is the restoration of wetlands, such as salt marshes or peat bogs. These environments create a natural buffer by absorbing water along the banks. There are multiple other co-benefits, such as the creation of carbon sinks via plant photosynthesis, or improved biodiversity by extending wildlife corridors, in particular for birds to feed and rest.



Combining adaptation and mitigation – the example of NbaS



Vincent Viguié,
Researcher at CIRED
(Ecole des Ponts).

There are multiple synergies between mitigation and adaptation. Insulated housing is a perfect example. If done properly, insulating buildings helps to keep homes cooler during heatwaves, and to consume less energy heating them during winter. Adaptation and

mitigation are essentially two sides of the same coin. The challenge is to rethink how a business develops within an area constrained by environmental factors — both because the environment will increasingly affect business activities, and because businesses must pay closer attention to the impacts they have on it.

Nature-based Adaptation Solutions can be deployed on different scales. Take the previous example of heatwaves: urban greening (e.g., growing plants on roofs, walls or in indoor courtyards) can help limit exposure to excessive heat. It is important to note that these Nature-based Solutions require a high level of expertise in ecological engineering. Depending on the results you want to achieve, you need to choose the right species, location, maintenance, etc. Another important point is that these solutions can provide many positive co-benefits. Trees and green spaces, for example, improve inhabitants' and office workers' quality of life. Urban greening, when done properly, can also help maintain certain local ecosystems.

Interview extracted from the Climate School.

Of course, companies cannot always deploy Nature-based Solutions. Carrying out a feasibility study is therefore essential to assess the viability of these solutions. Generally speaking, an adaptation plan combines several types of solutions. Nevertheless, many cost-benefit analyses favour NbaS solutions. For example, a study conducted in Vietnam on the risks of coastal flooding due to typhoons — which are estimated to affect 2.5 million people annually and result in a 33% increase in losses by 2025 — shows that a combination of ‘green’ solutions (such as the restoration of mangroves) and ‘grey’ solutions (such as human infrastructures like dykes) could completely eliminate the damage to the agricultural sector. The cost-benefit ratio is particularly favourable for certain solutions — mangrove restoration has a ratio of 9, meaning that every euro invested prevents €9 in damages, for gabions (stone structures used to stabilise soil) the ratio is 8, and for dykes it is 2. Opting for these types of solutions is therefore recommended, as they reduce the impacts of climate change while addressing the root causes.

In conclusion

Mitigation and adaptation go hand in hand. When mitigation and adaptation measures are developed together, the lines between the two become increasingly blurred. Priority should therefore be given to measures that create synergies between climate change adaptation and mitigation, i.e., measures that are useful for one without being detrimental to the other, and ideally, useful for both.

Example of the Binga hydroelectric dam (Philippines)

Binga Dam, in the Philippines, was built in the 1960s to increase energy production and help manage flooding.

The forest upstream of the watershed provided ecosystem services that were not taken into account during the installation and operation of the facility. Yet deforestation, which has accelerated over the years in the Agno river basin, combined with numerous cyclones and typhoons, has led to major landslides. These landslides have accelerated sedimentation around the dam, **leading to a decrease in the river's flow and a reduction in the water storage capacity.**

In the 2000s, the dam stopped working properly after losing almost 80% of its required water reserves. This directly resulted in intermittent energy production and increased maintenance costs due to additional sediment dredging (>+\$2 million/year).

One possible solution would be to replant a forest in the watershed.

part 6

PART 6

Adopting a systemic approach

Throughout this guide, we have focused closely on the way companies should approach the subject of climate change adaptation. Our aim was to develop a pragmatic roadmap that can be applied to any organisation. However, it is crucial to recognise that environmental challenges — both risks and opportunities, adaptation and mitigation — go far beyond climate issues alone, and cannot be reduced to adapting to company-specific risks.

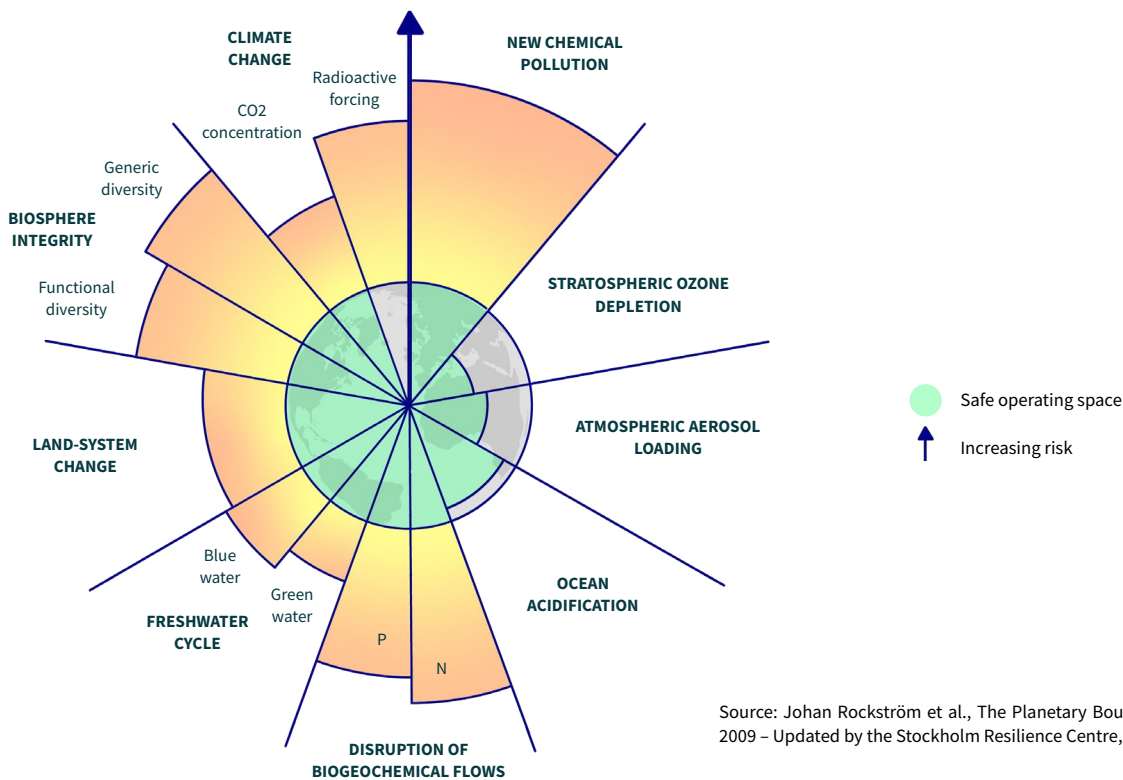
Major interdependent balances

Although climate change is at the forefront of discussions today, awareness is only the first step. To effectively meet future challenges, it is important to consider the nine planetary boundaries as a whole, as human activity is pushing them all to their limits. Exceeding any of these boundaries will make the Earth’s system more fragile and expose us to significantly deteriorated living conditions.

Climate change, which is directly linked to exceeding atmospheric greenhouse gas limits in the atmosphere, increases exposure to other environmental risks. For example, warming is causing more frequent and extreme weather events, a loss of biodiversity and a disrupted water cycle. Meanwhile, ocean acidification, caused by the absorption of excessive atmospheric carbon dioxide, is leading to coral calcification, reducing its ability to protect coastal areas.

Exceeding these boundaries also increases the risk of climate change — ocean acidification reduces the water’s capacity to absorb CO₂, thus increasing the concentration of the gas in the atmosphere. The artificialisation of soils also indirectly exacerbates the physical risks of flooding or drought.

A holistic approach is therefore essential, urging companies to expand their focus and actions beyond climate issues and CO₂ emissions, and to also address the pressures on the planet and our reliance on the ecosystem services it provides.



Source: Johan Rockström et al., The Planetary Boundaries, 2009 – Updated by the Stockholm Resilience Centre, 2023

Similarly, an approach that focuses solely on adapting a company or its activities to all the changes affecting the planet’s broader balance, would fall far short. Companies are part of an ecosystem they both depend on and influence — suppliers, customers, service providers, local policy-makers, etc. Once again, the issue is far too complex for siloed actions.

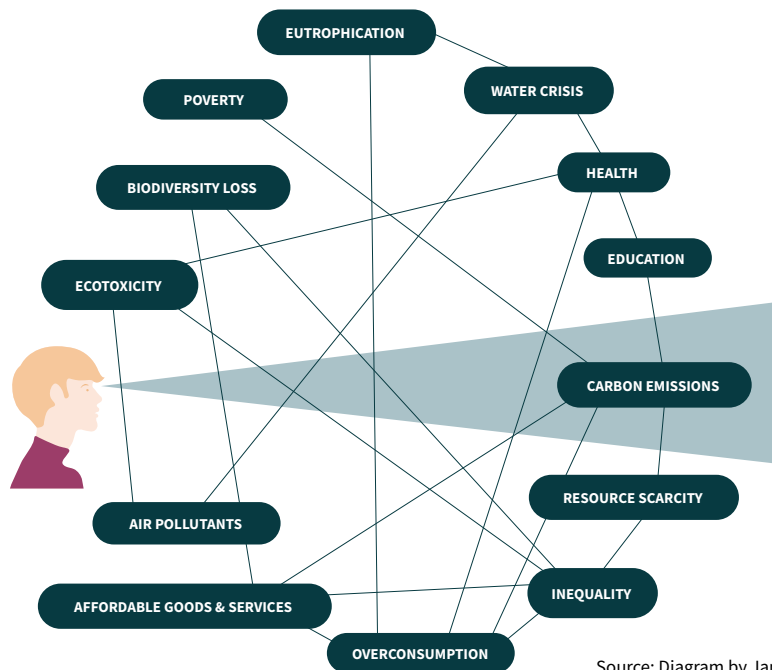
An adaptation strategy must therefore go beyond production processes alone, and cover internal operations (strategy, culture, finance, marketing, etc.), as well as the entire value chain and interactions with stakeholders. Within this context, a company’s mitigation and adaptation efforts rely on an understanding of each of its relationships:

- The impact of its activities and ways of minimising negative effects or reinforcing positive impacts on stakeholders, thereby fostering a more resilient environment for the company itself.
- Dependencies on certain stakeholders and infrastructures, and ways of structurally reinforcing them by increasing their capacity and resilience.

At a local level, this involves managing immediate risks, even indirect ones. At a global level, it means addressing the challenges posed by complex supply chains and interconnected markets. Examples of adaptation actions could involve:

- Working on corporate culture to ensure that employees and suppliers alike are more autonomous and, therefore, more responsible, thereby strengthening the entire system’s capacity to adapt.
- Stronger ties with the surrounding area, through more local and varied sourcing, or even a diversification of methods or business models.
- Adapting the way value is shared so as to increase the long-term value of stakeholders, including customers, who will then be in a position to defend it.

In short, companies must adopt a more comprehensive view of the ecosystem in which they operate, and contribute to its balance to remain resilient and sustainable.



Source: Diagram by Jan Konietzko

Conclusion

Companies are now well aware that they have to step up their human and financial efforts to adapt to climate change. After addressing their own operations, this approach must be expanded to the entire value chain.

This white paper provides a framework which draws on the latest regulatory developments, current scientific knowledge and feedback collected by Axa Climate's teams from their clients since 2019. This practical approach aims to help companies to strengthen their ability to adapt and to roll out a real climate change strategy.

But companies still need to understand exactly what we will need to adapt to. Here too, our response draws on science to quantify climate risks at a local level, and to study the various possible scenarios. This approach allows companies to adopt effective short- and medium-term adaptation measures while avoiding maladaptation and ensuring resilient operations. It also ensures that the recommendations are feasible (as they are based on practical, on-the-ground experience), and aligned with the latest reporting standards.

The clock is ticking — the effects of climate change are already here, with physical and financial impacts on companies. Worse still, the current trajectory of greenhouse gas emissions is leading to continued, and possibly worsening, global warming. Therein lies the challenge for companies — deploying a realistic and lucid adaptation strategy along with an ambitious mitigation strategy. We must do everything in our power to avoid the unmanageable while managing the inevitable.

Fortunately, solutions exist, and some, like nature-based solutions, offer a number of co-benefits. We hope that this white paper has convinced you that you can take firm, concrete action!

Key takeaways

1. It is essential to identify priority climate risks based on their frequency, intensity and the value of the activities at stake.
2. Companies must define new goals, select adaptation measures, preferably based on nature, and assess their feasibility and effectiveness in line with their risk profile and operational risk mapping.
3. An adaptation strategy must be accompanied by a mitigation strategy.
4. Adaptation measures must be 'no regret' measures that are flexible and incorporated into an action plan, with monitoring indicators to measure their progress over time.
5. A company's adaptation approach must take into account the local ecosystem and the areas in which it operates.
6. It is essential to adopt a systemic approach to tackle environmental challenges while taking into account the nine planetary boundaries.



About AXA Climate

AXA Climate supports businesses and public institutions in their adaptation to climate and environmental change through four lines of expertise – parametric insurance, training, consulting and a SaaS platform, Altitude.

Altitude is AXA Climate’s scientific platform to assess and manage climate and biodiversity risks, and support decision-makers as they adapt to climate change.

Altitude helps you to quickly identify your strategic sites that are the most exposed to climate risks all over the world, measure the potential financial impacts to define and monitor your adaptation strategy, with a library of more than 100 actionable adaptation measures.

Insurance

Protecting people, nature and economic activities against climate risks.

Consulting

Supporting organisations in their adaptation and transformation process.

Training

Enabling companies to improve their skills and involve all their employees in a sustainable transition.

SaaS

The scientific platform to assess and manage climate and biodiversity risks, and support decision-makers in their climate change adaptation process.



Altitude supports companies in their adaptation process through an in-depth understanding of their climate and biodiversity-related risks.

Altitude is AXA Climate’s scientific platform, to assess and manage climate and biodiversity risks, and support decision-makers in their adaptation to climate change.

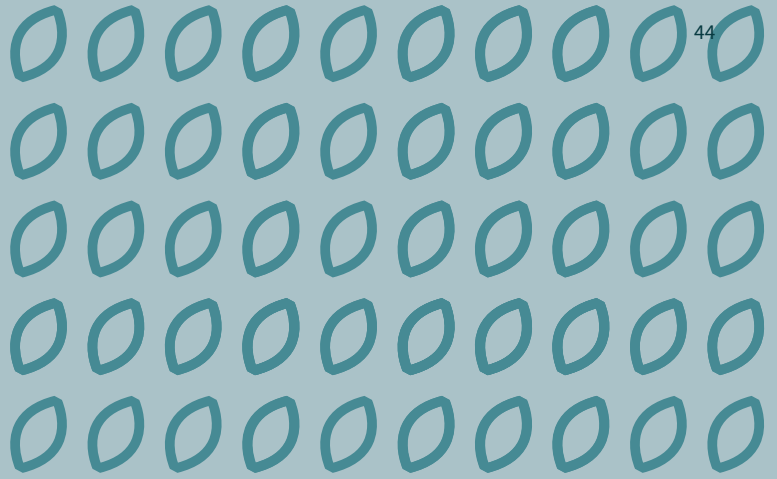
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image source: freepik.com



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About

‘Avoiding the unmanageable by adapting to the inevitable’ is a guide intended for all companies seeking to adopt an adaptation approach. This white paper provides tools for understanding and assessing risks, and identifying and prioritising adaptation actions, based on a systemic approach. The first version, ‘Managing the inevitable, how can we meet the challenge of climate adaptation?’ was published in February 2024 by AXA Climate’s teams and Climate School. A huge thank you to them, without whom this new version would not have been possible.

To find out more about Altitude’s support solutions, go to axa-altitude.com



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