

ADVANCING TCFD GUIDANCE ON PHYSICAL CLIMATE RISKS AND OPPORTUNITIES



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Executive summary

The final recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), released at the G20 summit in the summer of 2017, recommended that metrics on physical climate risks and opportunities should be included in financial disclosures but did not provide concrete guidance on what the appropriate metrics would be.

To address this challenge and support the emergence of standards for the disclosure of physical climate risks and opportunities, the European Bank for Reconstruction and Development (EBRD) and the Global Centre for Excellence on Climate Adaptation (GCECA) launched a targeted initiative to work with innovative thinkers in the financial and corporate sectors. The goal of this initiative was to identify the greatest needs for guidance and research and to lay the foundations for a common conceptual framework and a standard set of metrics for reporting physical climate risks and opportunities.

The EBRD-GCECA project focused on disclosure metrics specifically for corporations. Industry-led working groups with participants from the financial sector and corporations met over the first half of 2018 to discuss and consider key research questions:

- Working group 1: Metrics for physical climate risk management and disclosures
- Working group 2: Metrics for climate resilience opportunities
- Working group 3: Climate intelligence for business strategy and financial planning.

The working group discussions informed the development of a set of recommendations, presented in this report. These recommendations, primarily targeted at corporations, are intended to inform and support early efforts to adopt the TCFD recommendations.

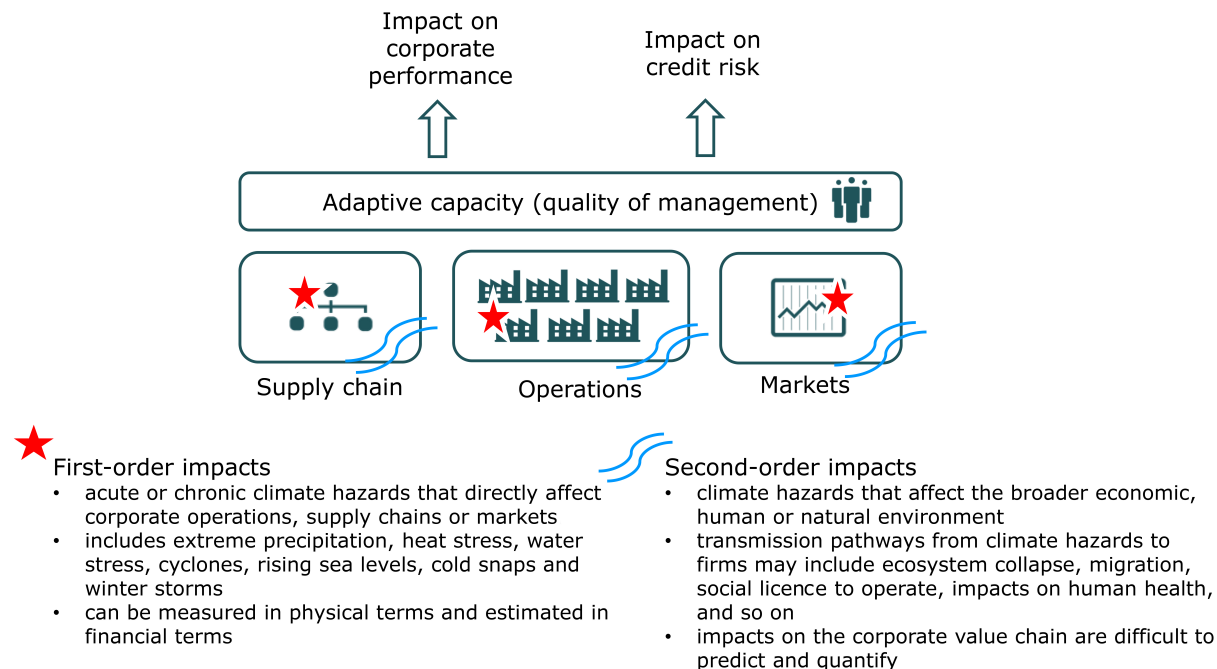
Disclosing physical climate risks

The TCFD recommendations identify climate-related physical risks as being one of the two main types of risks that financial and non-financial corporations should disclose, including both acute (event-driven) and chronic risks (those due to longer-term shifts in climate patterns). Climate change may affect all and any part of a company's financials, including expenditures, revenues, assets and liabilities, capital and financing. The TCFD recommends that organisations disclose information about governance, strategy and risk management, as well as metrics used to assess risks.

Identifying physical climate risks

A corporation's vulnerability to climate impacts goes well beyond the physical exposure of its facilities. It includes supply chains, distribution networks, customers and markets. Furthermore, a company's resilience to physical climate impacts depends on its risk management and business plans, as well as its governance.

Figure ES-1. How climate change affects corporate value chains



From the perspective of a corporation, we distinguish between first-order and second-order impacts. First-order impacts are direct hazards from climate change, both acute and chronic, that can be measured in physical terms (degrees Celsius, millimetres of rain, sea temperature, acres burned, and so on) and that affect specific regions or locations, often within a discrete timeframe (days, weeks, years). These hazards are relevant for all economic and human activities.

Second-order impacts include all impacts of climate change on economic, human and ecosystems beyond the boundaries of the corporation. These may include changes in the availability of natural resources, agricultural productivity, and the geographic distribution of species, disruption to transport, changes to global trade routes, migration, and macroeconomic indicators such as GDP, employment and interest rates. Unlike direct climate hazards, second-order impacts are difficult to predict and even harder to mitigate through traditional approaches to risk management.

The impacts of climate change on corporate value chains depend on where the company operates and what impacts may affect relevant locations, but they also depend on the company's activities. Corporations whose production processes consume high volumes of water, for example, may be particularly sensitive to changes in drought and the availability of water. Similarly, corporations with high-energy consumption or significant use of outdoor labour will experience greater challenges as average temperatures rise, affecting both energy costs and labour productivity.

Recommendation 1: Assess exposure to all first-order physical climate impacts

Corporations should consider all first-order impacts when undertaking a physical climate risk assessment: heat stress, extreme rainfall, drought, cyclones, sea-level rise and wildfires. Corporations should also consider in their physical climate risk assessments additional climate hazards relevant to their industries, such as ocean acidification for fisheries. Exposure to climate hazards should be assessed at the local scale (for example, flood risk to a land parcel, extreme rainfall and heat in a city), using the most recent climate data and literature.

Recommendation 2: Assess physical climate risks over the duration of an asset's lifetime or over the lifetime of a financial instrument

This paper recommends that a physical climate risk assessment should include projections for a 5- to 20-year timeframe, with a focus on 'tail risks'. Impacts beyond a 20-year timeframe should be assessed using scenario analysis to account for the uncertainty in climate policy and for the cascading impacts of climate change.

Firms should consider physical climate impacts over the following timeframes:

1. Assess changes in asset performance over the past 5-10 years (or longer) that are attributable to extreme weather events or to climate variability, in order to detect possible impacts from climate change.
2. Assess potential impacts over the expected lifetime of the asset and/or over the lifetime of the investment or loan.

Table ES-1. Timeframe and recommended approach to assessing physical climate risks

	Recommended timeframe	Approach for first-order impacts	Approach for second-order impacts
Short term	3-5 years	Probabilistic	Scenario analysis
Medium term	5-20 years	Probabilistic	Scenario analysis
Long term	20+ years	Scenario analysis	Scenario analysis

Recommendation 3: Disclose locations that are critical to value chains

This report recommends that corporations provide more detailed information on the location of their critical operations, suppliers and market, at least at the country level, as part of segment reporting and thereby enable investors and creditors to conduct analysis on exposure to risk in their portfolio.

For all physical climate risk disclosures, the focus should be on material risks. Corporations should disclose whether physical climate risks have been assessed at the asset level and disclose specific risks that are material at the group level, rather than making detailed facility-level information the default. The focus on materiality will ensure that disclosures are relevant and proportionate.

Recommendation 4: Provide detailed information on the financial impacts of recent extreme weather events

Firms should provide in their financial filings detailed information on the historical impacts of extreme weather events, including metrics on days of business interruptions and associated costs, costs of repairs or upgrades, fixed-asset impairment, supply chain disruptions and lost revenues.

Recommendation 5: Disclose the impacts of weather variability on value chains

Corporations with moderate or high sensitivity to variability in temperature and precipitation should identify and disclose whether and how changes in temperature and precipitation have materially affected their performance.

Recommendation 6: Perform forward-looking assessments of physical climate risks

Assessing future physical climate risks is extremely challenging. The combination of uncertainty over climate impacts, the timing of these impacts, business consequences and the effectiveness of risk management efforts will require additional work from companies if they are to gain a sophisticated understanding of what lies ahead. Corporations should disclose 1) their assessment of the types of physical climate risks to which they may be exposed in the future due to the geographic exposure of their facilities and 2) the estimated financial impacts from the risks they have identified as being material.

Metrics for projected impacts may include a combination of:

- the number of sites and business lines exposed to relevant climate impacts
- the projected changes in production, revenues, operational expenditure or capital expenditure due to climate change
- value-at-risk from probabilistic estimates (for example, 1:100 or 1:200) of extreme weather event disruption to operations or production, key suppliers, customers or markets
- annual average losses from projected climate impacts.

Recommendation 7: Describe risk management processes for physical climate change impacts

Corporations should describe their processes for identifying, assessing and managing the physical climate risks, as noted by the TCFD. For these physical impacts, aspects of particular interest to financial institutions and banks include risk management processes, insurance coverage, planned facility moves or retrofits, corporate climate resilience strategy, and engagement with local authorities to build climate resilience locally.

Disclosing physical climate opportunities

The TCFD also encourages corporations to disclose opportunities related to the impacts of a changing climate. This recommendation is critical to ensuring that businesses and financial institutions continue to thrive in a changing environment. It is also vital for promoting the healthy development of climate resilience products and services that cater to new market needs for climate resilience.

Identifying physical climate opportunities

The TCFD defines “climate-related opportunity” as “the potential positive impacts related to climate change on an organisation,” and notes that opportunities “will vary depending on the region, market and industry in which an organisation operates.” This report identifies three broad types of opportunities related to physical climate change impacts:

1. Opportunities related to managing existing physical climate risks
2. Opportunities to respond to new emerging physical climate risks
3. Opportunities to adapt to market shifts driven by physical climate impacts and cater to any resulting new market needs.

This framework invites firms to consider short-term and long-term opportunities alike, and opportunities to improve internal processes (efficiency, risk management), as well as opportunities to grow into new markets as the impacts of climate change become prevalent.

Climate resilience investment opportunities can also be broken down into ‘horizontal’ and ‘vertical’ solutions. Horizontal solutions include products and services for physical climate risk analytics and climate resilience that are relevant to all public and private organisations looking to manage physical climate risks and build climate resilience. Vertical solutions are products and solutions that cater to specific business sectors that actively manage business risks and have unique needs.

Disclosing opportunities that may arise from climate change raises challenges with regard to the disclosure of forward-looking information. Corporations may be sensitive about disclosing to investors and competitors quantitative or qualitative forward-looking information about market analyses and anticipated market conditions.

Recommendation 8: Identify opportunities based on managing physical climate risks and related market shifts

Corporations and financial institutions should strive to identify opportunities in managing existing physical climate risks and responding to emerging risks.

Corporations should also assess the potential changes in their value chains as a result of physical climate change impacts, and explore potential market shifts as customer needs change. They should target their products and services to cater to growing demand for climate resilience solutions.

Recommendation 9: Assess physical climate opportunities over timeframes relevant to business planning

Corporations should define the appropriate timescales in which to report physical climate opportunities in consultation with their investors. The preferred timescales will vary by sector. Opportunities in response to managing existing physical climate risks that affect recent and current accounts and the next year's accounts should be reported as part of core financials. Those opportunities arising from responding to emerging physical climate risks should be included in core financials where the impact is expected to affect current management accounts and future short-term trading as well as statements issued to investors on market conditions. Opportunities arising from market shifts linked to physical climate change impacts are unlikely to be reported quantitatively and are more appropriate for disclosure in general reporting on future business expectations.

Recommendation 10: Disclose physical climate opportunities for business at the segment level; for critical facilities, disclose climate resilience benefits at the facility level

Physical climate opportunities may be disclosed at different levels to best serve firms and investors. Opportunities due to shifting market demand or new products should be reported at the segment level, in line with risk disclosures. Benefits from managing existing or emerging risks may be disclosed at the segment level (for process or supply-chain improvements, for example). For critical facilities, it may be advantageous for firms to disclose significant climate resilience upgrades or strategic improvements at the facility level, to showcase good stewardship and provide confidence that critical facilities are protected.

Recommendation 11: Disclose benefits from climate resilience investments using the same metrics as for the disclosure of physical climate risks

Corporations should acknowledge the importance of accurately accounting for the opportunity effects on their core financials arising from actions to manage current risks and respond to emerging risks. These metrics may include avoided negative impacts on revenues, operating expenses, capital expenses, supply chain costs, value-at-risk, or projected annual average losses. Recent work by multilateral development banks on metrics for climate resilience results may provide a starting point but will require further development and modification. Whenever possible, companies should disclose public co-benefits from their climate resilience investments. These benefits may be disclosed qualitatively or quantitatively.

Recommendation 12: Include physical climate opportunities for business in qualitative disclosures

The disclosure of physical climate opportunities involving market shifts and new products and services can be achieved by qualitative disclosures of the lifecycle of new commercial opportunities. The disclosures may include information on the development stage of endeavours, sector, the size of potential markets, and the length of time until commercial viability.

Scenario analysis for physical climate risks and opportunities

With regard to climate intelligence for business strategy and financial planning, the TCFD recommendations strongly advocate the development and use of scenarios when analysing climate risks and opportunities. In this context, scenario analysis is intended as a tool to address challenges and acquire key information.

Scenarios are understood to provide a narrative, either qualitative or quantitative, which “describes a path of development leading to a particular outcome.” The types of scenario that could ideally be considered for scenario analysis are ‘context exploring’ scenarios (‘views of the world’) modelled on the approach of Shell, which allow organisations to understand risks and capture opportunities.

The development of physical climate risk scenarios has lagged in comparison to carbon transition scenarios; comprehensive hypothetical scenarios have not yet been developed or established for scenario analysis of these risks. Sector-level climate impact studies, which use climate model outputs, and integrated assessment models (IAMs) can be used to explore risks at the sector, system and spatial levels over time. However, the use of IAMs for climate impact analysis has been far less systematic and limited to a few sectors (such as impacts on agriculture, water and coastal zones from sea level rise).

Recommendation 13: Consider current and desired GHG concentration pathways and related warming projections as a basis for scenario analysis of physical climate risks and opportunities

The bases for evaluating physical climate risks are Intergovernmental Panel on Climate Change (IPCC) climate scenarios that show how increases in global mean temperatures are driven by concentrations of greenhouse gas (GHG) emissions in the atmosphere.

Corporations should not be concerned with developing new climate scenarios themselves. Instead, as a basis for their scenario analysis of physical risk, they should consider at least two main types of existing climate scenarios:

- Current GHG pathway: National climate policies currently in place around the world are projected to reduce baseline emissions, which would result in warming of about 3.4 °C above pre-industrial levels.¹
- Desired (‘aspirational’) GHG pathway: These are the scenarios compatible with limiting warming to below 1.5 °C by 2100 (with a probability of ≥50 per cent), and to below 2 °C in the 21st century (with a probability of about 80 per cent).

Recommendation 14: Integrate scenario analysis of physical climate risks and opportunities into existing planning processes to ensure strategic, flexible and resilient businesses and investments

The main reason to undertake scenario analysis is to obtain a comprehensive assessment from firms of their risks and opportunities. Firms should achieve this by exploring different possibilities of what might happen in the future, despite uncertainty and by integrating climate change considerations into their existing business strategies and financial planning.

For corporations and financial institutions, the direct value added by undertaking scenario analysis is that they will be able to align their business strategies with potential outcomes, which will make them more robust. In this sense, the real value of scenario analysis is the ability to ensure strategic, flexible and resilient businesses and investments, and is not the process of disclosure in itself.

Climate scenarios and output should be integrated into existing business and investment planning of corporations. Some firms – particularly large companies in specific industries – already produce scenarios as part of their business-planning and risk-management processes. In an ideal situation, companies and investors alike would develop scenarios and undertake scenario analysis of physical climate risks.

Recommendation 15: Avoid standardised scenario analysis in order to have a more comprehensive range of outcomes

Firms should look at more than one scenario and multiple climate models in order to have a more comprehensive range of potential outcomes. Although a degree of comparability is desirable, it is also recommended that corporations develop their own scenarios, which should be highly contextual, and based on the views and values of individual corporations.

There is more than one way to conduct scenario analysis. It may be done as a standalone workshop or as a longer-term planning process undertaken on a regular basis by a single company. In all its various forms, the aim of scenario analysis is to make more robust long-term plans by systematically analysing risks in possible future states.

Second-order impacts of climate change are well suited for inclusion in scenario analysis because they are impossible to predict with precision, but must be considered due to their wide-ranging and potentially catastrophic effects. Typical examples of macroeconomic impacts to be considered in scenario analysis include climate impacts on economic growth, global trade flows and human migration.

Recommendation 16: Consider data from a wide variety of sources and scales when developing scenario analysis of physical climate risks

In order to construct plausible scenarios of physical climate risks and opportunities, firms should consider inputs from a wide variety of sources and levels of detail. These include scientific data (not only on climate change), macroeconomic data, socio-economic data, data on political economics and policy, corporate data, 'vision' and market analysis data, 'big data', and so on. It should be noted that climate change is just one of the drivers that influences scenario analysis as intended in this report.

Recommendation 17: Take account of scientific uncertainty inherent in climate data and in scenario analysis of physical climate risks and opportunities

Corporations and financial institutions are very well accustomed to making decisions within a large spectrum of uncertainty. In the same way, they should consider and manage the uncertainty that surrounds climate data and climate science for scenario analysis. Scientific uncertainty should be taken into account and made explicit when assessing climate-related financial risks and opportunities.

Recommendation 18: Disclose qualitative information that is relevant to the company and its investors

The ultimate objective in disclosing the use of scenarios is to build investor confidence that a company is meaningfully engaged on the topic of climate change, that it is looking at a broad range of outcomes and is responsive and proactive, rather than defensive and reactive. In this context, firms should disclose information on their physical climate risks and opportunities in the way that is most appropriate to them, as well as to their investors, and to the type of information disclosed or its format (quantitative or qualitative).

Conclusion

Efforts to formalise and standardise the assessment and disclosure of physical climate risks and opportunities are still in their infancy. As science and business continue to progress in their understanding of climate impacts, the recommendations made in this report will evolve over time, informed by emerging practices and the continuous efforts of corporations, financial institutions, credit rating agencies, industry groups, think-tanks, regulators and governments.

Further challenges and research questions remain to be addressed across the three topics, including issues surrounding the materiality of risks, methodologies for quantifying the disclosure of risks, management practices, forward-looking statements, as well as guidance and standardisation for scenario analysis. For all of

these topics, broader cross-cutting challenges may also emerge, for example, with regard to ongoing policy and regulatory developments for climate disclosures.

Climate disclosures will remain a topic of active research and discussion, and this report aims to support the emergence of market practices that bring transparency to markets and help build climate resilience in firms and financial institutions.

Table ES-2. Summary of recommendations for disclosing physical climate risks and opportunities, and scenario analysis

Recommendations for the disclosure of physical climate risks			
	Supply chain	Operations	Markets
1. Hazards	<ul style="list-style-type: none"> Assess exposure to heat stress, extreme rainfall, drought, cyclones, rising sea levels, wildfire and other industry-relevant and/or locally specific climate hazards across the corporate value chain. 		
2. Timeframe	<ul style="list-style-type: none"> Assess exposure to first-order (direct) impacts in the short to medium term (2-5 and 5-20 years) using a probabilistic approach; use scenario analysis for long-term risk (more than 20 years) and possible exposure to second-order (indirect) impacts. 		
3. Level	<ul style="list-style-type: none"> Location (country or city) of key supplier facilities and a measure of their importance 	<ul style="list-style-type: none"> Location (country or city) of critical business facilities (such as production or support systems) and key distribution or logistics sites, as well as a measure of their importance 	<ul style="list-style-type: none"> Breakdown of sales by country and by segment
4. Impacts from recent extreme weather events	<ul style="list-style-type: none"> Decreased production capacity due to supply-chain interruption 	<ul style="list-style-type: none"> Reduced revenues, including situations where a significant number of staff members are unable to get to work Increase in operational expenditure (opex), such as repair costs, insurance premiums Increase in capital expenditure (capex) such as impairment of fixed assets, inventory write-downs 	<ul style="list-style-type: none"> Reduced revenues from lower sales due to the consequences of extreme weather events
5. Impacts of weather variability	<ul style="list-style-type: none"> Increase in supply-chain costs due to changes in the availability of commodities 	<ul style="list-style-type: none"> Increase in opex (energy costs, negative impacts on the workforce) Increase in capex due to weather or natural resources 	<ul style="list-style-type: none"> Reduced revenues from lower sales due to variability in the weather
6. Future risks of climate change	<ul style="list-style-type: none"> Suppliers or commodities likely to be affected by climate change Value-at-risk (VaR) from 1:100 or 1:200 and annual average loss projections from disruption to key supplier(s) 	<ul style="list-style-type: none"> Number of sites and business lines exposed to relevant impacts of climate change Projected change in production, revenues, opex or capex due to climate change VaR from 1:100 or 1:200 impact on operations or production Annual average losses from projected impacts of climate change 	<ul style="list-style-type: none"> Markets or sales likely to be affected by climate change VaR from 1:100 or 1:200 loss projections from impact on key customer(s) or markets
7. Physical climate risk management and climate resilience strategy	<ul style="list-style-type: none"> Supply-chain risk-management strategy Engagement with suppliers to help identify, assess and manage climate-related physical risks Engagement of suppliers with local and national governments to identify, assess and manage these risks 	<ul style="list-style-type: none"> Insurance and risk management instruments and total cost of risk (net risk exposure after risk management) Planned improvements, retrofits, relocations, or other changes to facilities that may reduce their vulnerability to climate impacts Engagement with local or national governments and local stakeholders on local climate resilience 	<ul style="list-style-type: none"> Logistics, distribution and sales risk management strategy Engagement with distributors and key customers to help identify, assess and manage climate risks

Table ES-2. (continued from previous page)

Recommendations for the disclosure of physical climate opportunities	
8. Opportunities	<ul style="list-style-type: none"> Identify opportunities inherent in managing existing and emerging physical climate risks Identify opportunities based on adapting to market shifts driven by a changing climate
9. Timeframe	<ul style="list-style-type: none"> Assess and disclose opportunities using an adequate timeframe, according to the industry and the type of opportunity: <ul style="list-style-type: none"> snapshot of current context (shortest timeframe) business planning timeframe asset lifespan (longest timeframe)
10. Level	<ul style="list-style-type: none"> Disclose physical climate opportunities at the segment level Disclose climate resilience benefits at the facility level for critical facilities
11. Metrics for climate resilience benefits	<ul style="list-style-type: none"> Disclose benefits of climate resilience investments using the same metrics that are used for the disclosure or physical climate risks In addition, whenever possible, assess and disclose public co-benefits from climate resilience investments (in other words, the wider economic benefits of managing physical climate risks)
12. Metrics for business opportunities	<ul style="list-style-type: none"> Disclose qualitative information on the lifecycle of a new commercial opportunity, including: <ul style="list-style-type: none"> the development stage of an endeavour the business area and connection to company's core business the size of the potential market the approximate timeframe for commercial viability
Recommendations for scenario analysis disclosures	
13. Climate scenarios	<ul style="list-style-type: none"> Consider current and 'aspirational' GHG concentration pathways and related warming projections as a basis for scenario analysis of physical climate risks and opportunities
14. Motivation	<ul style="list-style-type: none"> Integrate scenario analysis of physical climate risks and opportunities into existing planning processes to ensure strategic, flexible and resilient businesses and investments
15. Scenario building	<ul style="list-style-type: none"> Avoid standardised scenario analysis in order to have a more comprehensive range of outcomes
16. Data	<ul style="list-style-type: none"> Consider data from a wide variety of sources and scales when developing scenario analysis of physical climate risks and opportunities
17. Scientific uncertainty	<ul style="list-style-type: none"> Take account of scientific uncertainty inherent in climate data and in scenario analysis of physical risks and opportunities
18. Scenario analysis and disclosures	<ul style="list-style-type: none"> Disclose qualitative information that is relevant to the company and its investors <ul style="list-style-type: none"> Consider scenario analysis of physical climate risks and opportunities as an initial step towards building climate resilience

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