AN FTI CONSULTING REPORT — LAUNCH EDITION 2026

Climate Change & Adaptation

Rethinking climate risk integration across business, finance and policy

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Executive Summary

Financial institutions, corporate executives and investors are operating with climate risk models that systematically underestimate exposure by a factor of two to four times. This isn't a compliance issue, instead it represents one of the most significant mispricing phenomena in modern capital markets, materializing today across credit spreads, equity valuations and capital allocation decisions.

We analyzed 148 global companies representing $31.4 trillion in market capitalization to test whether current climate risk models provide decision-useful intelligence. The findings are stark: conventional platforms project approximately 2.0% portfolio losses, while our integrated analysis reveals 7.7% average exposure – a four-fold gap that stems from systematically underweighting transition risks relative to physical climate impacts.

Three insights define the challenge. First, transition risks – carbon pricing, technology disruption, stranded assets – exceed physical risks in magnitude and urgency, yet receive minimal analytical attention. Second, material exposure manifests within 10–15-year horizons relevant to actual business decisions, not distant 2050 targets. Third, climate exposure varies by 3x to 4.5x within single sectors, rendering sector-level analysis ineffective.

For a $50 billion corporate loan book, this represents $1.5 to $2 billion in unrecognized exposure. For investors, it means systematically mispriced portfolios with hidden concentrations. For corporates, it affects cost of capital by 25-40 basis points and competitive positioning. Recent UK regulatory action demonstrates supervisors are now comparing institutional approaches – those with systematic underestimation face heightened capital requirements.

This report quantifies the gap, identifies why current models fail, demonstrates the extreme heterogeneity that sector averages obscure and establishes the analytical architecture required to move from blind spots to informed advantage. The institutions that master company-specific climate risk quantification will capture competitive advantages through superior risk-adjusted returns, effective transition finance allocation and enhanced stakeholder credibility.

Introduction

Climate risk has moved from the periphery of ESG considerations to the center of credit quality, asset valuation and portfolio performance. Yet a concerning gap persists, despite mounting empirical evidence and intensifying regulatory scrutiny, most organizations continue to deploy climate risk models that systematically underestimate exposure – often by a factor of two to four times. This has profound implications for how lenders assess creditworthiness, how corporates manage enterprise risk, how investors construct portfolios and how all organizations structure climate-aligned capital deployment and support decarbonization pathways.

The financial impact is material across stakeholder groups. For a financial institution with a $50 billion corporate loan book, this represents $1.5 to $2 billion in unrecognized climate exposure. For a Fortune 500 industrial company, underestimated transition costs could affect enterprise valuation by 15-20%. For institutional investors, this systematic underestimation creates mispriced portfolios and missed opportunities for alpha generation. More immediately, this creates specific vulnerabilities. For lenders, this can result in the mispricing of climate-vulnerable credits and regulatory risk from supervisory comparison. For corporates, rising cost of capital as climate risk affects credit spreads and equity valuations. For investors, they could be hit with systematic mispricing of portfolio holdings and competitive disadvantage as peers with superior analytics capture outperformance opportunities.

Our findings are unequivocal. Conventional climate risk analysis platforms that focus primarily on physical risk induced impacts typically project single-digit portfolio losses – averaging approximately 2.0% (e.g., MSCI's CvaR when applied by NBIM to their portfolio).[1] In comparison, NBIM's study utilized other more advanced system level models that incorporate select aspects of transition risks estimated the impact to be exceeding 19.0% over the same horizon as that used by MSCI in its estimation (Year 2080).[2] By contrast, our integrated approach using a cash flow-based analysis – incorporating both physical and transition risks over a 15-year horizon (Year 2040) across multiple scenario pathways – estimates average climate exposure of 7.7%[3], (portfolio level CliF™[4] for the above-described portfolio composition). This four-fold gap over a shorter time horizon stems not from the underlying climate science assumptions, but primarily from more holistically capturing the transmission mechanism through which climate change affects business operations and thereby the cash flows and enterprise value of each corporate represented in our diversified portfolio.

Three critical insights emerge from our research:

- Transition risks substantially exceed physical risks in both magnitude and volatility, yet most institutional frameworks still focus predominantly on physical risk impacts. This has direct consequences for transition finance as institutions cannot accurately price transition loans, assess transition plan credibility or identify viable decarbonization investments when their models systematically underweight the very transition dynamics these strategies seek to address.
- Material climate exposure manifests within decision-relevant time horizons of 10-15 years, not the distant 2050 or 2080 timeframes often cited. This temporal compression means transition planning and transition finance deployment must accelerate accordingly.
- The heterogeneity in climate exposure across companies – even within identical sectors – makes granular, company-specific analysis essential rather than optional. Credible transition plans require understanding company-specific operational constraints, technology pathways, capital requirements, regulatory context and competitive positioning, which are elements that sector-level analysis fails to effectively capture.

The implications extend well beyond regulatory reporting, they fundamentally reshape how institutions should price loans, allocate capital, construct portfolios, evaluate transition plans and deploy transition finance. Applied to substantial corporate loan books or investment portfolios, this four-fold underestimation

translates into hundreds of millions in unrecognized exposure, systematic mispricing of climate-vulnerable credits and missed opportunities for value creation through strategic decarbonization. More critically, it undermines the efficacy of transition finance itself: capital deployed based on incomplete risk assessment flows to the wrong recipients, at the wrong price, supporting insufficiently rigorous transition strategies.

This urgency is now crystallizing in regulatory action. The UK Prudential Regulation Authority ("PRA") has recently enhanced requirements for UK regulated banks and insurers in managing climate-related risks through Supervisory Statement 5/25.[5] The PRA explicitly requires financial institutions to enhance identification of climate-related risks, understand how these risks impact their business model over relevant forward-looking periods under different climate scenarios and develop risk management responses proportionate to their climate-related risk vulnerabilities. Critically, the PRA emphasizes internal governance frameworks, including board ownership of climate risk – reinforcing that climate risk quantification must escalate from technical risk function to board and C-suite strategic priority.

The PRA's enhanced supervisory regime represents an increasing focus on climate risk even as ESG regulations face reduction in scope and delays within the EU and outright cancellation alongside climate regulations in the United States. Simultaneously, the UK Government's recent literature review RAF015/2526 on Climate Transition and Global Financial Stability highlights systemic risks at multiple levels, particularly how changes to cost of capital will impact emerging and frontier markets.[6] This regulatory evolution underscores a critical reality, that supervisors are comparing institutional approaches to climate risk quantification. Those demonstrating systematic underestimation face heightened capital requirements, additional reporting obligations and potential enforcement action.

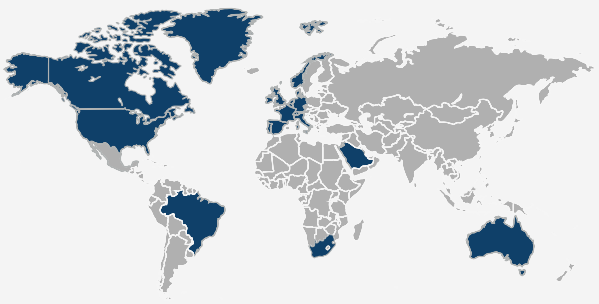
What We Found: A Four-Fold Underestimation in Current Practices

Our research objective was straightforward: test whether current climate risk models provide decision-useful intelligence for businesses and financial institutions. We curated a globally diversified sample replicating typical large-cap diversified portfolios held by commercial banks and institutional investors. The companies spanned communication services, consumer discretionary and staples, energy, healthcare, industrials, information technology, materials, real estate and utilities – representing $31.4 trillion in aggregate market capitalization across North America, Europe and Asia-Pacific.

We then subjected this portfolio to three distinct analytical approaches. First, we applied conventional limited-scope methodologies similar to widely used platforms like MSCI Climate VaR, which focus primarily on direct physical asset-level risks.[7] Second, we examined results from Norway's sovereign wealth fund ("NBIM"), which deploys more advanced damage functions capturing broader systemic effects.[8] Third, we deployed our integrated climate risk framework and analytics engine across nine scenario archetypes, running 100,000 Monte Carlo simulations per scenario and calculating 600 climate risk impact data points per company per year over a 15-year forward horizon.

The divergence in results proved striking. Our analysis, examining a 15-year horizon (2040) and integrating both physical and transition risks under business-as-usual climate and accelerated transition scenarios, revealed 7.7% average climate exposure measured through our Climate Forward™ (CliF™) metric – the estimated change in company valuation due to climate-driven shifts in future cash flows.

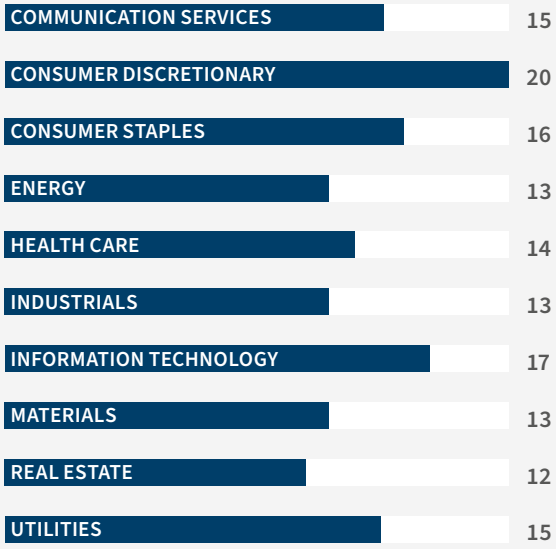
Geographies



Market Cap
31.4 USD Tn

Average Market Cap
212 USD Bn

Sectors



Key Input Metrics

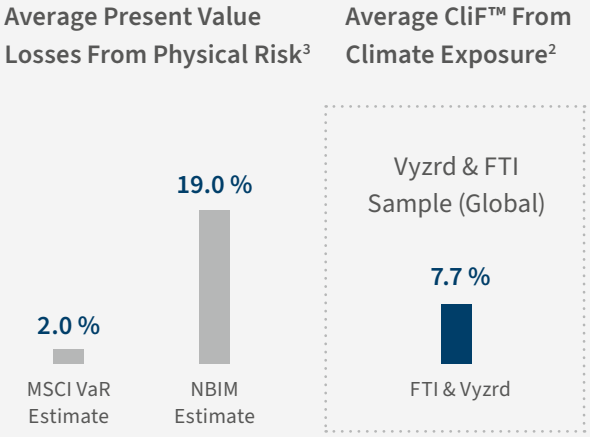
FINANCIAL

CLIMATE

READINESS

Three critical insights emerge from this comparison. First, the gap between 2.0% and 7.7% represents not different climate science, but rather the difference between assessing only direct physical impacts versus capturing the full transmission mechanism through which climate affects corporate value. Second, even over a shorter 15-year investment horizon – the timeframe actually relevant for most lending, business planning, and investment decisions – climate impacts are material and immediate, not distant and theoretical. Third, transition risks are substantially more significant and more imminent than conventional models suggest.

Estimate Comparison



Source: FTI Consulting analysis

Why Current Models Miss the Mark: Six Structural Barriers

Financial institutions and investors confront six interconnected obstacles that constrain accurate climate risk assessment. Our study design deliberately tested these limitations.

1. **Regulatory requirements are outpacing institutional capabilities.** Disclosure frameworks including IFRS S2 and ISSB mandate forward-looking scenario analysis, yet most institutions lack the data, analytical capability and resources to identify, design and translate macro scenarios into borrower or investee-specific financial impact models.[9] The outcome is compliance-oriented reporting that minimally satisfies disclosure obligations while generating limited decision value for actual investment strategy, risk management or capital deployment.

2. **Transition risk data exhibits significant gaps and fragmentation.** While physical risk quantification has advanced through climate modelling and geospatial analytics, transition risk assessment demands granular understanding, incorporation and modelling of technology roadmaps, policy trajectories, competitive dynamics and operational flexibility at sub-industry and individual company level of resolution. This specificity exceeds standard ESG data vendor offerings, forcing institutions to rely on sector proxies that mask critical heterogeneity.

3. **Climate valuation remains disconnected from core financial processes.** Credit committees require default probability adjustments. Portfolio managers need expected return recalibrations. Risk functions demand capital adequacy calculations. Climate assessments, however, typically yield qualitative scores or compliance documentation rather than the quantitative inputs necessary for pricing, provisioning and portfolio optimization.

4. **Scenario frameworks operate at mismatched levels of granularity.** Industry-standard scenarios from NGFS, IEA and comparable institutions provide valuable directional guidance at regional and sectoral levels.[10, 11] Translating these macro constructs into company-specific impacts, however, requires intermediate modelling of technology diffusion rates, input cost transmission, competitive positioning and operational responses – capabilities that are currently rare in the market and most institutions have yet to develop.

5. **Analytical complexity induces decision paralysis.** Climate science generates probabilistic distributions across multiple pathways. Economic impacts propagate through networked value chains. Policy responses vary by jurisdiction. Technology costs evolve non-linearly. Confronted with this multidimensional complexity, institutions frequently default to simplified heuristics or defer rigorous analysis, accepting systematic underestimation as the price of tractability.

6. **Counterparty risk assessment captures incomplete exposure.** A borrower's climate vulnerability extends beyond direct operations to encompass suppliers, customers and ecosystem participants throughout the value chain. Portfolio company resilience similarly depends on the adaptive capacity of commercial counterparties. Incorporating these network dependencies requires analytical approaches that current methodologies seldom provide and current systems do not scale across multiple business units, jurisdictions and counterparties.

Six Barriers Widen the Climate Risk Modeling Gap

Climate Regulations

Rapid increase in regulatory disclosure for corporates (e.g. TCFD/ISSB) and regulators mandating the inclusion of climate risk into the investment process

More Than Just Physical Risk

Transition risk is larger and more volatile than physical risk, but limited data is currently available to corporates or investors

Climate Valuation

Corporates and investors need forward-looking climate impact data to effectively manage corporate strategy or price financial instruments

Complexity

Climate calculations are complex with limited tools to transform chronic & extreme climate science into actionable business or investment insights

Scenario Analysis Limitations

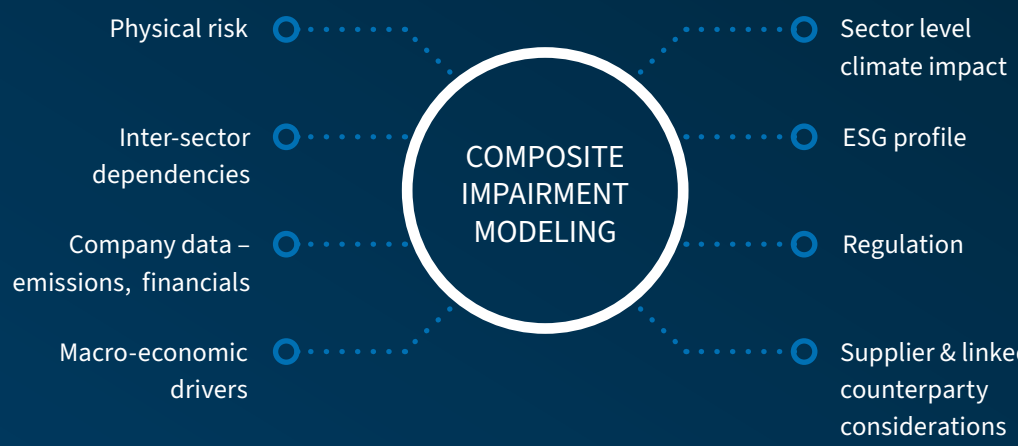
Industry standard climate scenario analysis focus on region & sector data, not the company specific data required by corporates or financial institutions

Managing Counterparties

The measurement of upstream & downstream counterparty risk is challenging due to limited data. This affects equity, debt & insurance pricing

AI and Industry Expertise Power Decision Ready Climate Analysis

Integrating several dimensions across system, industry and organizational levels – much beyond conventional models



The Heterogeneity Problem: Why Sector Averages Fail

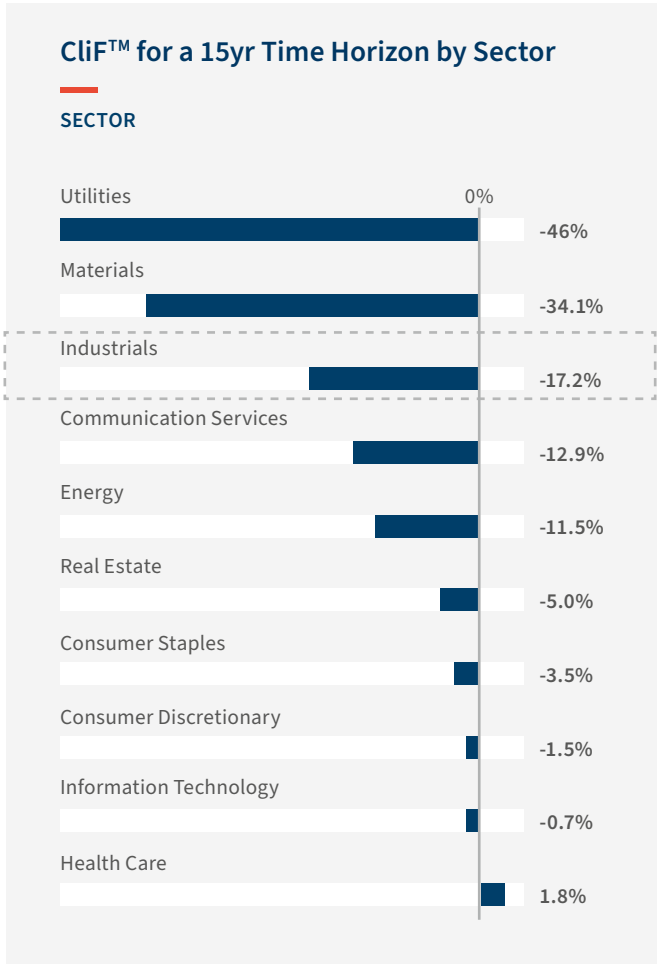
Perhaps the most striking finding from our analysis is the degree of climate exposure heterogeneity or dispersion – not just across sectors, but within them. This variation fundamentally undermines the sector-level proxy approaches that dominate current practice and reveals why granular, company-specific analysis is not merely preferable but essential.

Climate exposure varies by factors of 3x to 4.5x even within sectors. Our portfolio-level analysis revealed average CliF™ exposure of 7.7% under moderate climate and accelerated transition scenarios. However, examining sector-level detail shows exposure ranging from -46.1% for utilities to +1.8% for healthcare – a 47.9 percentage point spread. More critically, when we examined sub-industry variation within sectors, we observed the idiosyncratic exposure increase by 4.5x at the lower end and 3x at the higher end relative to overall portfolio levels.

Industrials: Sub-industry heterogeneity obscures aggregate risk. Within the Industrials sector, which showed -17.2% average CliF™ exposure, sub-industry variation proved extreme. Marine Transportation exhibited -96.1% exposure, air freight & logistics showed -56.7%, while professional services demonstrated +10.5% exposure – a positive outcome driven by low emissions and increased demand for advisory services during the transition. The 106.6 percentage point spread between worst and best performers within a single sector demonstrates why sector averages systematically mislead.

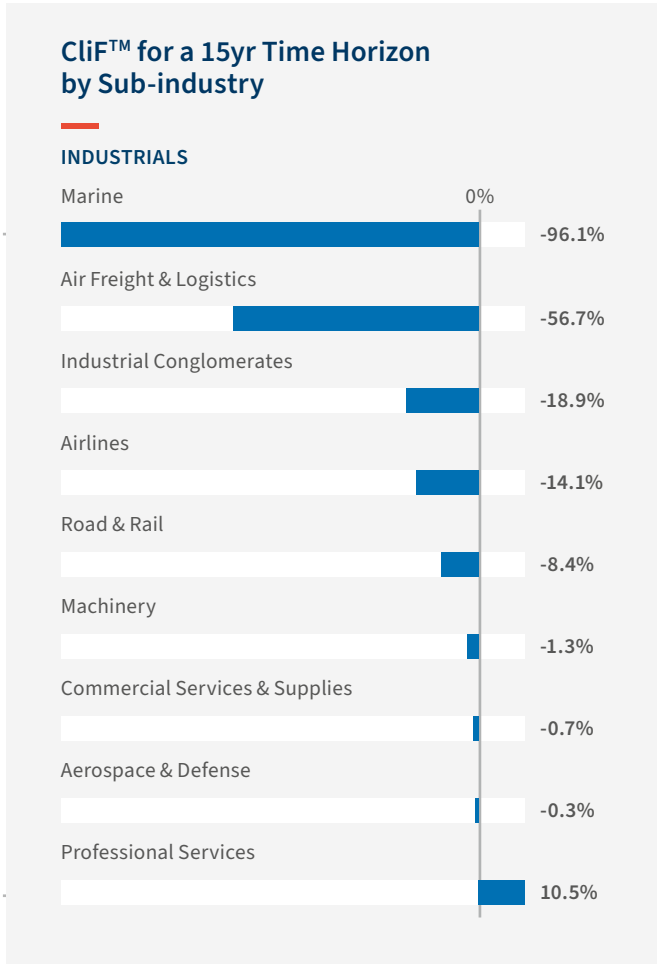
Our analysis revealed that a few sub-industries drive most sector-level risk. Marine and air freight face the largest declines due to high emissions, fuel dependency and limited decarbonization options – making them most exposed to transition risk. Meanwhile, most other sub-industries show moderate impact. This concentration effect means portfolio managers using sector-level screens systematically miss the actual risk distribution.

CliF™ for a 15yr Time Horizon by Sector



Source: FTI Consulting analysis

CliF™ for a 15yr Time Horizon by Sub-industry



Source: FTI Consulting analysis

Company-level dispersion within sub-industries reveals further complexity. Even within industrials sub-industries, company-level analysis revealed dramatic variation. Among companies in our sample, individual CliF™ scores ranged from -116.0% to +10.5% within the sector. The sector average of -17.2% obscures the reality that some companies face near-complete valuation impairment while others show resilience or even positive exposure.

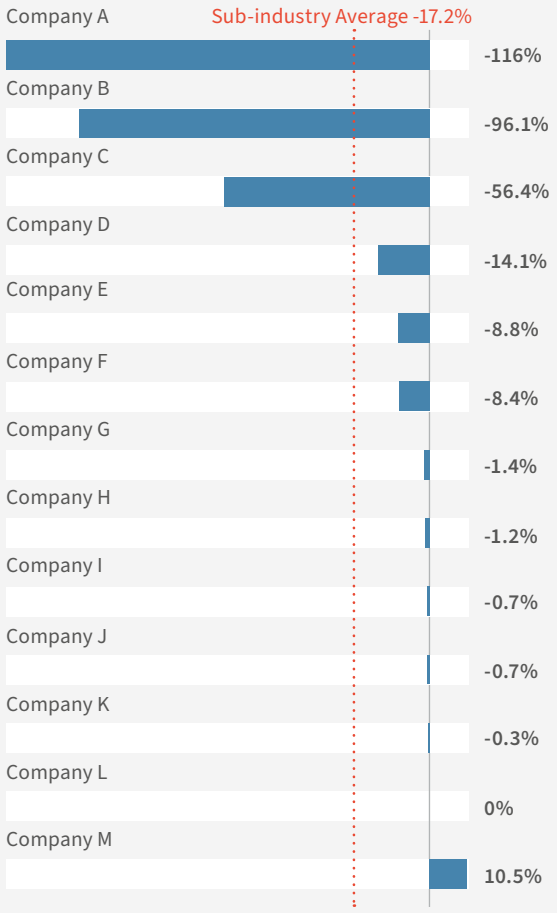
This pattern holds across sectors. A mix of factors, from emissions profiles, policy context, asset intensity, transition readiness and business model characteristics, drives variation in company outcomes. Critically, even in sub-industries with high-risk profiles, there are winners: the companies demonstrating resilience or positive exposure despite operating in challenged sectors.

Utilities: Extreme downside concentrated in specific companies. The utilities sector demonstrated average exposure of -46.1% – the highest sector-level risk in our sample. However, company-level analysis within the electric utilities sub-industry revealed concentration of extreme downside risk in specific firms. Individual company CliF™ scores ranged from -275.4% to -26.4% within the sub-industry.

This extreme dispersion reflects variation in carbon intensity, asset flexibility and transition plan credibility. The most exposed utilities operate high carbon generating assets with limited flexibility and slow transition strategies. Notably, we observed no clear outperformers – even "average" companies show substantial exposure, highlighting sector-wide vulnerability if transition expectations accelerate. Companies in the same country and sub-industry exhibited dramatically different resilience profiles based on transition readiness rather than geographic or regulatory factors alone.

CliF™ for a 15y Time Horizon by Company

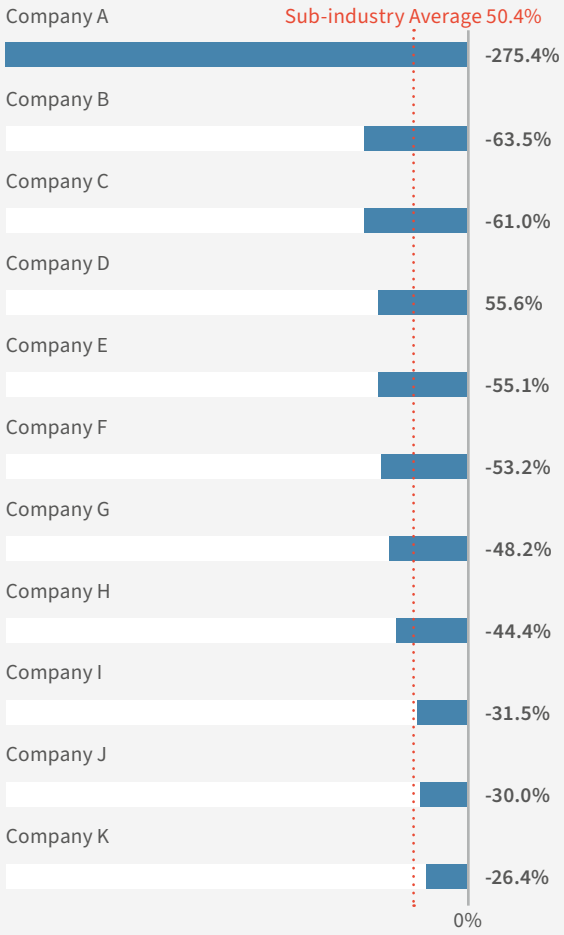
COMPANY LEVEL



Source: FTI Consulting analysis

CliF™ for a 15y Time Horizon by Company

UTILITIES

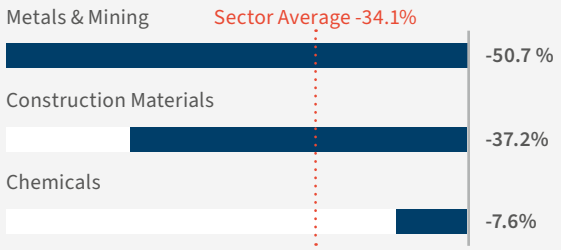


Source: FTI Consulting analysis

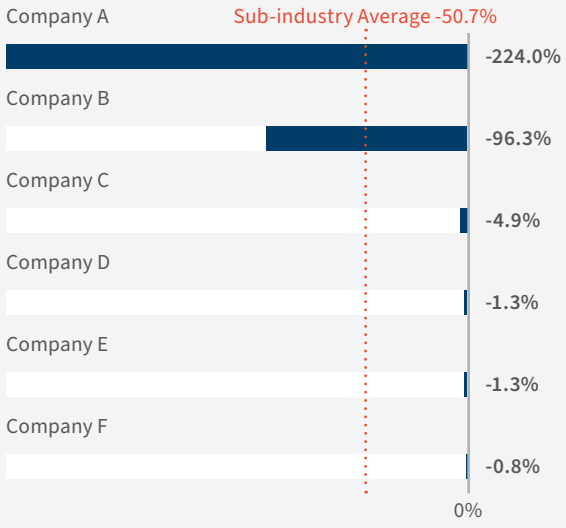
Materials: Commodity exposure drives intra-sector variation. Within the materials sector (average exposure -34.1%), sub-industry variation proved substantial. Metals & mining showed -50.7% exposure, construction materials -37.2%, and chemicals -7.6% – a 43.1 percentage point spread. The relative resilience of chemicals reflects diversification, innovation potential and demand stability, while metals & mining faces high emissions, energy dependency and limited decarbonization options.

At the company level within metals & mining, exposure ranged from -224.0% to -0.8%. This extreme dispersion reflects structural differences in commodity mix, geographic exposure and decarbonization strategy. Severe downside risk concentrated in carbon-intensive, undiversified firms – especially those exposed to thermal coal or lacking credible transition plans. Conversely, companies focused on transition minerals, exhibiting lower emissions intensity or pursuing proactive adaptation strategies showed dramatically reduced exposure.

CliF™ for a 15yr Time Horizon by Scenario



CliF™ for a 15yr Time Horizon by Company



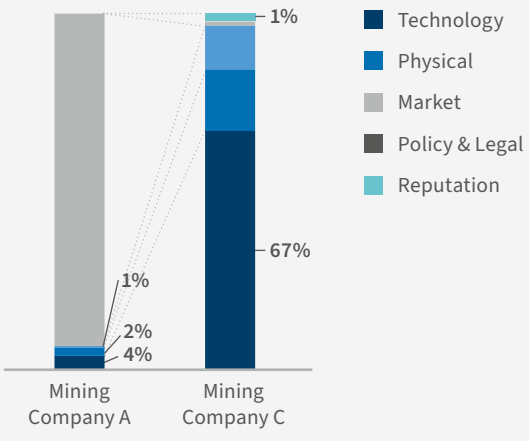
Source: FTI Consulting analysis

Geographic and strategic factors create divergence within identical sub-industries. Our deep-dive analysis of two mining companies operating in the same industry revealed how jurisdictional factors and company-specific strategies drive materially different outcomes. Company A, a downstream steelmaker operating in jurisdictions with carbon taxation, showed significantly different cash flow trajectories compared to Company C, an upstream iron ore miner without carbon tax exposure focused on green iron production.

Despite Company C operating without carbon taxation, it has invested heavily in energy transition, showing significant projected emissions decreases. This strategy future-proofs the business against policy shifts while maintaining attractiveness to customers, employees, investors and markets. Conversely, Company A faces near-term cash flow pressure from carbon taxes that limit reinvestment capacity – demonstrating how poorly structured policy can impair competitiveness and slow innovation even when transition intent exists.

The risk composition of these companies proved equally distinct. For Company C, technology risk constituted the highest contributing factor to overall climate exposure. For Company A, policy risk dominated – a pattern prevalent across jurisdictions with carbon taxation. Physical risk manifested differently as well: Company C faced $1.75 billion in asset impairment and productivity losses, while Company A showed $903 million in similar impacts, driven by different asset dispositions across geographies and specific asset characteristics.

Total Climate Impact Breakdown (%)

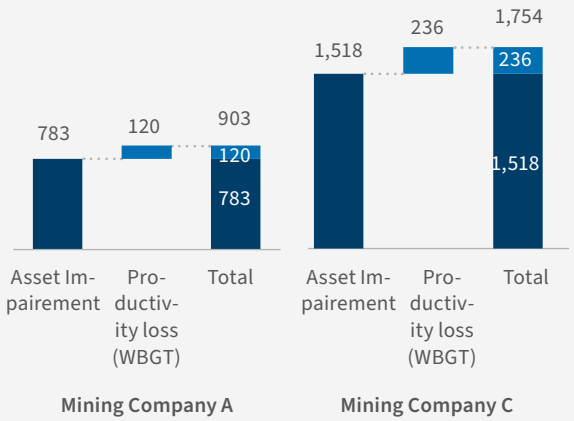


Source: FTI Consulting analysis

The implication for investors, boards and regulators is unambiguous: sector-level analysis systematically misprices climate risk. Our findings demonstrate that traditional approaches assigning uniform or narrow-range risk scores to sector peers create material misvaluations. Banks pricing loans based on sector proxies systematically underprice high-exposure companies while potentially overpricing low-exposure peers. Investors building portfolios using sector-level climate screens miss the 3x to 4.5x variation within sectors – variation that determines actual risk-adjusted returns and potential losses.

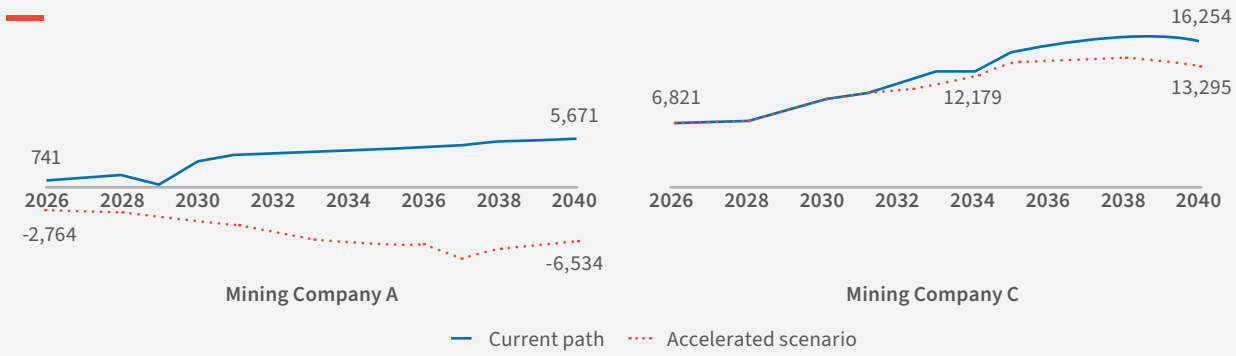
More critically, the factors driving climate exposure heterogeneity – policy environment, operational flexibility, commodity mix, technology positioning, transition strategy credibility, asset characteristics – are precisely the elements that granular, company-specific analysis captures but sector averages obscure. Institutions operating without this resolution cannot accurately price risk, identify concentrations or recognize opportunities. The company-level transition readiness, not sector classification, must drive capital allocation and risk decisions to avoid outsized losses and identify viable transition investments.

Impact of Physical Risk Broken Down By Type (USD mn)



Source: FTI Consulting analysis

Projected Annual Free Cash Flow Comparison (USD mn)



Source: FTI Consulting analysis

The 9 Strategic Imperatives for Business Leaders, Investors and Regulators

In our view, given the 2x- 4x underestimation in current climate risk methodologies, depending on how financial markets, business leaders, and policy makers respond to this measurement gap will determine competitive dynamics through 2030. At a high level, three plausible pathways emerge that will create competitive dynamics in distinct ways depending on each context:

Pathway 1: Regulatory-Driven Rapid Adoption

Regulators mandate enhanced climate risk quantification similar to the UK PRA's SS5/25 across major jurisdictions by 2026-2027. Supervisory comparison forces institutions to upgrade methodologies rapidly. Market bifurcation occurs within 24 - 36 months, with leaders capturing transition finance opportunities, strategic upsides and competitive advantage, and laggards facing capital penalties, operational losses and business downside risks. This will require organizations to be able to be agile and adjust rapidly to a new policy context.

Pathway 2: Market-Driven Gradual Adoption

Market repricing events, major portfolio revaluations, high-profile credit events and institutional investor repositioning create periodic catalysts for methodology enhancement. Adoption occurs over 4-6 years as competitive pressure builds. Early movers gain advantages, but gap remains closeable for institutions acting decisively. Those organizations that will take the lead in building forward looking business models that focused on transition and adaptation measures will strengthen their competitive position.

Pathway 3: Delayed Recognition

Political and economic pressures delay climate risk integration. Market continues operating with incomplete models until physical climate impacts or abrupt policy shifts force recognition. Sudden adjustment creates market dislocation, significant stranded asset write-downs and concentrated losses for unprepared institutions. Organizations that are pro-active even in a delayed recognition context will benefit from establishing early leadership via building resilience and adaptation capabilities which will become a core competitive advantage when the regulatory context starts to rapidly evolve.

We assess competitive separation will become evident within 3-5 years, with leadership positions largely established by 2028-2030 absent major market disruption. In summary, three factors will govern the pace of competitive separation and pathways:

- Regulatory timeline for enhanced requirements (18-36 months based on UK PRA precedent)
- Market recognition events crystallizing underestimation (unpredictable but increasing probability)
- Technology maturity for scaled company-specific analysis (capabilities exist now; adoption timeline variable) in association with capability maturity within organizations

Our research generates several unambiguous imperatives for senior business leaders, investors, financial services executives and policy makers navigating the intersection of climate risk, transition planning and capital allocation:

1. **Recognize that current climate risk models are not conservative, they are inaccurate.** The four-fold gap between 2.0% conventional estimates and our 7.7% integrated assessment is not a matter of risk appetite or analytical preference. It reflects systematic measurement error. Boards, C-suites and investors must understand they are operating with materially incomplete information about business performance and portfolio exposure – information that directly affects their ability to assess transition plan viability, price transition finance appropriately and distinguish credible decarbonization strategies from greenwashing.

What This Means for Board Responsibilities

Directors and Trustees face specific governance implications from systematic climate risk underestimation:

— **Fiduciary Duty Exposure:** Operating with materially incomplete risk information, particularly when the underestimation is quantifiable and the solution is available, creates potential liability. When a 4x measurement error affects portfolio valuations, lending decisions, and capital allocation, directors cannot credibly claim appropriate oversight if they've not demanded analytical upgrades.

— **Strategic Risk:** Competitors with accurate climate risk models are gaining measurable advantages in three areas: (1) Superior risk-adjusted returns through precise credit pricing, (2) market share in high-growth transition finance segments, and (3) preferred relationships with climate-conscious corporates seeking sophisticated capital partners. These advantages compound, each quarter your institution operates with inferior analytics and insights the competitive gap widens.

— **Regulatory Risk:** Climate stress testing has moved from disclosure exercise to supervisory expectation. The ECB's 2022 climate stress test identified approximately €70 billion in combined losses under disorderly scenarios in its limited scope exercise. Supervisors are comparing institutional approaches. Those demonstrating systematic underestimation face heightened capital requirements, additional reporting obligations and potential enforcement.

— **Reputational Risk:** Transition finance deployed based on inadequate risk assessment creates dual exposure. First, capital may concentrate in companies with aspirational rather than executable transition plans generating poor risk-adjusted returns when plans fail to deliver. Second, media and stakeholders increasingly scrutinize whether transition finance genuinely supports decarbonization or constitutes greenwashing. Superior analytics distinguish credible strategies from window dressing.

Board Action Required

Climate risk quantification must escalate from risk function technical project to board and C-suite level strategic priority to drive operational, financial and strategic advantage. Across jurisdictions, emerging principles governing board actions include:

— **Duty of Care:** Directors must inform themselves about material climate risks affecting the business and enhance their understanding and capability related to climate risk management

— **Duty of Loyalty:** Must act in the corporation's best interests, which increasingly includes long-term climate resilience

— **Risk Oversight:** Climate risk should be integrated into enterprise risk management

— **Scenario Planning:** Many regulators expect boards to consider increasingly more mature and comprehensive climate scenario analysis in line with IFRS S2 or equivalent requirements

— **Strategic Integration:** Climate considerations should inform business strategy, not just compliance

2. **The time horizon for climate impact is shorter than assumed.** Our 15-year analytical window, directly relevant to typical loan tenors, investment holding periods, long-term business strategy & planning, and even macro-policy design, already captures material exposure. Institutions treating climate risk as a 2050 or 2080 phenomenon are fundamentally misreading the risk timeline. The exposure is immediate and the mispricing is occurring now. This temporal reality has profound implications for transition planning, companies require transition strategies delivering measurable progress within 5-10 years, not aspirational 2050 targets. Financial institutions and investors must evaluate transition plans against this compressed timeline, assessing whether proposed pathways generate sufficient risk reduction and competitive positioning within decision-relevant horizons.

3. **Transition risk exceeds physical risk in both magnitude and urgency.** Our findings consistently demonstrate that policy changes, technology disruption and market shifts driven by decarbonization create larger and more volatile financial impacts than direct physical climate effects. Yet most institutional frameworks focus predominantly on physical risk. This imbalance must be corrected, particularly for transition finance assessment. Evaluating a company's transition plan requires quantifying exposure to carbon pricing, stranded asset dynamics, technology disruption, regulatory changes and competitive repositioning. Institutions focusing primarily on physical adaptation while underweighting transition dynamics cannot effectively evaluate the very strategies transition finance seeks to enable.

CASE STUDY

Policy Volatility and Competitive Advantage – EV Manufacturing

The electric vehicle sector demonstrates how transition policy stability creates measurable competitive advantage and how volatility destroys it.

China's Coordinated Approach: China established comprehensive EV policy frameworks in 2009 with the "Ten Cities, Thousand Vehicles" program, followed by consistent expansion of subsidies, infrastructure mandates and manufacturing incentives. This 15-year policy continuity enabled:

— Domestic manufacturers to achieve economies of scale with predictable demand curves

— Supply chain integration across battery production, critical minerals processing and vehicle assembly

— Long-cycle capital investment in gigafactories justified by regulatory certainty

— Market dominance: Chinese manufacturers now control approximately 60% of global EV production and approximately 75% of battery manufacturing capacity

Western Policy Whiplash: By contrast, EU and U.S. policy volatility has systematically undermined competitive positioning:

United States:

— 2022: Inflation Reduction Act provides $7,500 EV tax credits and manufacturing incentives[12]

— 2024: Congressional debates on credit phase-out create planning uncertainty[13]

— 2025: Potential policy reversal discussions freeze long-term capital commitments[14]

— Result: Manufacturers delay over $12 billion in planned battery plant investments; multiple projects placed "under review"[15]

European Union:

— 2021: "Fit for 55" mandates 100% zero-emission vehicle sales by 2035[16]

— 2023: Germany secures exemption for e-fuels, creating regulatory fragmentation[17]

— 2024: Delayed implementation of battery passport requirements[18]

— 2025: Discussions of timeline extensions amid industry lobbying[19]

— Result: Automakers face 18–24-month strategic planning cycles versus 5-10 year horizons in China

Financial Impact: The policy stability differential translates directly into climate exposure and competitive positioning:

— European EV manufacturers face 35-40% higher capital costs due to policy uncertainty premiums

— Supply chain fragmentation increases production costs by 15-25% versus integrated Chinese competitors

— Technology development cycles extended by 12-18 months as companies hedge against policy reversals

— Market share erosion: Chinese brands captured 23% of European EV market in 2024, up from 8% in 2021

Implication for Climate Risk Assessment: This case demonstrates why transition risk quantification must incorporate policy stability analysis alongside emissions trajectories. Companies operating in jurisdictions with volatile transition policy frameworks face materially higher execution risk, stranded investment exposure and competitive disadvantage – factors that sector-level analysis systematically fails to capture but company-specific assessment reveals.

Board-Level Question: How does your institution's climate risk framework account for policy volatility differentials across geographies? Are transition finance terms adjusted for jurisdictional policy stability, or do current approaches treat regulatory certainty as uniform across markets?

4. **Granularity is not optional, it is essential.** The heterogeneity we observed, even within sectors, confirms that sector-level proxies are inadequate for decision-making. The six-fold exposure spread within single sectors, the three-fold differences between companies in identical sub-sectors and geographies and the non-intuitive drivers of climate vulnerability all demonstrate that institutions require company-specific and asset-level quantification. This granularity proves particularly critical for transition finance: credible transition plans reflect company-specific operational realities, technology pathways, capital constraints and competitive dynamics. Generic sector-based transition frameworks cannot capture the operational flexibility, asset characteristics, supply chain configurations and strategic positioning that determine whether a particular company's transition strategy is viable or aspirational.

5. **Need for linking transition plan assessment to financial impact quantification.** Our analysis reveals that companies in identical sub-industries and geographies exhibit dramatically different climate exposure based on transition readiness, technology strategy, policy context and operational characteristics. For Company A in our mining sample, policy risk dominated exposure due to carbon taxation in operating jurisdictions. For Company C, technology risk proved paramount despite operating without carbon taxes, reflecting strategic investment in green production methods. These distinct risk profiles demand distinct transition strategies and warrant different transition finance terms. Institutions must move beyond binary "credible/not credible" transition plan assessments toward quantified evaluation of how specific transition initiatives affect company-level climate exposure, cash flow trajectories, and

competitive positioning. This enables pricing transition finance based on risk reduction delivered rather than aspirational commitments made.

6. **Need for next-generation analytical and data infrastructure supporting granular decision-making.** This necessitates moving beyond compliance reporting to generate actionable intelligence calibrated for actual business decisions – financial, operational and strategic. Modern climate risk platforms must leverage advanced computational capabilities, including bounded AI models that ensure reliability and auditability of analytical outputs while processing the massive datasets required for company-specific analysis. Credit committees need climate-adjusted default probabilities alongside traditional metrics. Portfolio reviews must incorporate climate concentration analytics. Transition finance decisions should integrate quantified assessments of how proposed investments affect borrower climate exposure, with clear line of sight from capital deployment to risk reduction to financial returns. Investment decisions should evaluate transition pathway viability against company-specific operational constraints and competitive dynamics, not generic sector assumptions. The combination of AI-powered analytical engines with domain expertise enables institutions to transform complex climate data into decision-grade intelligence at the scale and speed modern markets demand.

7. **Embed climate risk assessment into core operational workflows rather than maintaining parallel processes.** Our approach demonstrates this is achievable and more efficient than current siloed structures. Risk reporting should present climate exposure with equivalent rigor to credit, market or operational risks. Transition finance frameworks should integrate seamlessly with credit underwriting, requiring the same analytical rigor for climate risk reduction as for traditional credit enhancement. This integration ensures that transition finance supports genuinely transformative strategies rather than subsidizing business-as-usual with green labels.

Select Key Takeaways for Boards and C-Suite

— The disclosure-to-decision gap is widening; only a small minority of companies provide complete, decision-grade transition data across core indicators; most disclose partially.

— Integrated analysis (physical plus transition, over a 15-year horizon) produces materially higher valuation impacts than physical-only approaches.

— Dispersion is the risk: sector averages conceal the outliers that drive tail losses and mispricing within portfolios.

Key questions facing business leaders and investors: Where are our largest climate risk/opportunity concentrations? Which assets/investments drive the tail? Are we sufficiently pricing transition readiness into credit, investment and capital allocation decisions?

8. **Transition from point-in-time assessment to continuous monitoring.** Our scenario-based approach with probabilistic distributions reflects the reality that climate risk evolves as policies shift, technologies advance, and extreme events materialize. Critically, transition risk exhibits fundamentally greater volatility than physical climate risk. While climate change follows a relatively predictable trajectory based on established scientific data and atmospheric physics, transition dynamics respond to rapidly evolving factors: policy reversals and regulatory shifts, company strategic pivots, consumer preference changes, supply chain reconfigurations and geopolitical tensions that reshape energy markets and technology adoption pathways. This heightened volatility demands continuous monitoring rather than periodic snapshots. Transition plans face execution risk, technology development uncertainties, policy evolution and competitive dynamics that all affect strategy viability over compressed timeframes. Institutions require systems that update exposure assessments and transition plan evaluations as conditions change in real-time, enabling proactive engagement when execution deviates from plan rather than discovering transition failures at refinancing.

9. **Recognize that transition finance effectiveness depends on accurate risk quantification.** Capital allocated to support decarbonization generates intended outcomes only when deployed based on rigorous assessment of baseline exposure, transition pathway viability and expected risk reduction. Our findings demonstrate that companies with credible, funded transition strategies aligned to operational realities and competitive dynamics exhibit materially lower climate exposure than peers, sometimes by factors of two to three times within identical sub-industries. This variation creates both opportunity and hazard for transition finance providers. Institutions with superior climate risk quantification capabilities can identify genuinely transformative strategies worthy of preferential pricing while avoiding capital allocation to insufficiently rigorous plans. Those operating with systematic underestimation risk creating transition finance portfolios that fail to deliver promised risk reduction while concentrating exposure in companies pursuing aspirational rather than executable strategies.

Conclusion: From Analytical Blind Spots to Informed Advantage

Our analysis of 148 global companies representing $31.4 trillion in market capitalization delivers an unambiguous conclusion, that climate risk underestimation represents one of the most significant mispricing phenomena in modern capital markets. Traditional methodologies underestimate exposure by factors of two to four times – not as a matter of analytical judgment, but because of structural limitations this research explicitly identifies and addresses.

The financial consequences are immediate and material across stakeholder groups: For corporates, higher cost of capital, strategic misallocation and competitive disadvantage. For investors, mispriced portfolios, concentration risks and missed alpha opportunities. For lenders, underpriced credits, unrecognized exposures and regulatory penalties.

Our findings challenge three core assumptions. First, material climate impacts occur within 10-15 years, not distant 2050 timelines. Second, transition risks exceed physical risks in both magnitude and urgency. Third, within-sector variation dwarfs cross-sector differences, making company-level analysis essential for any organization assessing climate exposure, whether evaluating their own operations, portfolio companies or borrowers.

The distinction between climate leaders and laggards emerges clearly in our company-level analysis. Firms with credible, funded transition strategies demonstrate materially lower exposure – sometimes by factors of two to three times – compared to peers in identical sub-industries. This heterogeneity creates measurable opportunity, corporates can optimize transition strategies to lower cost of capital. Investors can generate alpha through precise company selection. Lenders can price climate risk accurately while identifying viable transition finance opportunities.

The solution pathway is well defined, with integrated frameworks spanning macro policy, industry dynamics, and company operations. AI-powered analytics combining computational scale with sector expertise to support decision-making. Processes which embed climate assessment directly into capital allocation, portfolio construction, and credit underwriting - not parallel compliance exercises.

The strategic choice is clear. Organizations that master this integration will define competitive advantage in climate-informed business, investment and finance. Those operating with systematic underestimation will face widening performance gaps, whether measured in market share, portfolio returns or enterprise value.

The era of treating climate risk as distant and manageable has ended. The era of precise, financially grounded climate intelligence has begun. Competitive advantage accrues to organizations recognizing this inflection point now.

Methodology

This report is based on a joint FTI Consulting - Vyzrd study designed to quantify composite climate exposure in financial terms, and to test why many prevailing approaches understate risk by treating climate impacts as narrow, linear or purely "physical-risk" problems.

Study design and data foundation: We curated a representative, large-cap sample of 148 publicly listed companies across 10 sectors and 17 geographies to replicate a diversified portfolio. Inputs include a blend of 150+ commercially sourced and open-source parameters per company (e.g., revenue growth, EBITDA margin, free cash flow and WACC; Scopes 1 - 3 emissions; carbon price exposure; climate vulnerability; water use; green/non-green revenue share; climate share of R&D; and indicators of enterprise/credit risk) alongside proprietary datasets and industrial structuring.

Scenario architecture - avoiding false equivalence: We use established scenario references (e.g., NGFS and IEA) as anchors but explicitly recognize that real-world outcomes diverge by jurisdiction and industry structure. For that reason, Vyzrd's climaTick™ models physical pathways and transition pathways independently, then combines them into an integrated exposure profile. This helps in avoiding simplistic "single-path" mapping and capturing divergence between global pathways and operating realities.

Physical pathways are anchored to three warming outcomes (RCP2.6/4.5/8.5), and transition settings are tested across scenario archetypes (up to 9) to reflect uncertainty and policy divergence.

Three-tier modelling stack: (macro → sub-industry → issuer). The engine links: (i) macro-level policy pathways, energy transitions, carbon pricing and trade policies; (ii) sub-industry modelling (160+) capturing technology cost curves, input dependencies, pass-through dynamics, abatement options and value-chain exposures; and (iii) organizational modelling that ties footprint, locations, contracts, CapEx/OpEx plans, financing and management responses to decision-grade cash flow deltas for each issuer.

Uncertainty and non-linearity: To move beyond point estimates and "average-out" thinking, the analysis uses 100,000 Monte Carlo simulations per elected scenario, calculating hundreds of datapoints per company per year across a 15-year horizon, enabling fat-tail outcomes, thresholds and abrupt policy/technology shifts to be reflected in valuation impacts (rather than smoothed away). In practice, key risk and opportunity drivers are treated as discrete cash-flow levers (revenue, cost, capex, productivity and financing impacts), with scenario-appropriate ranges and dispersion.

Financial metric (**CliF™ - Climate Forward™**): Results are expressed as Climate Valuation Effect (CVE) – the estimated impairment to company market capitalization driven by ex-ante climate-related cash flow adjustments that integrate physical, transition and liability risks (plus opportunities). CVE expressed as a percentage of market cap is termed as CliF™, a metric that enables comparability across issuers, sectors and scenarios.

Aggregation and interpretation: Portfolio, sector and sub-industry results are calculated as market-cap-weighted averages of company-level CliF™ within each group. Insights are portfolio-specific and should not be generalized without re-running the analysis for the relevant universe; importantly, composite climate risk is treated as a "living" calculation that should be refreshed as policy, technology, markets and company fundamentals continuously (and at times, rapidly and unexpectedly) evolve.

Endnotes

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4 CliF – Climate Forward™ is Vyzrd's proprietary benchmark metric that offers a unified, auditable, portfolio-integration-ready measure that consolidates climate-driven cash flows (and therefore valuation) impacts into a decision-ready score for credit, investment, and capital allocation decisions. CliF is calculated for a specific climate and transition scenario, and over a defined climate horizon (between 1 and 15 years).

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