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Navigating physical and transition risk in the APAC banking landscape

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EXECUTIVE SUMMARY

In an evolving regulatory landscape, it is increasingly important for both risk and lending teams at APAC banks to understand the impact of physical and transition risk on their portfolios. However, financial institutions face significant hurdles: incomplete or non-standardized data and the challenge of translating unfamiliar sources of risk into credit and financial implications.

The sample analysis in this whitepaper, using Moody's data and models, presents a strategic, data-driven approach to overcome the challenges with example case studies and a three-stage roadmap. Because a bank's portfolio risk is driven by the performance of its individual borrowers, our analysis focuses on the counterparty level, specifically for corporates. Through detailed case studies of Singapore (physical risk) and Indonesia (transition risk), we find that the risk impact varies intricately on a firm level, for both severe physical risk events in Singapore and energy transition scenarios in Indonesia. Lacking the ability to uncover and quantify risk at a granular, counterparty level, banks can easily bypass their most significant exposures, leading to underpriced risk and unforeseen capital erosion.

THE NEW RISK REALITY FOR APAC BANKS

Across the Asia-Pacific (APAC) region, the risk environment is changing in ways that are now impossible for banks to ignore. Physical and transition risks are no longer abstract concepts or long-range forecasts; they're showing up in credit conversations, influencing portfolio quality, and reshaping how risk teams think about business-as-usual activities. For many institutions, this shift is being felt in everyday decisions, from evaluating borrower resilience to adjusting capital planning and navigating evolving supervisory expectations.

Regulators across APAC have taken notice and are moving with purpose. Authorities in Malaysia (BNM)¹, Singapore (MAS), Indonesia (OJK)², Japan (FSA/BoJ)³, Hong Kong (HKMA)¹⁰, and New Zealand (RBNZ)⁴ are embedding these risks directly into their oversight frameworks. Stress-testing exercises are becoming more advanced, challenging banks to demonstrate how they would manage through severe, but realistic, scenarios. At the same time, global shifts toward standardized disclosures, including IFRS S2, are raising expectations for transparency and accountability.⁵

Regulators are increasingly adopting a dual-horizon approach to physical and transition risk, requiring banks to consider both severe outcomes in the short-term and long-term scenario perspectives.

- **Long-Term Scenarios (to 2050):** Regulators often rely on Network for Greening the Financial System (NGFS) scenarios as a common analytical framework. The long-term components of both HKMA's 2023-2024 exercise and BNM's 2024 exercise are based on NGFS Phase III scenarios¹⁰. These scenarios provide consistency across institutions while also presenting the challenge of assessing how different policy pathways will shape sector profitability and, ultimately, bank credit risk.
- **Short-Term Scenarios (1-3 Years):** Supervisors also recognize the need for more immediate, actionable insights. MAS's framework included a three-year projection (2024-2026),⁶ and the FSA/BoJ has indicated that its next exercise will also use a shorter timeframe.⁹ This shorter view helps bridge long-term scenario analysis with near-term business planning, capital allocation, and risk management.

For both physical and transition risk, data and modelling requirements are becoming more specific and stringent.

- **Physical risk shocks: A convergence on tail-risk events:** Supervisory focus on physical risk is shifting from broad qualitative assessments to quantitative "shock" exercises—centered on extreme, low-probability, high-severity events. BNM mandated a 1-in-200-year nationwide flood event¹ corresponding to future worst-case environmental conditions but applied to present time (based on the Representative Concentration Pathway (RCP) 8.5 scenario in 2050 from the Intergovernmental Panel for Climate Change (IPCC)).¹ MAS (Singapore) also mandated a similar 1-in-200-year flood event under RCP 8.5, 2050 conditions, applied in 2024. Supervisors expect banks to translate a physical event into measurable credit losses. OJK explicitly links flood risk to reductions in property values and its impact on Loss Given Default (LGD).²

Similarly, the RBNZ's scenario showed how drought and flood events drove defaults in the agriculture and mortgage portfolios.⁴ Furthermore, the direction of travel from regulators like the FSA/BoJ, which noted the need to move toward more sophisticated stochastic analysis, signals a future where banks will be expected to model not just a single event, but a full distribution of potential loss outcomes.³

- **Carbon Emissions Granularity:** A consensus is forming around the need to assess Scope 1, 2, and 3 GHG emissions. Regulators in Indonesia,⁶ Malaysia,¹ and New Zealand⁷ have all set this expectation. Regulators are pushing for greater precision. Indonesia's OJK, for example, has issued a detailed technical guide (Book 2) and emissions calculation guide (Book 3) that includes a formula for estimating financed emissions.⁸ This marks a clear shift away from broad estimates and toward verifiable, standardized calculations that can be compared across institutions.

For risk teams, these developments mean that simply adjusting existing models isn't enough. Teams are being asked to rethink how environmental change and related policy measures could impact borrower viability, how corporate borrowers might react individually to unprecedented sources of financial stress, and how portfolio exposures may evolve as transition pathways accelerate. The stakes are becoming more significant. In its 2023 stress test, the Reserve Bank of New Zealand (RBNZ) found that a severe, long-term scenario could reduce bank profits by 25% and dividends by nearly 40% compared to a base case. Perhaps more strikingly, aggregate impairment expenses were five times higher than in the base case.⁴

The message is clear: to remain resilient and competitive, banks must go beyond regulatory expectations. They need strategies that can withstand uncertainty, protect portfolio health, and support customers through a rapidly changing risk landscape.

KEY CHALLENGES FOR BANKS

Meeting heightened regulatory and supervisory expectations comes with a familiar set of challenges. And while these challenges are significant, tackling them head-on is what allows institutions to move from reacting to requirements to building a forward-looking, strategically grounded risk management framework.

Challenge 1: Incomplete data and the need to understand uncertainty

Regulatory stress tests across the region, from the FSA/BoJ³ and RBNZ⁴, continue to surface a central issue: banks simply don't have the level of detail or consistency in data needed for accurate risk modeling. It's not just about missing information. It's about information that isn't standardized, comprehensive, or relevant. A common example is location data. Many banks still work from non-standardized addresses that require manual clean-up and conversion into coordinates. For corporate customers, the problem becomes even more complex. Risk doesn't reside at headquarters; it sits within operational facilities, warehouses, plants, and supply chain nodes. Yet, those precise, geocoded locations, along with details about what each site does or what type of activity occurs there, are often incomplete or unknown.

Layered on top of this is the uncertainty that comes with forward-looking analysis. Many models rely on central estimates, such as average annual loss, which can mask the severity of potential severe outcomes. When banks rely too heavily on these averages, they risk overlooking "tail risk" that could materially affect capital and earnings.

To strengthen decision-making under uncertainty, banks are increasingly encouraged to broaden their analytical toolkit. Stochastic modeling – where thousands of plausible event simulations are run - can reveal the full distribution of potential outcomes and quantify the likelihood of severe impacts. This aligns with the direction regulators are moving, with BNM and MAS incorporating a 1-in-200-year flood scenario¹ and the FSA/BoJ advocating for stochastic approaches³ to better capture the range of possible demands.

Challenge 2: Translating physical and transition impacts into credit risk

A flood map or a carbon price forecast is only the beginning – not the full picture of credit risk. One of the biggest challenges for banks is translating these external signals into tangible changes in Probability of Default (PD) and Loss Given Default (LGD) at the counterparty level. This is where environmental science meets financial reality. The challenge for banks is to bridge the gap between raw hazard data and its final credit implications, a process that involves several complex steps.

- For transition-related pressures, this means understanding how factors such as rising carbon costs or shifts in consumer behavior could affect a firm's cash flows, profitability, and ability to service debt, ultimately altering its PD.
- For physical risk, the translation is equally critical. Flooding, storms, or heat-related disruptions can damage property, halt operations, or interrupt supply chains. These changes don't just create short-term challenges; they can reduce collateral values, raise recovery costs, and increase LGD2. And when productions stop, or revenue drops, a firm's capacity to repay loans weakens, pushing PD higher as well.

In practice, this requires a meaningful shift in mindset – moving from hazard metrics to impact metrics. A hazard metric might tell you that a property sits in a flood zone. An impact metric, such as damage ratio, tells you what that actually means in financial terms. Making that jump requires a quantitative assessment of hazard intensity, asset vulnerability, and financial exposure. This complex modeling is typically not performed by banks themselves but is provided by specialist vendors. For banks, the task is to work with vendors that can deliver validated impact metrics, which are essential for establishing model credibility in regulatory contexts.

Translation is essential. It's what allows institutions to feed these insights into existing credit models and capital frameworks, making sure decisions are anchored not just in maps or forecasts, but in measurable financial risk.

Challenge 3: From regulatory burden to strategic advantage

For many banks, regulatory stress testing can feel like a heavy lift – a costly, resource-intensive compliance exercise that is more about meeting expectations than creating business value. But there's a real opportunity in reframing how these exercises are viewed. The question isn't just *"How do we comply?"* but *"How can these insights help us make smarter, more forward-looking decisions?"*

Every scenario, whether focused on physical pressures or transition-related shifts, points to meaningful changes in a bank's portfolio risk profile. When viewed strategically, those shifts can highlight areas of vulnerability and areas of competitive advantage. The analytics developed for stress testing can be repurposed to:

- **Steer the portfolio:** Spot concentrations in sectors or regions where risk may be rising faster than pricing or controls can keep up and take early action to rebalance exposures.
- **Strengthen lending policy:** Refine underwriting standards and risk appetite to reflect a more nuanced understanding of emerging risks. RBNZ's findings, for example, showed the importance of tracking the insurance status of mortgage portfolios more closely⁴.
- **Identify opportunities, not just risks:** Pinpoint customers and sectors where financing can support meaningful action. "Green financing" or transition-focused lending can help firms adopt lower-emissions technologies, improving long-term credit outcomes. "Adaptation finance" can support resilience investments that reduce physical exposure and protect collateral.

Unlocking this value requires more than advanced analytics. It requires bringing these insights into the heart of credit processes, capital planning, and strategic decision-making. When integrated effectively, scenario analysis becomes truly more than a regulatory requirement – it becomes a tool that helps banks answer a fundamental question: **How should we change the way we do business?** This whitepaper concludes with a three-stage roadmap designed to help institutions make precisely this strategic transition.

THE STRATEGIC SOLUTION: TURNING ENVIRONMENTAL DATA INTO FINANCIAL INTELLIGENCE

Addressing these challenges requires more than meeting regulatory checklists, it calls for a framework that helps banks make clearer, faster, and more confident decisions. The path forward lies in using advanced analytics to translate complex environmental signals into actionable financial insights. A truly strategic approach allows banks to:

- **Close the data gap:** Enrich portfolio information with accurate, geocoded locations for corporate facilities and collateral, and standardize messy or inconsistent address data so it becomes reliable, machine-readable, and ready for modeling.
- **Understand the full range of outcomes:** Go beyond averages by using stochastic modeling to simulate thousands of plausible disaster events. This will uncover the full distribution of potential impacts, including the likelihood of severe, capital-impacting losses that traditional approaches may miss.
- **Translate environmental pressures into credit terms:** Build a clear, quantitative link between a hazard (e.g., a flood) or a policy change (e.g., a carbon price) and its financial impact on a borrower. Whether it's a flood disrupting operations or a transition policy altering cost structures, the goal is to connect those effects directly to changes in cash flow, collateral value, PD, and LGD.

Taken together, these capabilities turn physical and transition risk from abstract concepts into concrete metrics that risk teams can actually use. They form the engine that helps banks bridge the gap between regulatory expectations and strategic action, empowering institutions to protect portfolios, support customers, and plan for a more resilient future.

ANALYTICS IN ACTION: QUANTIFYING PHYSICAL AND TRANSITION RISK

To show how a strategic, data-driven approach helps banks overcome the challenges of data gaps and translation, this section walks through two illustrative case studies. The first recreates a regulatory physical risk stress-test for a sample of Singaporean firms. The second uses scenario-adjusted financials to examine how the energy transition could affect Indonesian corporates.

Together, these examples highlight a clear message: both physical and transition risks can meaningfully affect financial and credit portfolios of individual borrowers, and that impact must be reflected in lending decisions and credit policy.

Case Study 1: Uncovering hidden physical risk in Singapore

This case study demonstrates that physical risks can materially influence creditworthiness. The methodology specifically mirrors the physical risk stress test exercise specified by MAS in 2024, demonstrating that these concerns are aligned with real regulatory requirements. The MAS scenarios specify a severe flood, with impact not only through direct damage to assets and operations, but also through broader macroeconomic ripple effects.

The objective: Assess how a severe but plausible 1-in-200-year flood scenario would affect the credit profile of Singaporean companies and uncover where hidden risk concentrations may be sitting.

The methodology: A step-by-step solution

- **Providing complete physical risk data (Solving challenge #1):** The process begins with corporate financial data from Orbis, Moody's proprietary data resource on private companies, and then assigns each company a location in Singapore. The analysis can also accommodate multiple locations per counterparty, though here one location each was used for simplicity. Moody's physical risk models can harness data at a granular level, providing highly differentiated impact data for locations that are close to each other, which adds value even in a smaller country like Singapore.

- **Modeling the event (Solving challenge #1):** Moody's physical risk models, underpinned by thousands of event simulations, generate impacts by location for a 1-in-200-year flood shock. This captures the tail risk dynamics that banks need to understand.
- **Translating to financial impact (Solving challenge #2):** For each firm, the model calculates a “damage ratio” that estimates the proportion of assets and operations lost under the scenario.
- **Deriving the credit metric:** The damage ratio and associated macroeconomic impacts specified in the MAS stress test are fed into Moody’s credit model to produce post-shock, 1-year Probabilities of Default (PD) for each firm.

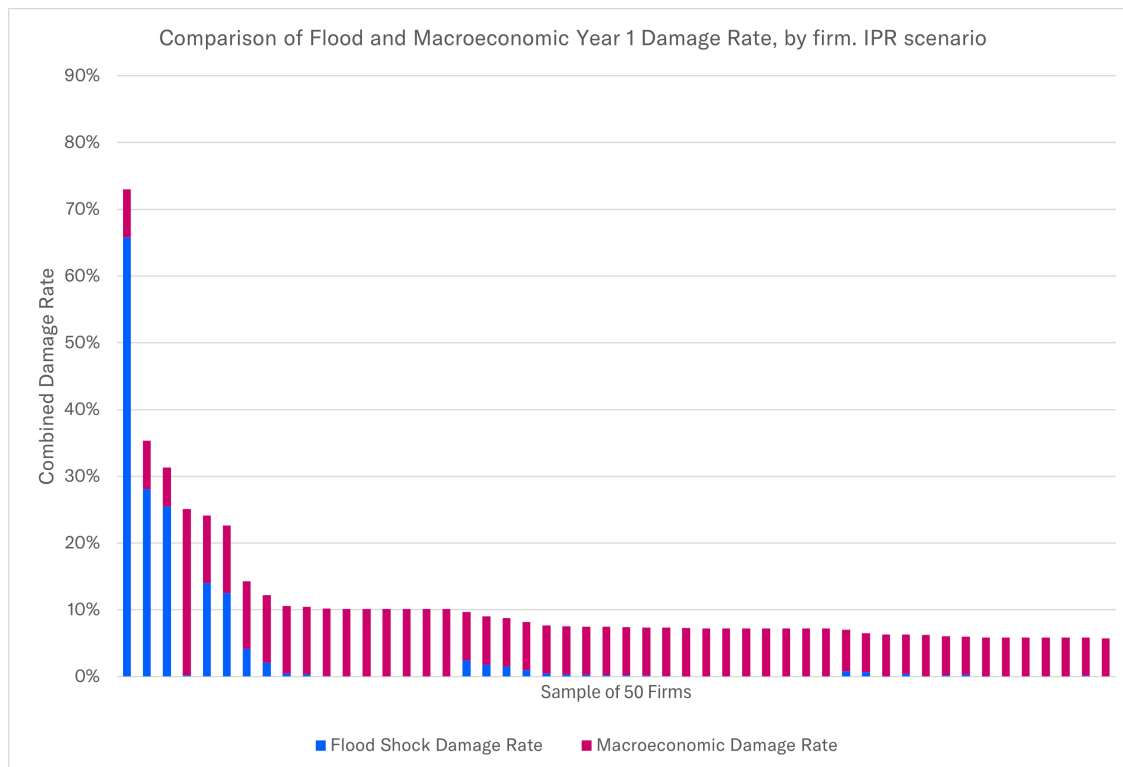
The results: A long tail of unexpected risk

The analysis reveals a key insight: portfolio-level averages hide meaningful pockets of vulnerability.

→ **From physical risk scenarios to financial impact:**

The flood shock and the macroeconomic shock both have significant impacts, yet they have different implications for firms. Figure 1 looks at the damage rates incurred by each of the 50 firms under the IPR (Isolated Physical Risk) scenario. These represent the extent of inhibition or damage to their assets and operations. It indicates that the flood shock impact (blue) is very unevenly distributed across firms in the sample. The macroeconomic shock (pink) is more evenly distributed, but still with substantial variation. To identify the most impacted firms, it is advisable to combine these shocks, considering both direct and indirect physical risk impacts.

FIGURE 1. *The analysis uses the IPR scenario prescribed by MAS and shows Combined Damage Rates produced by Moody’s for the 50 sample firms in Year 1 of the scenario. Heat stress is a component of the original scenario, but proved to have a minimal impact in this case and therefore is omitted from the graph.*



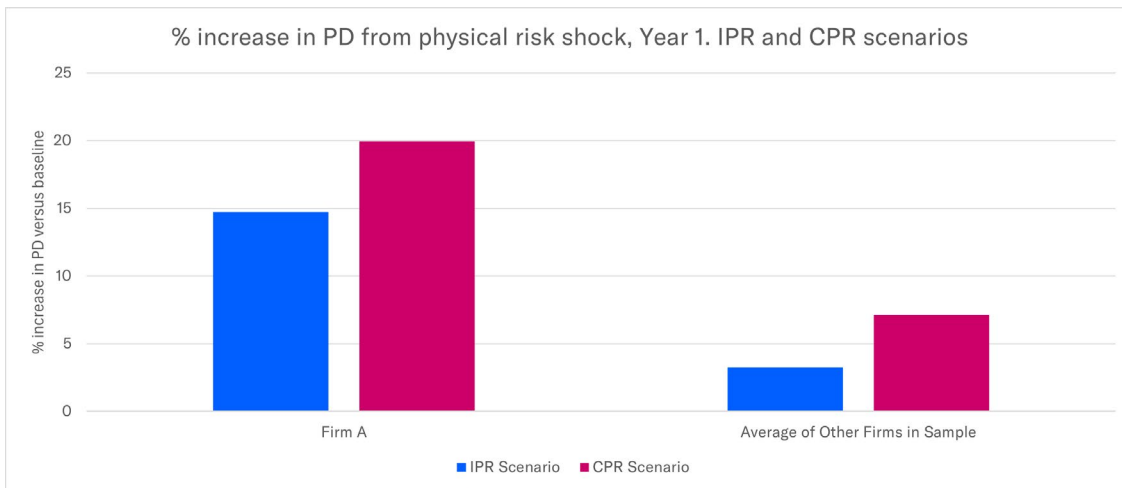
→ **Moderate average impact:**

If looking at only average impact of a 1-in-200 year flood scenario across a portfolio, acute physical risk impact seems insignificant. The average firm sees its PD increase by approximately 3.5% in the IPR scenario, and 7.4% in the CPR (Combined Physical Risk) scenario, where the physical risk shock occurs in an unfavorable macroeconomic environment.

→ **Pockets of risk:**

The average figure hides a wide variation in the level of PD impact. This is due to the uneven distribution of shock shown in Figure 1, plus variation in firms' susceptibility to the shock. For a highly exposed firm in a vulnerable subzone, a much larger increase in PD is possible, as shown in Figure 2 for Firm A. For Firm A, PD rises from 7.0% to 8.1% in the IPR scenario (a 15% increase). In the CPR scenario, Firm A's PD rises from 7.0% to 8.4% (a 20% increase).

FIGURE 2. The analysis uses the IPR and CPR scenarios provided by MAS, showing increases in 1-year PD after Year 1 of the scenarios projected by Moody's credit model for corporates. On the left are the figures for Firm A, the most heavily impacted firm, and on the right are the figures for the average of the remaining 49 sample firms. The PD impact incorporates the impacts of macroeconomic, flood and heat stress damages.



This change for firm A is likely large enough to trigger a rating downgrade. Without granular, location-specific analysis, a bank could easily overlook its most at-risk counterparties.

Case Study 2: Modeling Transition Risk in Indonesia

This case study shows how scenario-adjusted financials can help illuminate the real financial health implications of energy transition for Indonesian corporates. Understanding these impacts requires more than a view of sector performance alone – it also requires insight into each firm’s carbon emissions profile and its starting financial position.

The objective: Model how a disorderly transition scenario (e.g., NGFS Delayed Transition) would affect the credit quality of Indonesian firms operating in high-impact sectors.

The methodology: A forward-looking financial assessment

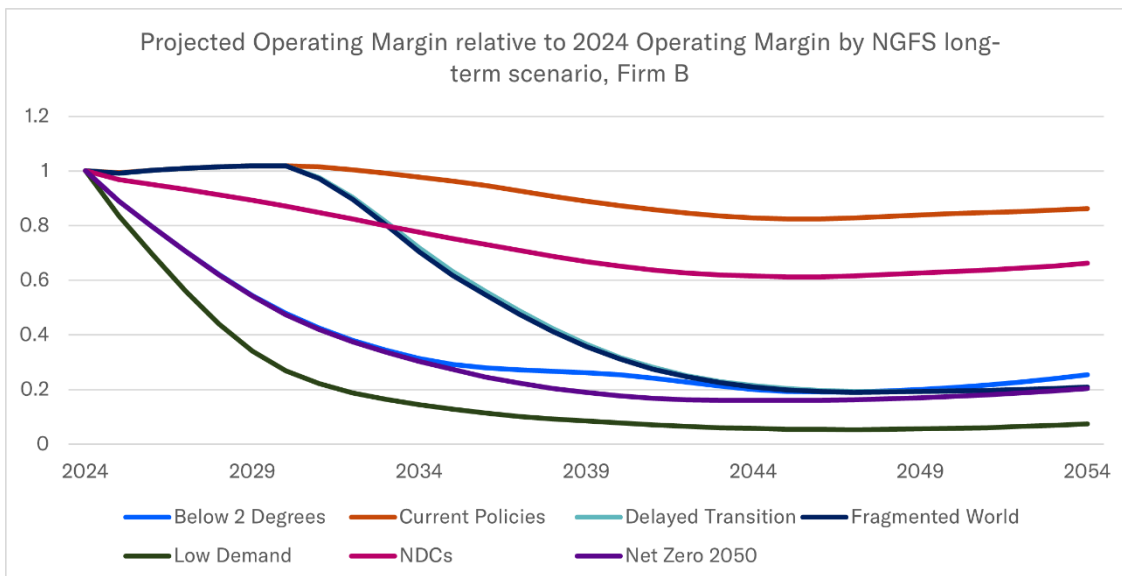
- **Providing transition data (Solving challenge #1):** The process uses Moody’s firm-level carbon emissions data and models, which are used to retrieve the emissions of each company at the start of the scenario, and estimate starting emissions where reported data is absent.
- **Establishing a baseline (Solving challenge #1):** The analysis starts with current financial statements (for a sample of Indonesian companies across sectors like Mining, Utilities, and Manufacturing (sourced from platforms such as Orbis).
- **Applying transition shocks to financials (Solving challenge #2):** Moody’s pro forma financial statement model is then used to stress key financial line items based on the trajectories of industry-standard NGFS V scenarios, including the impacts of sectoral performance and carbon price. This offers specific forward-looking firm financial performance metrics. Banks can deploy these as inputs to their existing internal models to better understand the impact of the energy transition on their counterparties.

The results: Firm-level variation is key

→ **Impact of industry:**

Firm performance varies considerably under energy transition scenarios. Some firms are highly financially exposed to the energy transition based on their industry. Figure 3 demonstrates that Firm B is exposed to the energy transition because of its status as an oil and gas firm. Firm B’s operating profit decreases significantly under the energy transition. The most ambitious transition scenarios such as Net Zero, along with the Low Demand scenario in green, produce the most severe and abrupt impacts.

FIGURE 3. The analysis projects firm operating profit to 2054 using the NGFS Phase V long-term scenarios and Moody’s pro forma adjusted financial statement capability. Initial values are normalized to 1. The analysis incorporates both physical and transition risk impact from Moody’s projections, but this example is chosen specifically to highlight transition-related outcomes.



→ **Impact of firm emissions:**

In industries that are not energy-related and therefore not directly affected by the energy transition, firms can still be exposed to risk based on their carbon emissions. Firms C and D are both in the textile sector, which is anticipated to grow across all scenarios, but Firm C is more vulnerable to the energy transition due to its much higher greenhouse gas emissions intensity. Figure 4 shows that Firm C begins with a positive EBITDA, whilst Firm D begins with a negative EBITDA as seen in Figure 5. Yet the pattern switches during the energy transition. Firm C's performance depletes over time in transition scenarios due to carbon costs. The effect of high carbon emissions can outweigh good initial financial performance to reduce firm earnings, potentially driving substantial impacts in less than 10 years.

FIGURE 4. The analysis projects firm EBITDA (Earnings Before Interest, Taxes, Depreciation & Amortization) to 2054 using the NGFS Phase V long-term scenarios and Moody's pro forma adjusted financial statement capability. Initial value is normalized to 1. The analysis incorporates both physical and transition risk impact from Moody's projections, but this example is chosen specifically to highlight transition-related outcomes.

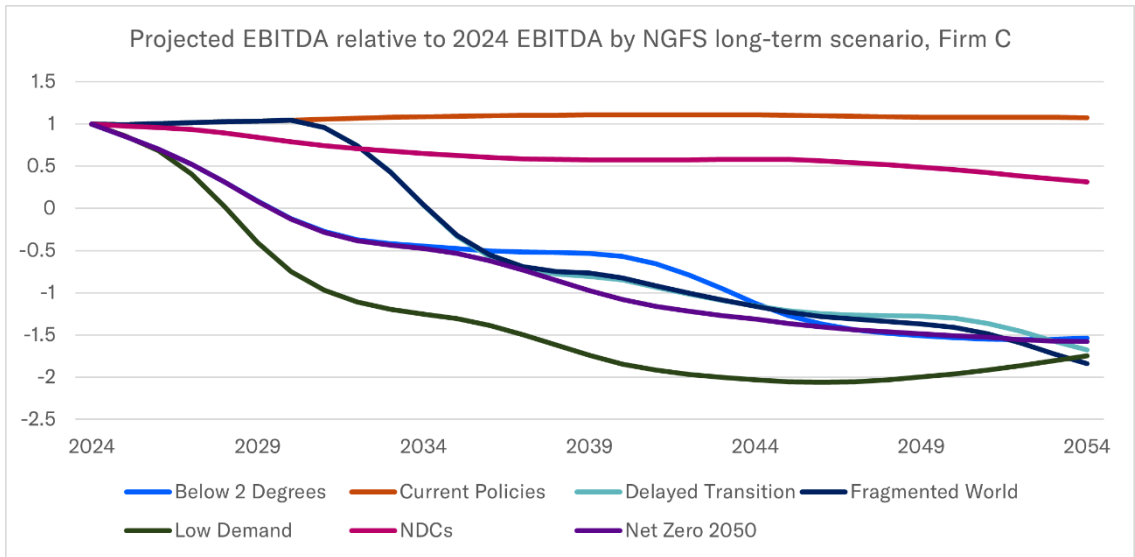
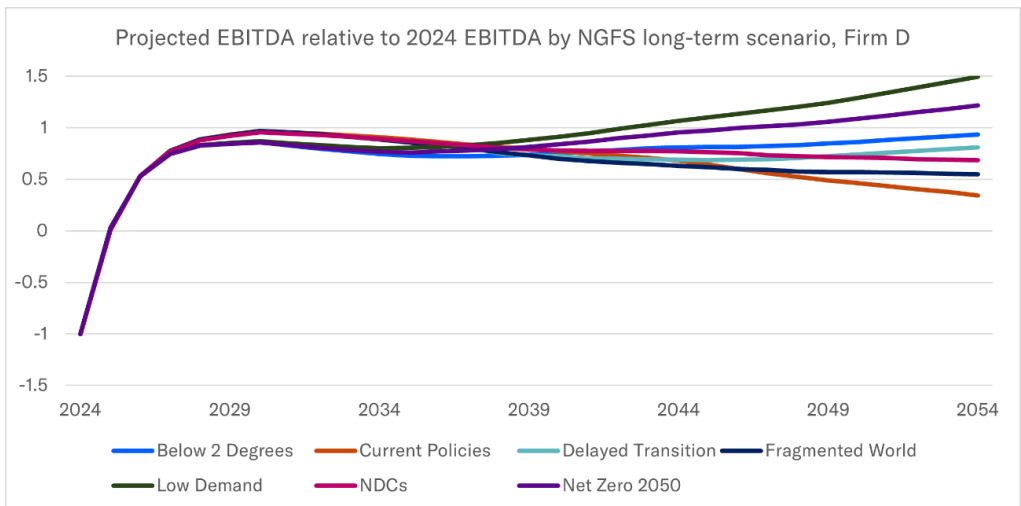


FIGURE 5. The analysis projects firm EBITDA (Earnings Before Interest, Taxes, Depreciation & Amortization) to 2054 using the NGFS Phase V long-term scenarios and Moody's pro forma adjusted financial statement capability. Initial value is normalized to -1 to reflect that the starting value is negative. The analysis incorporates both physical and transition risk impact from Moody's projections, but this example is chosen specifically to highlight transition-related outcomes.



→ **Integrated insights into firm performance:**

Identifying firms that need repricing or lending limits requires more than industry information and scenario modelling. It requires a combination of financial performance information, carbon emissions and industry data, deployed through credit modelling, to accurately price transition risk at the loan level.

In both the physical and transition risk cases, the outcome of the analysis varies significantly at a firm level, emphasizing the importance of integrating specialist risk intelligence into lending policy and portfolio management. The strategic actions derived from these insights are not generic; they are specific to the risks and opportunities uncovered for each counterparty.

The case studies above illustrate a granular, data-driven approach to physical and transition risk. This methodology is not just a best practice; it directly aligns with the clear and converging expectations being set by supervisors across the APAC region. While regulators may differ in the fine print, a consistent set of core requirements is taking shape, validating the need for this level of data-driven analysis. Meeting these validated requirements, however, brings the discussion back to the strategic question posed in challenge 3: **how can banks turn this significant analytical effort from a compliance burden into a competitive advantage?** The answer lies not just in identifying credit risks under stressed conditions, but also in enhancing practices, policies, and planning to steer strategy on an ongoing basis across the institution. The following section provides a framework for that implementation.

THE PATH FORWARD: A ROADMAP FOR BANKS

To navigate the new evolving reality, banks can move beyond treating physical and transition risk as a niche compliance task by following a structured, three-stage journey:

1. Initial actions: Building the foundation

The first step is to meet immediate regulatory demands and address foundational data gaps. This involves enhancing data collection (geocoding locations, tracking emissions), leveraging vendor models to assist with stress tests, and using these exercises as a diagnostic tool to identify high-risk sectors and data deficiencies.

2. Medium-term: Embedding governance and risk management

With a baseline established, the focus shifts to embedding risk into business-as-usual processes. This includes formalizing risk appetite by revising sectoral lending policies, defining Key Risk Indicators (KRIs) like financed emissions per unit of lending, and integrating these into credit onboarding and monitoring.

3. Long-term: Strategic integration and capital planning

The ultimate goal is to translate physical and transition risk intelligence into capital planning and balance sheet strategy. This involves integrating stress test results into the Internal Capital Adequacy Assessment Process (ICAAP), as expected by regulators like BNM¹¹ and OJK¹², and using scenario-based simulations to inform adjustments to internal risk weights and IFRS 9 impairment calculations.¹³

CONCLUSION

Across the APAC region, physical and transition risks are no longer abstract concepts but measurable financial realities. Regulators are converging on a set of core expectations: granular data, sophisticated scenario analysis, and a clear translation of environmental drivers into financial impacts. As the case studies demonstrate, portfolio-level averages are insufficient; the real risks lie in concentrated, localized exposures that only advanced analytics can uncover.

For banks, the path forward requires a dual focus. In the short term, they must build the capabilities to help meet regulatory demands. In the long term, they must leverage these capabilities to drive strategic decisions, turning a compliance burden into a competitive advantage. By embracing a proactive, data-driven approach, banks can not only work to safeguard their balance sheets but also play a pivotal role in financing a resilient and sustainable economy.

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