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Banking Environment Initiative

Resilience-Adjusted Credit Risk:

Operationalising climate adaptation in financial decision-making

May 2026

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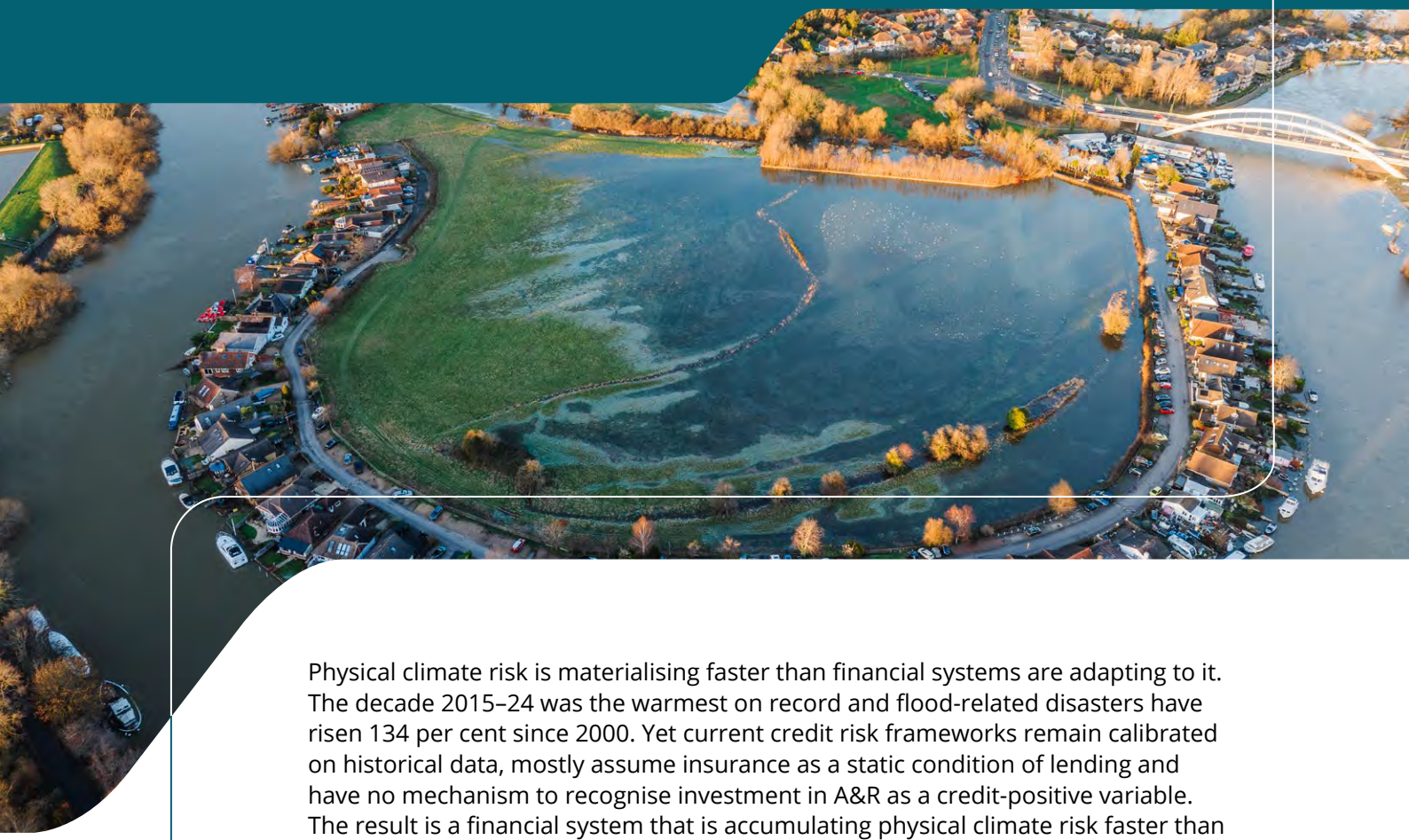
Contents

Executive summary

This report proposes the Resilience-Adjusted Credit Risk (RACR) framework: a structured approach to integrating physical climate risk, insurance adequacy and adaptation and resilience (A&R) investment into credit assessment, adjusting the core metrics of probability of default (PD) and loss given default (LGD) to reflect both borrower exposure to physical hazards and their capacity to manage and reduce that exposure.



Physical climate risk is materialising faster than financial systems are adapting to it. The decade 2015–24 was the warmest on record and flood-related disasters have risen 134 per cent since 2000. Yet current credit risk frameworks remain calibrated on historical data, mostly assume insurance as a static condition of lending and have no mechanism to recognise investment in A&R as a credit-positive variable. The result is a financial system that is accumulating physical climate risk faster than it is pricing it and actively directing capital into possible future stranded assets.

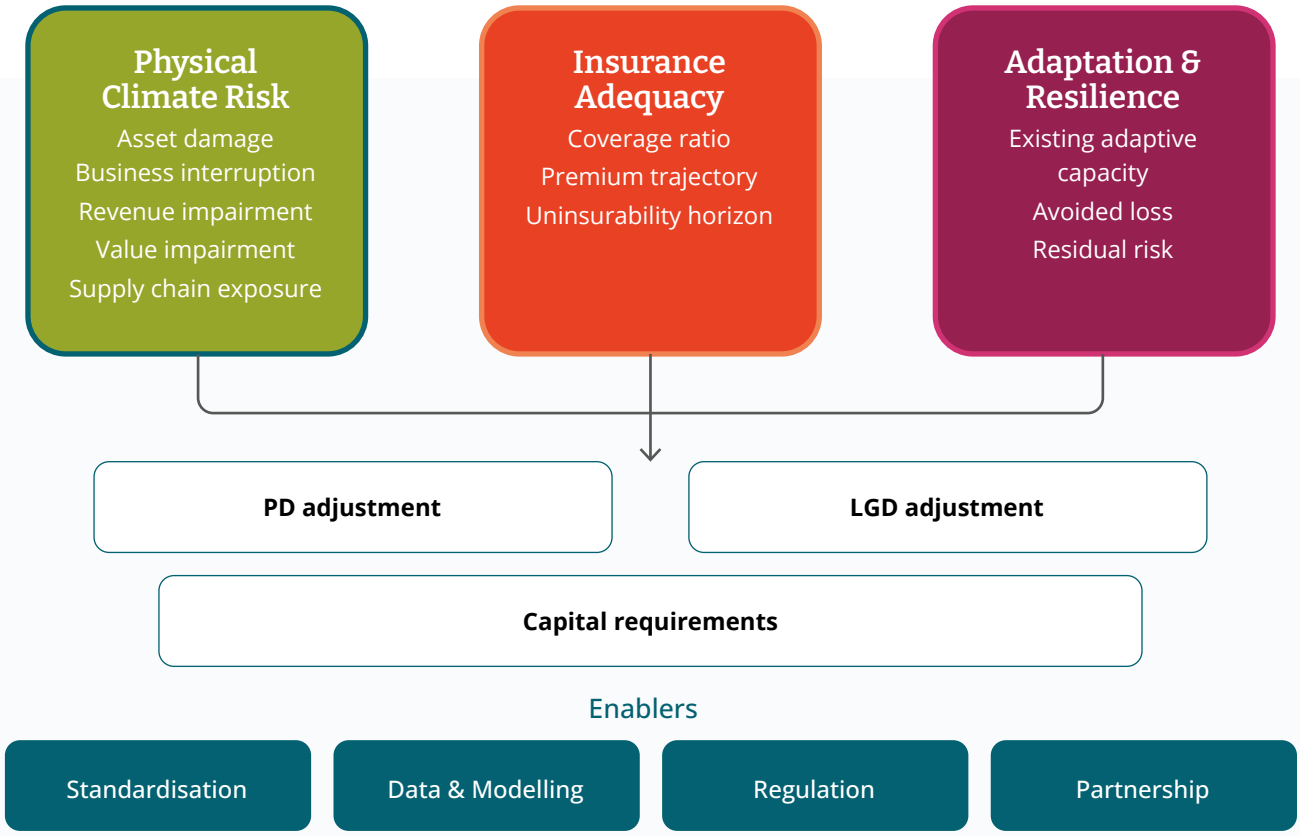


Figure 1: Resilience-Adjusted Credit Risk framework

The problem is structural. Banks are aware of the challenge and increasingly engaged with it, but face six compounding barriers: regime gaps in prudential frameworks; a revenue paradox in which A&R investment benefits are not captured; low observed climate-related bad debts that understate forward-looking risk; attribution failures that obscure climate losses within standard risk categories; a horizon mismatch between credit tenors and the timescale of physical risk and A&R materialisation; and a growing insurance blind spot as coverage withdraws from high-risk markets. These barriers are self-reinforcing: invisible losses suppress urgency, which suppresses investment, which perpetuates the absence of evidence.

The RACR framework is modular and iterative. Its three components address the barriers directly. The Physical Climate Risk (PCR) component introduces forward-looking, asset-level hazard assessment across loan tenor, producing PD uplifts and LGD adjustments. The Insurance Adequacy component replaces the assumption of coverage with an assessment of verification, premium trajectory and uninsurability risk. The A&R component transforms resilience investment into a quantifiable credit variable, recognising avoided loss as a PD and LGD reducer. Banks can begin with qualitative overlays and triage screens; the architecture supports improving quantitative integration as data infrastructure develops.

Scaling RACR requires collective action. Four enablers are essential but cannot be built by individual institutions alone: convergence on a common adaptation taxonomy; data and modelling infrastructure that also serves as a client engagement tool; resilience-linked insurance pricing that rewards verified vulnerability reduction; and recognition of resilient assets in capital requirements. Early signals such as the EU Infrastructure Supporting Factor, the Monetary Authority of Singapore's capital relief pilot and Prudential Regulation Authority (PRA) SS5/25 point in the right direction.

The case for early action. Banks that build RACR capability now will be better positioned as regulatory frameworks tighten and will gain a competitive advantage in climate-exposed sectors where clients increasingly need lenders that can engage on physical risk as a credit issue. Insurers that engage as data and validation partners will sustain the insurable markets that are otherwise at a risk of shrinking. Investors that develop demand for resilience-linked instruments will access a significant and underserved opportunity. Regulators that act to standardise methodologies and create capital incentives will strengthen financial stability before losses that are currently misclassified begin to surface at scale.

The RACR framework is a conceptual scaffold. Empirical calibration is a priority for future research. What this report establishes is the architecture and the urgency of beginning to build it.

1. Background

The impact of climate change is unfolding at up around the world, yet progress on adaptation and resilience is not keeping pace with worsening conditions. The decade spanning 2015–24 stands as the warmest on record,[1] with drought events increasing by a third and extreme temperature events tripling since 2000.[2] Meanwhile, since 2000, the number of recorded flood-related disasters has risen by 134 per cent compared with the two previous decades.[3]

The increasing severity and frequency of extreme weather events, such as floods and wildfires (acute risks), alongside gradual climatic shifts like sea level rise (chronic risks) affect households, businesses, governments and financial institutions. These hazards damage property and infrastructure and disrupt supply chains, reducing output and productivity. In turn, financial institutions face declining values of climate-exposed physical assets used as collateral, lower profitability and growing exposure to gaps in insurance coverage. Indirect macroeconomic effects, including reduced productivity and economic activity, further amplify these impacts.[4]

Consequently, the Bank for International Settlements identifies climate risk as a material driver of financial risk, including credit risk.[5] Explicit incorporation of climate risk into credit risk would allow physical risk to be considered in the pricing of loans, loan loss provisions and capital requirements.[6] However, in practice, this integration is not as straightforward, and current credit risk models often fail to incorporate this important risk.[6,7]

On the other side of the coin, this absence of priced-in physical risk associated with climate change obscures the need to mitigate it within the banking risk process. Investment in adaptation and resilience (subsequently referred to as A&R in this report) is critical to reducing exposure and vulnerability to climate risks and building capacity to prepare for, respond to and recover from its impact. Yet, currently, a profound imbalance in capital allocation persists. In the UK, the Climate Change Committee estimated an additional investment of £10 billion per year would be needed to help the country prepare for climate change.[8] The scale is even greater in developing countries, which the United Nations Environment Programme (UNEP) estimated to be up to US$359 billion per year, signalling the need for finance beyond the reach of public budgets.[9] This gap results in a continued under-investment that leaves assets vulnerable.

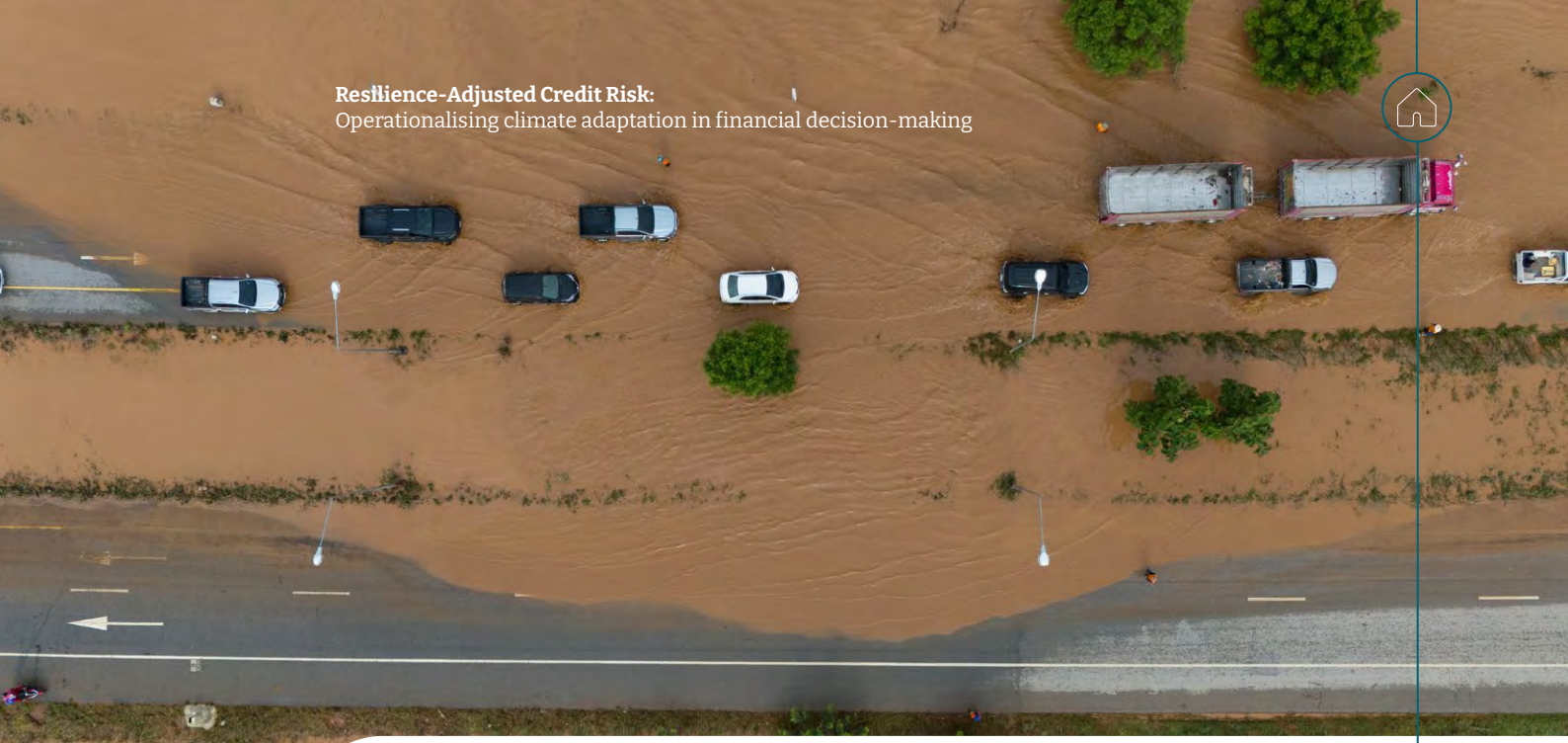
In April 2025, the PRA noted that no major British lender could fully quantify climate risk across their portfolios, often treating it as a reputational issue rather than a core threat to solvency.[15]

Meanwhile, for every $1 spent on climate-resilient infrastructure, $87 is directed towards projects lacking resilience considerations.[10] This is an active accumulation of risk, where new capital is being committed into potential future stranded assets.

The United Nations Framework Convention on Climate Change (UNFCCC) Baku to Belém roadmap recognises this problem, explicitly calling for private capital to scale resilience in agriculture, water and infrastructure.[11] The increased attention on the private sector is echoed in the latest Adaptation Gap report, which estimates that the private sector could contribute around US$50 billion per year if backed by targeted policy action and blended finance solutions.[12]

To enable private finance to flow towards adaptation, financial institutions need to be able to account for both how physical risk impacts credit risk and how investment in A&R could mitigate those risks. Without it, the absence of a mechanism to operationalise A&R investment into credit metrics results in systemic mispricing.[13] Recent work by the Climate Financial Risk Forum encourages regulatory alignment that recognises A&R in risk calculations.[13] Operationalising resilience also allows financial institutions, as well as corporates, to make the business case for investing in A&R, thereby generating more high-quality, resilient assets.

Therefore, there is a need to examine how physical climate risks and A&R investment can be operationalised into the credit risk processes. This research addresses this gap by proposing a Resilience-Adjusted Credit Risk (RACR) framework. The report first assesses the current practices and gaps, before identifying opportunities that banks can take to start integrating these components in the credit process. This research is also developed in line with the latest supervisory statement set out by the PRA for firms' approaches to managing climate-related risks.[14] The objective is to price in not only the risks but also the opportunities from A&R.

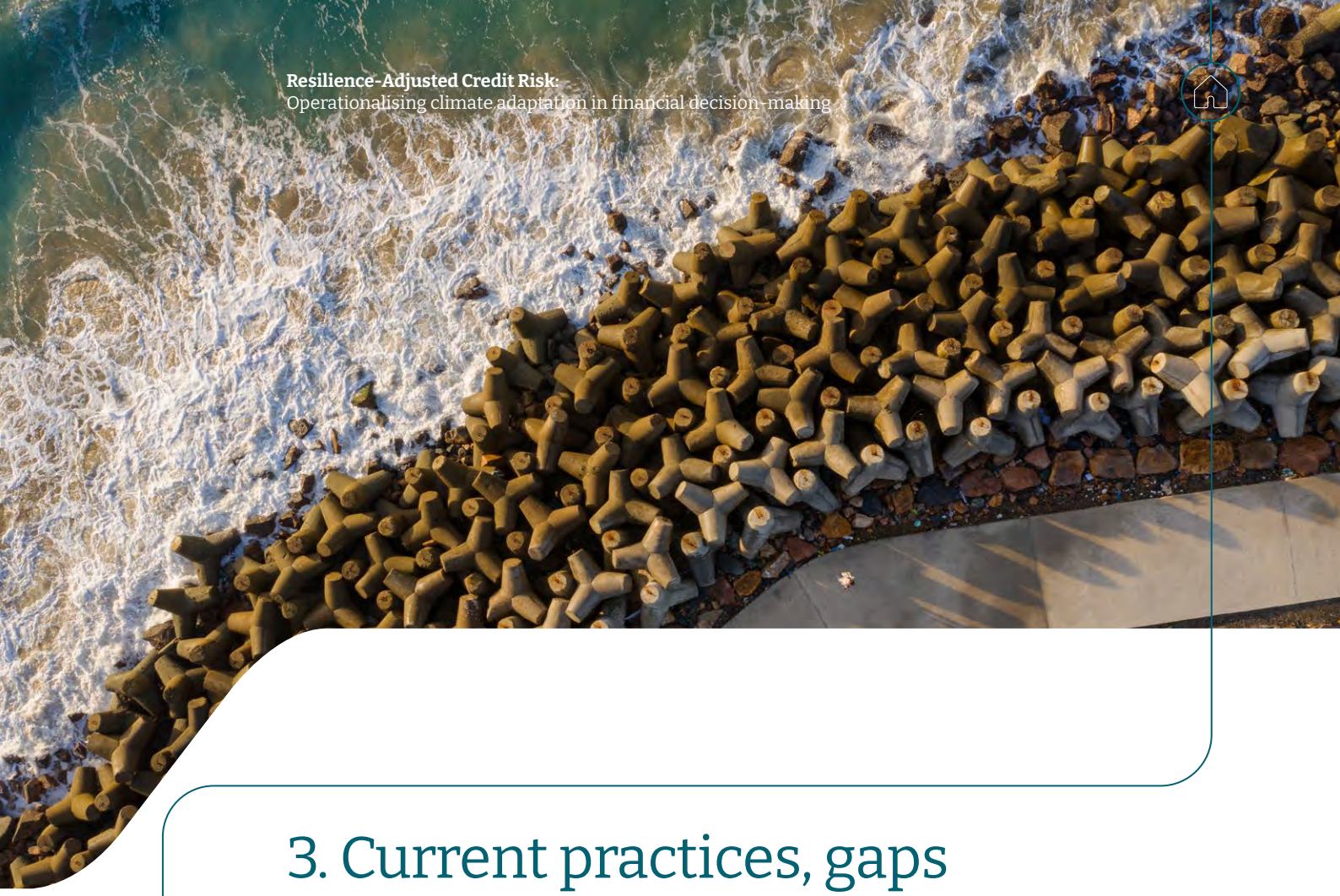


2. Methodology

This paper is developed based on a literature review comprising academic journals and grey literature on physical climate risk, A&R and credit assessment. Additionally, expert interviews were conducted throughout November 2025 with 20 experts across credit, risk and sustainability departments in seven institutions. Expert groups were convened as part of the research, comprising nine institutions across banks, insurers, asset managers, international organisations, industry associations and academics providing critical input and feedback, and met two times throughout the project duration.

The scope of the research covers credit risk only and does not include market risk, liquidity risk or operational risk that can also come from climate risk.[5] It also looks at physical climate risk only, and not transition risk or nature-related risks. It is important to note that nature-related and climate-related risks are interrelated and share similarities such as non-linearity and tipping points, as well as differences in their impact and measurement.[15] Addressing the two in an integrated manner is desirable.

This research has clear limitations. First, in terms of the interview sample, its size does not represent the whole sector, and there is selection bias inherent in voluntary participation. Findings from interviews are then illustrative of emerging practice rather than descriptive of the sector overall. We have provided more evidence from the literature where possible. Second, the regulatory analysis is primarily UK and EU-centric and has not covered other geographies in detail, and therefore may not be representative of other jurisdictions. Third, the current RACR framework is a conceptual framework which currently has no specific weighting to it, and empirical calibration of the functional form is identified as a priority for future research.



3. Current practices, gaps and opportunities

The transition from acknowledging physical climate risk and A&R to pricing it is currently at different levels of maturity within financial institutions. While frameworks exist, there are significant challenges and a disconnect between expectations and the operational reality of credit risk processes and decision-making.

This chapter discusses (i) the spectrum of maturity in current bank practices, (ii) barriers to integration of physical risks and A&R, (iii) vulnerability of the insurance blind spot, (iv) opportunities and (v) enablers.

3.1. Different approaches in bank practices

Two key industry studies provide the benchmark against which current bank practices can be assessed. The GARP Risk Institute's 2023 survey of global financial institutions finds that while climate risk practices have improved industry-wide, the gap between leaders and the broader field is narrowest in governance and strategy, and widest in quantitative areas such as metrics, scenario analysis and disclosure.[16] Leaders are nearly twice as likely to apply quantitative assessments for physical risk, and scenario analysis adoption has grown significantly, from 35 per cent of institutions in 2019 to 75 per cent in 2022. The United Nations Environment Programme Finance Initiative (UNEP FI) and Global Credit Data report published in June 2025, based on a survey of 32 banks across five regions, provides a more granular picture: expert judgement remains the dominant approach, driven primarily by regulatory mandates, with only

18 per cent of banks integrating physical risk into internal ratings-based (IRB) models. Capital-level integration, such as expected credit loss (ECL), risk-weighted assets (RWA) and economic capital, remains largely exploratory.[7] These two sources confirm that the industry is moving, but operational integration into credit assessment remains a gap. Our interviews reveal a spectrum of four approaches that map onto and extend this picture. It is worth noting that these approaches are not mutually exclusive and are best understood as layers of increasing sophistication that accumulate rather than replace one another.

- **The compliance-driven approach:** For some interviewed banks, climate risk is mainly assessed in the regulatory-mandated stress-testing exercise. It is done to meet regulatory expectations, but it remains siloed from the credit-scoring process. Stress testing looks at high-level economic changes and does not include the more detailed analysis necessary to impact individual lending decisions. This is aligned with the assessment by the UK Centre for Greening Finance and Investment, which found the stress-testing paradigm to be generally too high-level to be fully utilised for bank-level financial exposures and to require further layers of modelling to translate it into financial impacts in banking portfolios.[17] UNEP FI similarly finds that regulatory compliance is the primary driver for 62 per cent of banks using the results of their climate risk assessments, while use for credit decisioning or strategy planning remains less common.[7] In both cases, compliance activity creates a form of reporting without operational integration; the exercise exists, but its outputs do not yet feed into pricing or origination.

- **The qualitative approach:** Beyond complying with the regulatory rules, interviewed institutions also rely on a qualitative approach such as manual checks and client engagement. This treats climate risk as a qualitative overlay, rather than a formulaic driver of the interest rate. This aligns with the findings from UNEP FI and Global Credit Data, which reveal qualitative assessments to be one of the most common methodological tools used by banks.[7] GARP's findings add further texture: less advanced firms are significantly more likely to remain at the qualitative stage, while leaders have moved to quantitative assessment at roughly twice the rate.[16] While it can be suitable for early stages, qualitative assessment is often hard to aggregate, making it difficult to drive meaningful insights into trends. Moreover, the interviewees broadly argue that data opacity at the asset level is a significant barrier. Specific asset-level location and insurance data remain opaque or difficult to acquire, hindering granular risk pricing. As a result, the qualitative approach, while appropriate as a first step, tends to reach a ceiling quickly in terms of the credit risk insights it can generate.

- **The data-heavy approach:** To address the data opacity barrier above, the more advanced banks are purchasing data from third-party providers or vendors. These vendors vary and could provide data and services ranging from climate risk at different locations, hazard scenarios and mapping asset-level locations, to the more advanced digital twin, where they could simulate the impact of various A&R measures on assets. UNEP FI confirms that external data providers are among the most commonly used data sources across the surveyed population.[7] While this is useful, some interviewees noted that it could require a considerable investment

and may not necessarily produce results that are ready to use for banks, such as being too aggregated and high level or using metrics that banks do not commonly use. Banks also struggle with third-party climate models that are often 'black boxes', making it hard to generate consistent, comparable insights across a global portfolio. For instance, flood risk models often lack information on data sources and choices of vulnerability and exposure, making it difficult to compare and understand the quality of data from different providers,[13] especially when there is a large spread of hazard and physical risk estimates from different data providers for the same asset.[18] For banks, the challenge is not just sourcing data, but characterising and quantifying this uncertainty within their credit risk models.

- **Developing internal capabilities:** A cohort of interviewed banks, acknowledging the limitations of the vendor market, have begun building internal capabilities by combining multiple vendors to provide different components of the analytical stack, and building the integration, interpretation and credit-translation layer in-house (a buy-and-build data approach). This approach is more data intensive than pure vendor reliance because it demands more granular inputs from each vendor and requires a good understanding and experience of existing solutions. The primary motivations are to understand the assumptions underlying third-party models, exert greater control over modelling choices, and generate outputs in metrics and formats directly usable in credit risk workflows.

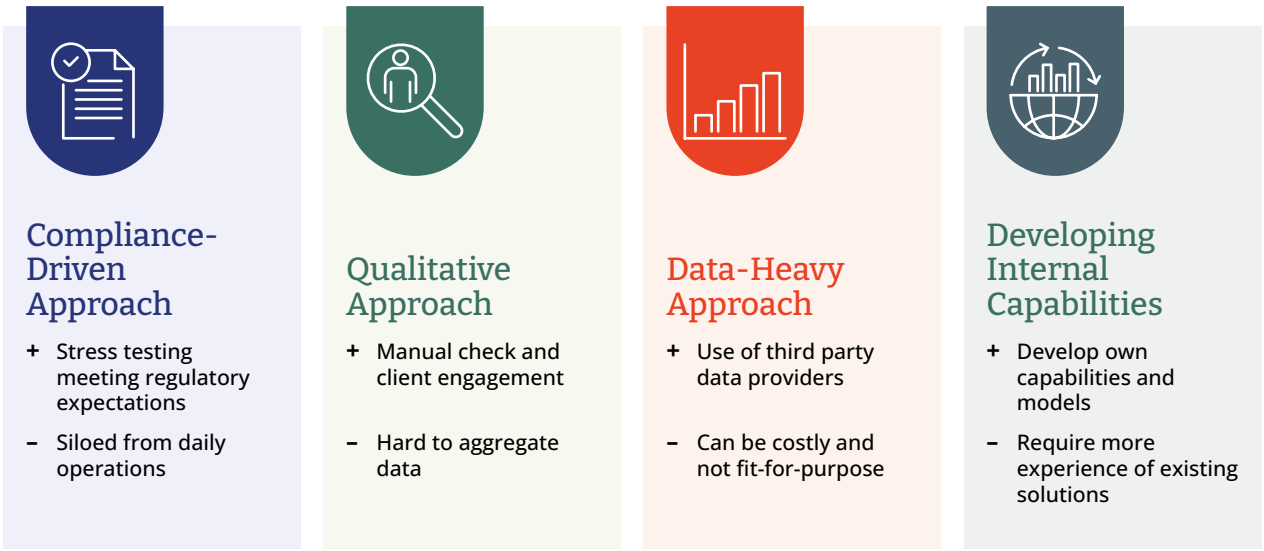


Figure 2: The different approaches to physical climate risk integration

3.2. Barriers to implementation

Recent publications have surfaced many barriers to integrating physical climate risk and resilience into financial decision-making, such as regime gaps in prudential frameworks; data limitations which make models hard to build even where intent exists; misaligned incentive structures which reduce the commercial case for doing so; and the absence of shared standards, linked to the contextual nature of A&R and therefore the difficulties to compare, validate or act on produced outputs.[7,13,19,20] Interviews validated some of these literature-based barriers while surfacing specific operational pain points. The barriers identified below do not operate independently. As the concluding synthesis to this section sets out, they form a system of mutually reinforcing constraints: a dynamic that has important implications for how solutions need to be designed.

1. **Regime gaps:** Current prudential frameworks (Basel III) contain two analytically distinct blind spots with respect to physical climate risk:
    - **Horizon problem:** Capital requirements are calibrated over a one-year window. However, since a major natural disaster is a rare event in a statistical sense, it often fails to impact the average one-year PD,[6] leaving the bank potentially under-capitalised for the actual risk. The PRA's Climate Change Adaptation Report 2021 identified that this one-year time horizon for the majority of capital requirements might result in future climate-related financial risks remaining uncaptured.[4]

> "Our biggest problem that we have, in terms of incorporating [physical climate risk] into probability of default models and others, is the simple statement of fact that we aren't allowed to."
>
> Interviewee 1

    - **Non-stationarity issues:** Regulatory models principally rely on historical default data, which, by definition, cannot account for the unprecedented nature of climate change. This is not merely a data gap that will close as more observations accumulate; it is a structural limitation of backwards-looking calibration under conditions of non-stationarity. Climate risks are uncertain, non-linear and include potential tipping points which are hard to be accurately capture in the financial system.[21] Standard credit models that assume the statistical distribution of losses is stable over time may become progressively less defensible as physical hazard frequencies and intensities accelerate beyond precedent. Battiston et al. (2021) argue that this renders conventional risk models structurally ill-suited to climate risks, which are uncertain and non-linear.[22]
    - **The revenue paradox:** Expert interviews surfaced a major hurdle: adaptation projects often require a client to take on additional debt – to install drainage infrastructure, build flood defences or invest in drought-resistant equipment – without generating an immediate increase in revenue. Under current credit models, this increases the borrower's leverage without a corresponding improvement in income-based metrics, which can paradoxically lower their credit score despite making them a safer long-term bet.

This paradox has two distinct dimensions. The first is a *leverage effect:* the additional debt mechanically worsens debt-to-income and debt-to-equity ratios, which are standard inputs to credit scoring. This treatment of A&R investment as cost is identified as one of the challenges why, despite studies that show significant returns on resilience,[23] investment has not flowed as needed.[24] The second is a revenue recognition problem: the primary benefit of adaptation investment is the avoidance of future losses; reduced probability of flood damage, lower revenue volatility from drought and improved collateral durability. Under current accounting conventions and credit assessment practice, avoided future losses are not recognised as revenue, nor do they appear in EBITDA calculations. The financial benefit of resilience is therefore not only hard to estimate but also hard to capture.

> "You're lending to someone to improve resilience to physical risk; you're increasing their debt with no immediate financial returns. So, their credit rating must be getting worse."
>
> Interviewee 6

This absence of a traditional revenue stream has long been identified as a major barrier in A&R investment, both in developed market contexts[8] and emerging markets,[25] suggesting this is not a problem specific to any one regulatory environment but is embedded in the logic of how credit models are constructed.

However, this view overlooks a significant and commercially important category of adaptation investment that does generate immediate and measurable revenue or cost-reduction benefits. The Global Center on Adaptation (GCA) demonstrates various A&R investments in this context.[26] For instance, in agricultural contexts, resilient seed varieties typically produce higher yields under stress conditions, generating additional income.[27] The under-investment problem in this category is linked to market awareness and acknowledgement of these dual benefits. The revenue paradox in its strictest form therefore applies to the subset of adaptation that is primarily defensive, where the benefit is loss avoidance rather than income generation.

The revenue paradox is compounded by a structural market failure that the adaptation economics literature identifies as positive externalities. Many adaptation measures result in high environmental or societal benefits that others who bear none of the cost can benefit from, with no additional returns for investors. This creates the systematic divergence between private financial returns and broader economic and social returns, which reduces incentives for private sector participation.[28,29]

3. **Low climate-related bad debts to date:** To date, interviewees have not observed significant bad debts directly attributed to physical climate risk. This lack of historical evidence dampens the urgency and makes it challenging to convince credit risk functions to overhaul existing frameworks. At first glance, published empirical evidence appears to validate this observation: staff analysis from the Federal Reserve Bank of New York found that destructive weather disasters over the last quarter of a century had only modest effects on US banks' performance, with no significant increase in loan losses and default risk, even at the 95th percentile of disaster damages, and that disasters tended to increase loan demand in ways that offset losses and supported profitability.[30]

However, this observation may require careful disaggregation before it can be treated as evidence that physical climate risk is financially immaterial. First, losses may have largely been absorbed elsewhere: an empirical literature on the economic impacts of disasters found that despite the rising costs of damages, many natural disaster events have a relatively modest impact on output and growth, which disappears fairly quickly, due to government disaster aid and insurance helping smooth losses over time.[31] Second, climate-driven losses that did reach bank portfolios may have typically been recorded under other risk categories, a classification challenge discussed in detail in barrier 4 below, further suppressing their visibility in climate-specific loss data. Lastly, historical low losses are not predictive of future losses under accelerating physical risk. The modest credit loss record to date reflects a climate system that has not yet crossed the thresholds at which physical risk becomes systematically disruptive to creditworthiness at scale. The empirical record is backwards-looking by construction; it cannot account for the non-linear dynamics of climate risk materialisation under higher warming trajectories. The European Central Bank (ECB) and European Systemic Risk Board (ESRB) have cautioned against treating historical loss data as a reliable guide to future climate-related credit losses precisely because of this forward-looking gap.[32]

> "For many of these [physical climate risks] events, because of insurance that's available, because of diversifications, and so on... The impacts tend not to be immediate."
>
> Interviewee 2

4. **Classification and attribution challenges:** A further barrier to integrating physical climate risk into credit decision making is losses that may be linked to climate change remain largely invisible in banks' risk taxonomies and data systems. Interviews highlight difficulties in identifying and recording events as physical climate risks. For most banks, climate change is not, and has not been, classified as a standalone risk category within their credit models. A primary hurdle lies in the attribution of losses: climate-driven impacts, ranging from acute physical risks (eg, increased frequency of flooding) to chronic shifts (eg, declining agricultural yields due to increased temperature) are typically classified as standard operational disruptions or 'business-as-usual' volatility and may be obscured by more traditional drivers such as inflationary pressures or geopolitical instability. This occurs because climate related impacts are difficult to separate from more familiar macroeconomic drivers. For example, revenue declines linked to extreme weather may be attributed to inflationary pressures, and competitive pressure or supply chain issues due to physical climate risk may be ascribed to geopolitical tensions. In reality, physical climate events may co-occur with other shocks. Where a flood coincides with supply chain disruption from a geopolitical event, or a drought compounds with food price inflation, the financial losses that emerge are non-linear, greater than the sum of their parts. This compounding dynamic means that current loss classification systems are likely to underestimate the total magnitude of losses in scenarios where multiple shocks interact.[33] Another attribution challenge is distinguishing between losses arising from direct asset damage and those arising from business interruption, including first-mile supply chain disruption and broader indirect effects, each of which has different credit implications, different recovery timelines and different mitigation strategies.

Because climate risk is obscured in this way, it fails to emerge as a distinct driver of creditworthiness, which (i) hinders banks from building the historical climate loss datasets needed to calibrate future models, (ii) reinforces the perception of the muted impacts of climate risks in the financial sector (as documented in barrier 3 above) and (iii) leads to under-investment in A&R.

Underpinning this classification problem is the technical complexity of climate attribution. Attribution science, which combines historical observations with modelling to estimate how climate change has altered the probability and severity of specific events, has advanced significantly. However, its outputs are not yet in a form that integrates readily into financial sector loss classification processes.[34] This data gap creates a self reinforcing cycle where climate risk may appear insignificant simply because it is not systematically recorded.

5. **The horizon mismatch:** A final barrier arises from the horizon mismatch between which risks are visible within the credit decision horizons that dominate mainstream lending, and the timescales over which physical climate risks and adaptation outcomes materialise. Annual insurance renewal cycles compound this: even where loan tenors are long, insurance coverage, a key assumption in credit models, is repriced annually, creating a structural discontinuity between the credit assessment horizon and the coverage horizon it depends upon. The practical implications are asset-class specific and in some cases already acute. In the UK residential mortgage market, standard lending terms now routinely extend beyond 2039, the statutory date at which Flood Re, the government-backed reinsurance scheme that currently makes flood insurance affordable in high-risk areas, is scheduled to transition out of the market. This creates a direct and measurable horizon mismatch: mortgages originated today may reach mid-term at the point when the insurance backstop underwriting their collateral value ceases to exist in its current form. Additionally, most financial institutions operate with planning cycles, credit decision cycles and performance evaluation frameworks of one year. Compensation frameworks further exacerbate the issue: business originators and senior management are often evaluated on short term profitability or portfolio growth, rather than the relatively long period for materialisation of climate-related results.[35]

   By contrast, many material physical climate risks, such as chronic water stress, sea level rise, heat stress or shifting agricultural viability, unfold over decades. This mismatch reduces the visibility of climate related risks in credit assessments and diminishes incentives for borrowers and banks to invest in adaptation.

3.3. Vulnerability of the insurance blind spot

An important assumption underlying banks' current credit risk management is that physical climate risks are largely mitigated through insurance coverage. Similarly, in the Bank of England's 2021 Climate Biennial Exploratory Scenario (CBES), most banks assumed that insurance cover would mitigate part of the impact of greater physical risk on their corporate borrowers.[36] Yet recent developments in the insurance sector, marked by insurers withdrawing from or limiting coverage in certain markets,[37,38] indicate that the protection they have historically provided may not always be available in all cases going forward. Broadly, there are at least three distinct risk channels that have different implications for credit risk: the risk that a borrower loses insurance coverage entirely (uninsurability); the risk that coverage becomes inadequate relative to actual loss (underinsurance); and the risk that rising premiums and/or attachment to policies impair debt service capacity (affordability). These are different problems with different credit implications and different mitigation strategies.

This pressure is increasingly seen in stress tests globally. For example, the Australian Prudential Regulation Authority (APRA)'s 2026 Insurance Climate Vulnerability Assessment found that direct losses from weather perils, together with climate-related economic impacts, could lead the national protection gap to rise to affect around one in four homes by 2050.[39] Meanwhile, the US Federal Reserve System's 2024 pilot Climate Scenario Analysis asked participants to estimate the credit impact of physical hazards assuming no insurance coverage.[40] Additionally, the Reserve Bank of New Zealand's 2024 Reverse Stress Test notes that "banks are increasingly aware of the risks posed by changes or disruption in the insurance market".[41]

Understanding these channels matters beyond the lending relationship. For insurers, the same dynamic represents a market sustainability question: where physical risk goes unmitigated and finance continues to flow to increasingly exposed assets, the concentration of losses in exposed geographies can accelerate the coverage withdrawals that shrink the insurable market. In a joint-industry letter, the Association of British Insurers highlighted how 11 per cent of new homes built between 2022 and 2024 are at risk of flooding today[42] and how these homes are at risk of future uninsurability.[43] Banks and insurers therefore share a structural interest in earlier, more granular risk assessment, one that identifies where adaptation investment could keep assets insurable and creditworthy simultaneously.

- While this shift is being noted by some within the financial services sector, baseline assumptions in risk models typically do not factor in this development.

> "In terms of our model, what we do today, we assume they are insured, that's assumption number one."
>
> Interviewee 1

> "...We assume that whatever damage they incurred, they will be paid the full [amount]."
>
> Interviewee 2

- A bank's ability to check and/or validate the insurance cover that clients have varies significantly by jurisdiction and the type of facility. For example, for project finance, insurance is typically a mandatory and verified condition, giving the bank higher visibility and control. For property-specific lending (eg, residential property mortgages), insurance is usually a condition of lending and is considered by valuations teams at origination and at the end of a lending term. However, ongoing coverage status is rarely verified between these points. For other secured facilities, insurance is typically a condition of lending that is confirmed by the borrower, providing limited visibility to the bank. Meanwhile, for unsecured facilities, it is much harder for banks to track a client's overall insurance position, as borrowers are typically reluctant to provide this information. In many cases, banks simply do not know, and cannot easily ascertain, the insurance status of their unsecured borrowers.
- More advanced banks are beginning to model variations where insurance is partially or fully removed. However, the lack of granular data on insurance (what is covered and for how much is the level of cover) makes these exercises more theoretical than operational at present.
- The uncertainty around government-backed schemes represents another dimension of the blind spot. Flood Re, the UK's public–private partnership reinsurance programme, currently makes flood insurance affordable for high-risk residential properties, but is scheduled to transition out of the market in 2039.

> "Does insurance exist in the first place, and if it does, what to expect as "a payout? It remains opaque, very opaque."
>
> Interviewee 4

The credit risk and insurability nexus

1. Insurance withdrawal increases business interruption losses and collateral exposure

When an insurer withdraws from or limits coverage in a high-risk market, it impacts the amount of coverage that can be provided should a disaster occur and its collateral value. On the former, borrowers lose both the asset protection and the business interruption coverage that would otherwise support continued debt service during the recovery period. This creates a compounding effect on probability of default (PD). The latter impacts loss given default (LGD) by turning the asset into impaired collateral, because the lender's ability to recover value in default is directly dependent on the asset's continued physical integrity.[44]

2. Premium inflation impairs debt service capacity

Even where coverage remains technically available, rapidly rising premiums represent a direct and growing operating cost pressure on borrowers. For agricultural borrowers, property owners in high-risk zones and infrastructure operators in climate-exposed locations, insurance as a proportion of operating expenditure can rise. This premium inflation impacts borrowers' cash flows and reduces their debt service capacity,[45] which represents a deterioration in creditworthiness that may not be captured unless the lender is explicitly modelling forward insurance cost trajectories.

3. Correlated withdrawal creates portfolio-level concentration risk

Insurance withdrawal tends not to be idiosyncratic. When a major insurer or reinsurer retreats from a geography or hazard class, it typically does so across an entire book of business, affecting many borrowers simultaneously.[37,46] This creates a correlated deterioration in credit quality across bank portfolios that is concentrated in precisely the geographies and sectors most exposed to physical climate hazards. This is analogous to wrong-way risk, the phenomenon when a counterparty's credit exposure increases while its creditworthiness declines. In this context, the common factor is physical hazard intensity: as it rises, borrowers in exposed geographies face a greater probability of default, while the insurance coverage that underpins the collateral value backing those loans simultaneously retreats, meaning the bank's residual exposure at default increases at precisely the moment creditworthiness deteriorates. This amplifies rather than diversifies portfolio risk, and is most destabilising when concentrated in geographies already carrying the greatest physical hazard exposure.

Table 1 below synthesises the barriers above identified in our interviews and corroborated by the literature review, highlighting why current credit risk assessments struggle to fully capture physical climate risks.

Table 1: Overview of the credit assessment gaps and their operational consequence

Feature of credit assessment	Traditional credit model approach	The reality of physical climate risk, and why it matters
1. Regime gaps	Relies on historical default data and mean reversion assumptions.	Climate change breaks historical patterns; past weather data is no longer a reliable predictor of future extremes. Traditional IRB models cannot account for the non-linear, forward-looking dynamics required to anticipate climate shocks.
2. Revenue paradox	Adaptation investments, primarily those that accrue in avoidance of loss, increase debt without immediately increasing revenue, worsening leverage ratios.	Adaptation mitigates future PD, LGD and collateral impairment, making the borrower safer in the long run, but current models penalise borrowers for the short-term debt increase without recognising the long-term risk reduction. Some A&R measures can also generate income, providing dual benefits.
3. Low climate-related bad debts to date	Credit assessments assume past performance patterns persist; climate related defaults remain extremely limited in datasets.	Losses have been absorbed by insurance and government relief rather than appearing in bank credit data, and often are not properly captured. Historical low losses are not predictive of future losses under accelerating physical risk.
4. Classification and attribution challenges	Losses are recorded under broad, familiar categories (operational, market, idiosyncratic borrowers' issues).	Climate-related losses are obscured by, and can compound with, inflation, geopolitics and supply chain volatility. Compounding risks can accumulate to a level greater than the sum of their parts.
5. Horizon mismatch	Longer-term risks are often not visible within the credit decision horizons. Planning cycles, credit decision cycles and performance incentives emphasise one-year windows focused on near-term profitability and portfolio performance.	Physical climate risks unfold over decades; adaptation benefits accrue slowly. Long-term risks are systematically underweighted, and incentives to invest in adaptation are weak for both banks and clients.
6. Insurance assumption	Assumes clients maintain adequate coverage; insurance is often a condition precedent for lending.	Coverage is shrinking, premiums are rising, and banks often lack visibility into the insurance status of borrowers.

These barriers do not operate independently. The classification and attribution failure (barrier 4) and insurance blind spot (barrier 6) can contribute to the low observed bad debt problem (barrier 3), since losses that are not recorded as climate related cannot appear in climate loss statistics. The horizon mismatch (barrier 5) reduces the urgency of addressing the regulatory gap (barrier 1), since banks operating on short cycles have limited incentive to advocate long-horizon capital reform. And the revenue paradox (barrier 2) is, in part, a product of the attribution failure: if avoided loss from adaptation cannot be measured and recorded or revenue-producing A&R measures are not accounted-for, it cannot be priced.

The result is a self-reinforcing system in which physical climate risk appears immaterial, partly because it is not measured or is obscured by other mechanisms (as discussed above); adaptation appears unrewarding, partly because its benefits are invisible; and regulatory reform appears unnecessary, partly because the historical loss record, constructed from misclassified and publicly absorbed losses, does not yet reflect the forward-looking risk. This systemic character of the barriers has a direct implication for the design of solutions: individual institutions acting unilaterally can make progress along the maturity curve described in Section 3.1, but breaking the reinforcing dynamics between barriers requires co-ordinated action across banks, regulators, data providers and insurers. The RACR framework proposed in Section 4 is designed with this systemic context in mind.

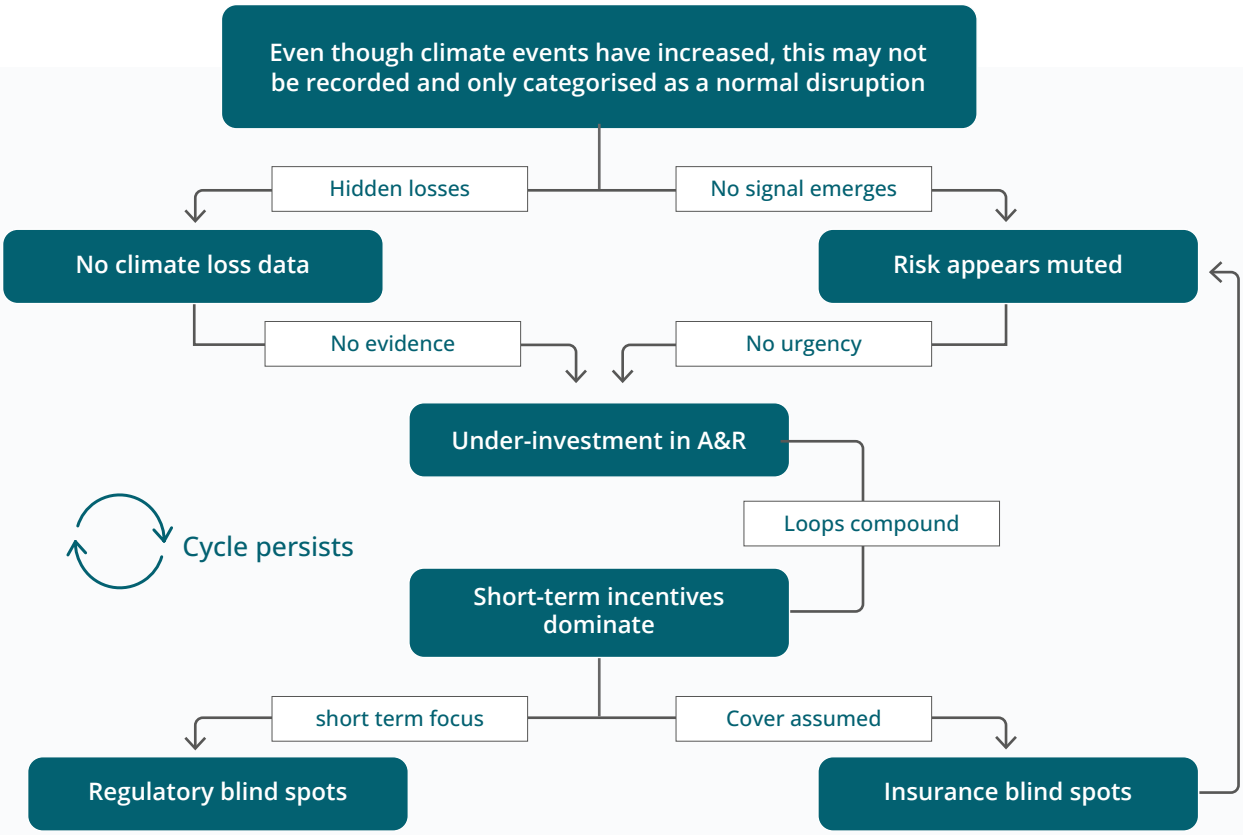


Figure 3: Possible feedback loops of different barriers interact with and compound each other

3.4. Opportunities for building Resilience-Adjusted Credit Risk

Resilience-Adjusted Credit Risk (RACR) refers to the integration of physical climate risk, insurance adequacy, and adaptation and resilience investment into standard credit assessment, adjusting the core credit metrics of probability of default (PD) and loss given default (LGD) to reflect both the borrower's exposure to physical hazards and their capacity to manage and reduce that exposure. The full framework is set out in Section 4.

As banks work towards operationalising RACR, several strategic opportunities emerge across client engagement and product innovation. These opportunities not only strengthen credit portfolios but also can enhance competitiveness, expand market share and unlock new revenue streams.

Driving competitiveness and additionality through informed discussion with clients

Banks have a significant opportunity to differentiate themselves by helping clients understand and manage their long-term exposure to physical climate risks. While corporates are best placed to understand the specific physical characteristics of their own assets and operations, many still lack awareness of how climate risks and A&R may affect asset values, operational continuity or solvency. According to a 2024 survey, only 21 per cent of companies have an adaptation plan, and within those, 69 per cent do not quantify adaptation cost.[47] Meanwhile, mandatory disclosure frameworks are progressively requiring corporates to assess and report on physical climate risks, for example, the European Sustainability Reporting Standards (ESRS) and International Financial Reporting Standards (IFRS) S2 mandate this for companies in their respective jurisdictions. Where clients disclose their physical risk exposures, applied scenarios and underlying assumptions in a transparent and comparable manner, banks can use this information to materially improve the quality of their own credit assessments, drawing on clients' knowledge of asset locations, operational dependencies and supply chain exposures. As disclosure requirements expand and standardise across jurisdictions, this creates a progressively improving data flow that can address some of the asset-level gaps that have historically constrained bank-level physical risk assessment, provided that the transparency and comparability of client disclosures continue to improve.

By identifying physical risks for the client as well as leveraging clients' own stress testing and climate scenario insights, banks can support the identification of climate related vulnerabilities and engage borrowers in forward looking conversations about resilience measures and adaptation planning. This role strengthens long-term client relationships, reinforces borrower resilience through climate shocks and improves credit performance. This is where the opportunities are for forward-thinking banks, creating additionality and therefore possessing a competitive advantage. Understanding sustainability topics and being able to discuss them in the context of the borrower's business is a significant value-add from a relationship banking perspective.

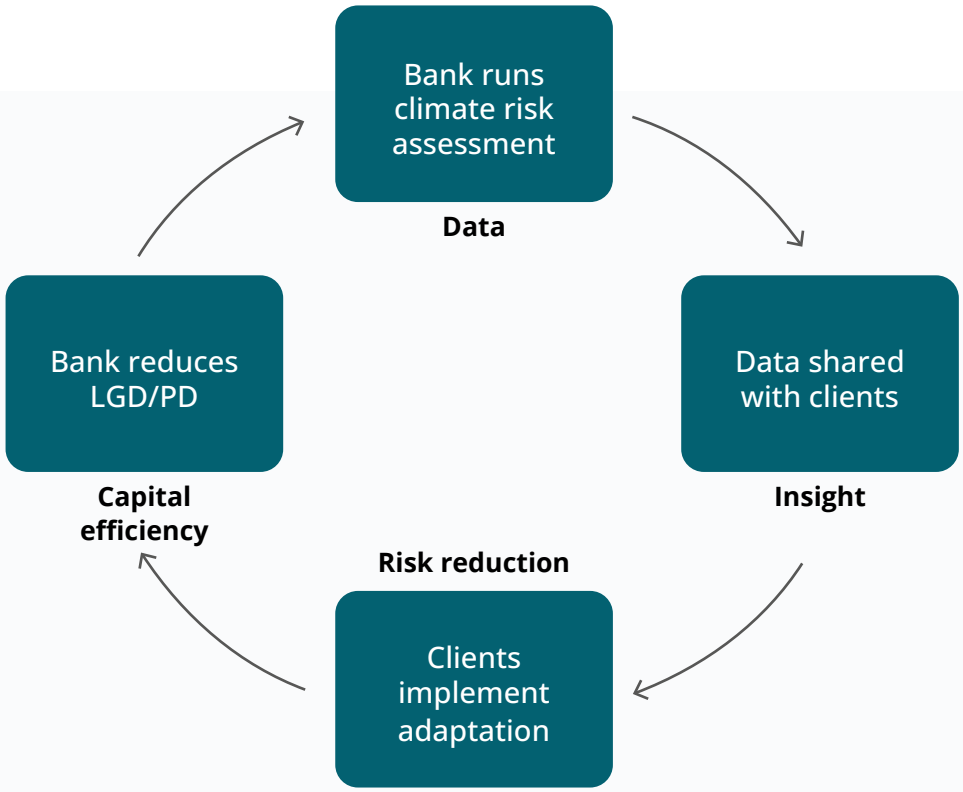


Figure 4: How banks' climate risk assessment can be repurposed as client service

Product innovation

Better integration of physical risk data can form the basis of new financing solutions, tailored to clients facing physical climate risks, and actively rewarding the management of vulnerability.[48]

Examples include:

- resilience-linked loans where interest rates adjust according to a borrower's adoption of agreed adaptation measures
- green or resilience-aware mortgages incorporating location-specific flood or heat risk
- insurance-linked credit products that package lending with catastrophe coverage.

Several institutions have begun working on these concepts in practice, demonstrating how climate-resilient finance can be embedded into mainstream lending operations:

- Bank Negara Indonesia has introduced climate-resilient financing products for agricultural and coastal sectors, embedding adaptation requirements into loan eligibility. Borrowers may need to adopt measures such as water-efficient irrigation or mangrove restoration to qualify for subsidised interest rates. The bank aligns loan terms with seasonal forecasts from the Meteorological Agency, and in flood-prone areas, loans are bundled with index-based insurance to provide repayment relief when hazard thresholds are triggered.[49]

- Rabobank, through its Rabo Partnerships platform, integrates yield-based crop insurance into loan products. Insurance payouts are triggered by independently measured yield losses, enabling farmers to maintain repayment capacity during difficult seasons. Drawing on principles similar to parametric insurance, where payouts depend on observable indicators, this model reduces credit default risk while strengthening climate resilience.[50]

- Standard Chartered's adaptation finance transaction with JinkoSolar illustrates how trade finance instruments can also serve as vehicles for embedding resilience into supply chains. Standard Chartered provided bank guarantees to facilitate the delivery of storm and extreme weather-resilient solar modules to solar farms in Florida, the UAE and Saudi Arabia, regions vulnerable to tornadoes, tropical storms and sandstorms, demonstrating the potential of adaptation as an investable asset class and the role of trade finance in connecting demand for resilient technology with supply.[51]

It is also worth emphasising that A&R measures relevant to credit assessment extend beyond property damage protection. A study by MSCI estimates that potential business interruption risk is 14 times larger than asset damage risk.[52] Investments that mitigate business interruption, backup power generation, battery energy storage systems or on-site renewable generation may have a material impact on PD. These measures also often deliver co-benefits in the form of reduced operating costs, making them more commercially attractive to borrowers and easier to evidence in credit assessments.

3.5. Enablers

The opportunities identified in Section 3.4 demonstrate that banks can begin integrating physical climate risk and resilience into existing processes today. However, realising these opportunities at scale, and scaling RACR across whole portfolios rather than individual transactions, depends on foundational enablers that no individual institution can build alone. The enablers below underpin both the risk management and the commercial case for RACR. They are not independent: A&R outcome standardisation and data infrastructure are preconditions for the other two, since insurance-linked pricing mechanisms and capital incentive frameworks both depend on validated, comparable metrics to function credibly. They define the shared infrastructure agenda that banks, regulators, investors, insurers, borrowers, data providers and standard-setters (such as the Loan Market Association, International Capital Market Association and others) need to advance collectively.

A&R outcome standardisation

Scaling A&R finance requires agreement on what A&R means in measurable terms, both for internal credit models and for the client-facing product structures that Section 3.4 describes. A resilience-linked loan with a credible key performance indicator (KPI) structure requires agreed definitions of what counts as a qualifying adaptation measure and how its effectiveness is verified. Two standardisations are particularly critical: an agreed-upon taxonomy or playbook, which would also give relationship

managers a structured basis for client engagement; and resilience certificates providing standardised third-party assessments of asset-level resilience, analogous to energy performance certificates. The Flood Performance Certificate currently being developed by Flood Re[53] provides an instructive example. Broader adoption across hazard types and asset classes is a collective priority that requires stakeholder co-ordination.

Data and modelling

Standardised metric definitions require underlying data and modelling tools to produce them. While metrics standardisation defines the output format that credit models require, data infrastructure determines whether those outputs can be generated for a given asset at an acceptable cost and confidence. Critically, this infrastructure serves a dual purpose: the same geospatial hazard data and stress-testing models that improve internal credit assessment can be repurposed as a direct client service, enabling the forward-looking resilience conversations that differentiate relationship banking from transactional alternatives.

Resilience-linked insurance pricing

Where effective A&R measures reduce physical risk exposure, this may be reflected in insurance outcomes. However, the relationship between resilience investment and premium reduction is often more complex. Insurance pricing reflects broader market dynamics such as portfolio concentration, reinsurance pricing cycles and capital requirements alongside asset vulnerability. The benefit of adaptation investment for insurance purposes can also be observed as preserved access to coverage: in markets where insurers are withdrawing from high-risk geographies, maintaining insurability may itself represent the financial return on resilience investment.

> “If there is actual evidence on insurance premium reduction, that provides some level of confidence to us as a bank, because you can rely on others’ assessment.”
>
> Interviewee 7

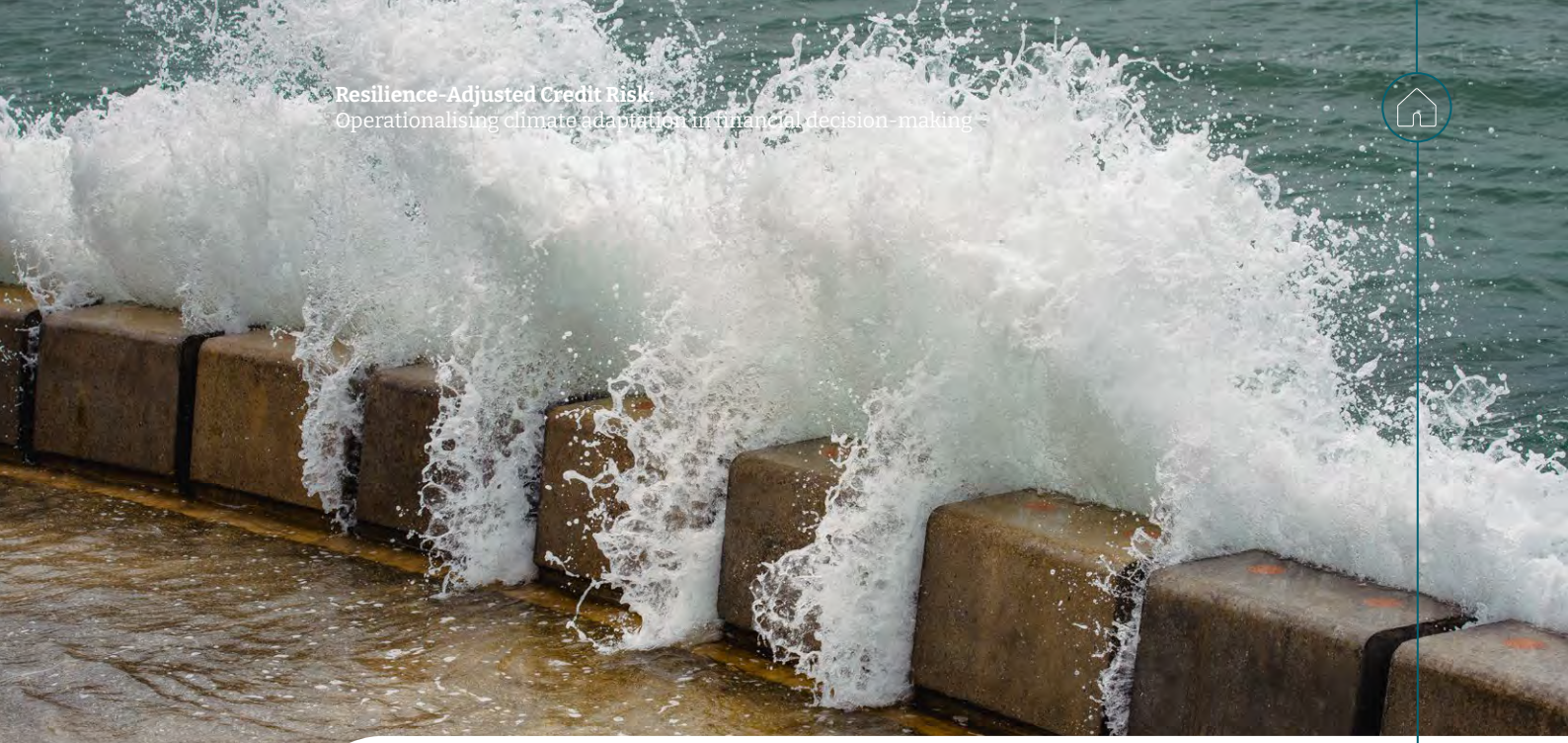
However, the aspiration to have such resilience-linked insurance pricing is still worth pursuing. Currently, 36 per cent of insurers provide explicit incentives for resilience measures and loss mitigation, underscoring that there are ways forward and opportunities to grow.[54] Allowing resilience-adjusted pricing in insurance also benefits both insurers and banks. If that adjusted premium is embedded in loan pricing, the result is a compounding financial incentive operating through both insurance and credit markets simultaneously. The product innovation examples in Section 3.4 illustrate this mechanism already operating in practice. Formalising it at scale requires the resilience certification and avoided loss metrics described above. When functioning, this mechanism addresses the revenue paradox at its source, making resilience-linked loan structures commercially viable beyond individual transactions.

Capital requirement incentives

The regulatory direction of travel on capital treatment of resilient assets represents a significant potential enabler for RACR adoption, and one that directly strengthens the competitive case for banks to build this capability now. Financial regulators' clarification on how A&R investments can positively influence capital requirements and supervisory assessments can positively support investment.[54] Interviewees also highlighted the importance of mechanisms such as the Infrastructure Supporting Factor (ISF) in Europe, which applies a 25 per cent capital requirement to qualifying loans. Although some interviewees noted challenges in determining which assets qualify, the broader regulatory signal – reducing capital charges for resilient assets – is viewed as a positive step. This approach is expected to improve banks' ability to offer more competitive pricing for such assets. Similarly, the Monetary Authority of Singapore has introduced a pilot allowing infrastructure assets that meet defined sustainability standards to benefit from reduced capital charges.[55]

> "The Infrastructure Supporting Factor, for example, has allowed us to do some business that we wouldn't be able to do otherwise."
>
> Interviewee 6

Individually, each enabler delivers value. Collectively, they constitute the infrastructure: agreed definitions, reliable data, aligned insurer incentives and supportive capital rules that allow RACR to function as a common framework across the financial system. The cross-sector engagement needed to build them is addressed in Section 4.4.



4. Resilience-Adjusted Credit Risk (RACR) framework

The sections above have established the urgency, barriers and opportunities to integrating physical climate risk and A&R into credit decision-making. This chapter proposes a framework, the Resilience-Adjusted Credit Risk (RACR), to bridge that gap. It is intended to work with existing credit risk infrastructure, while introducing the forward-looking adjustments necessary to price in physical risk and reward investment in A&R. The framework operates across three components, maps to existing credit metrics and identifies credit levers banks can deploy.

The three components of RACR are each designed to address one or more of the structural barriers identified in Section 3.2. The Insurance Adequacy component addresses the insurance blind spot (barrier 6), replacing the assumption of coverage with a structured assessment of verification, possible estimation of premium trajectory and uninsurability risk. The A&R component addresses the revenue paradox (barrier 2) by quantifying avoided loss as a credit-positive variable; it reframes resilience investment from a leverage-worsening cost into a measurable reduction in PD and LGD. The PCR component addresses both the regime gaps (barrier 1) and the horizon mismatch (barrier 5) by extending risk assessment across loan tenor and grounding it in forward-looking, asset-level hazard data rather than historical defaults. Taken together, the three components also begin to address the classification and attribution challenges (barrier 4): by requiring banks to document physical hazard exposure, insurance status and A&R measures at origination, the framework generates the structured data trail that

is currently absent from most credit files. This will not resolve the historical loss record problem (barrier 3) in the near term, which requires accumulated time, but it lays the foundation for building the evidence base that future calibration will depend on.

The framework is designed to be modular and iterative: banks at the compliance-driven or qualitative stages described in Section 3.1 can begin with triage screens and qualitative overlays, while those with more developed data infrastructure can implement quantitative PCR and A&R adjustments. The architecture is the same across maturity levels and what changes is the precision of the inputs.

4.1. Components of RACR

A standard credit assessment evaluates a borrower's likelihood of default (probability of default, PD) and the expected loss if they do (loss given default, LGD), together determining the exposure and pricing of a loan. These metrics are calibrated primarily on historical financial performance data, which, as established in Section 3.2, currently structurally fails to capture forward-looking physical climate risk.

The RACR framework expands this standard by introducing three interacting components, each of which feeds into adjustments to PD and LGD:

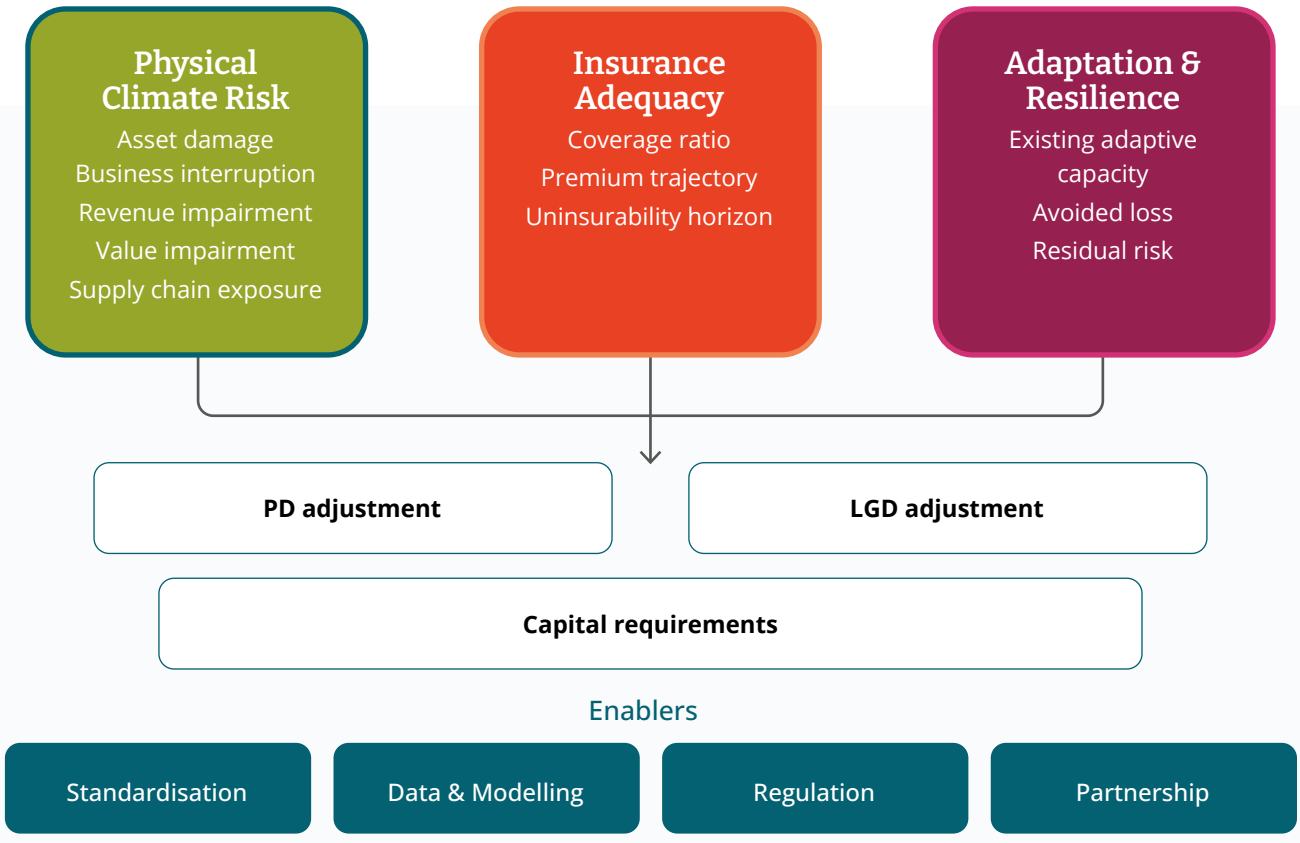


Figure 5: Resilience-Adjusted Credit Risk framework

Component 1: Physical Climate Risk (PCR)

What it assesses: This component establishes the financial materiality of physical climate risks to a specific borrower. This component is a function of event probability (hazard), exposure (asset at risk) and vulnerability (sensitivity and adaptive capacity).[56]

Key inputs: PCR assessment operates across a number of potential financial impacts:

- **Asset damage ratio:** the proportion of asset value expected to be destroyed or impaired at a given hazard intensity, drawn from damage functions. This translates physical climate risks into a financial loss estimate.
- **Business interruption:** revenue loss during the recovery period following a hazard event. This is a cash flow timing impact; operations are disrupted for a defined period, and feed into PD assessment.
- **Chronic revenue impairment:** structural reduction in revenue from gradual climatic shifts, such as declining agricultural yields under sustained water stress, rising cooling costs under heat stress, or reduced asset productivity from shifting seasonal patterns. Unlike business interruption, this is an impairment that accumulates across the loan tenor and affects the long-run viability of the borrower's income.
- **Collateral value impairment:** reduction in the market value of secured assets under physical hazard scenarios, accounting for both the probability of direct damage and the market's repricing of climate-exposed assets. This is the primary channel through which PCR affects LGD.
- **Supply chain exposure:** the borrower's dependence on climate-exposed suppliers or logistics routes is another dimension worth noting, though operation is still emerging.

Methodology requirement: Two requirements distinguish PCR assessment under RACR from standard credit analysis. First, the assessment needs to look at asset-level conditions. A sector-wide classification of 'high flood risk' is insufficient for credit underwriting. This requires geospatial hazard data mapped to the location of collateral or business premises. Where data uncertainty is high, banks could maintain explicit uncertainty ranges rather than relying on point estimates, and stress-test credit decisions at the high end of those ranges. The Institutional Investors Group on Climate Change (IIGCC)'s Physical Climate Risk Appraisal Methodology (PCRAM 2.0) offers one example of methodology for conducting asset-level physical climate risk appraisal in investment contexts.[57]

Second, the time horizon needs to extend beyond the standard one-year credit cycle. Chronic risks in particular may accumulate across the tenor of a loan: a five-year agricultural loan originated today may reach peak repayment stress at a point when drought probability has materially increased relative to the point of underwriting. PCR assessment could therefore model risk at origination, at mid-tenor and at maturity, follow the steps outlined by UNEP FI (2025),[58] and document data gaps throughout as set out in PRA SS5/25.[14]

Credit output: The PCR assessment produces two primary credit adjustments: (i) a PD uplift, expressed in basis points, reflecting the increased probability of default under modelled hazard scenarios at each assessment point across the loan tenor, and (ii) an LGD increase, operating through two channels: direct collateral value impairment from physical damage, and reduced recovery value from a market that progressively discounts climate-exposed assets. These two outputs are the risk scores that then flow into the subsequent components: Insurance Adequacy and A&R.

Component 2: Insurance Adequacy

What it assesses: This component assesses whether the insurance coverage a borrower holds is adequate, sustainable and affordable relative to the physical risks identified in the PCR assessment. A recent whitepaper advised lenders not to assume that insurance will remain affordable or available over the full life of a long term loan. Instead, forward looking risks should be assessed and incorporated into credit decisions, given that insurance coverage is typically renewed on an annual basis.[54]

The Insurance Adequacy component is most directly applicable in markets where formal insurance coverage is relatively widespread. In developing country contexts where insurance penetration remains a challenge, this is likely to be less relevant. This resembles a limitation of the paper that has been included in the Methodology section.

Key inputs:

- **Coverage verification:** Does the borrower hold adequate coverage for the relevant physical hazards, and has this been independently confirmed? Verification standards could be calibrated by facility type, with project finance requiring the most rigorous validation and unsecured facilities requiring at a minimum a structured self-declaration.
- **Premium trajectory:** Rising insurance premiums represent a direct operating cost pressure on borrowers. Banks could develop internal estimates of forward premium trends, drawing on broker intelligence, reinsurance and financial-market signals and loss data.[59] Where premiums are likely to increase significantly, this could be factored into projected debt service capacity.
- **Uninsurability risk:** Is there a credible risk that the asset or activity will become uninsurable within the loan tenor? This could be modelled as a stress scenario in which full coverage is removed, and the resulting impact on PD and LGD calculated explicitly.

Methodology requirements: Insurance adequacy assessment can be conducted at origination, at each annual covenant review, and at any point where material changes in the insurance market for the relevant geography or hazard class are identified. The depth of assessment could be calibrated by facility type (Section 3.3). More advanced banks could begin modelling the zero-coverage stress scenario as a standard sensitivity analysis. For reference, the World Business Council for Sustainable Development (WBCSD)'s strategies for forecasting future insurance pricing include sources of possible data, especially relevant to corporate clients.[59] The IIGCC has also produced several case studies on this, looking at solar plants across central and southern Europe.[60]

Credit output: This component produces three adjustments: (i) PD and LGD under zero-coverage stress: the recalculated PD and LGD assuming no insurance recovery, establishing the worst-case exposure that informs covenant design and provision-setting; (ii) insurance-adjusted collateral value: the collateral value after applying a haircut for uninsured or underinsured risk, flowing directly into LGD calculations; and (iii) premium cost in the debt service ratio: the annual insurance premium expressed as a proportion of debt service capacity, capturing any change to affordability that feeds into PD assessment when premium inflation erodes the borrower's ability to service debt.

Component 3: Adaptation and Resilience (A&R)

What it assesses: The third pillar transforms A&R investment into a quantifiable credit variable, addressing the revenue paradox identified in Section 3.2. This reframes the analytical question from 'how exposed is this borrower?' to 'how exposed is this borrower, given the implemented adaptation?' It is this shift that enables resilience to be priced as a credit-positive variable. A prerequisite to this component is cataloguing the specific adaptation interventions applicable to the borrower – for example, drainage improvements, drought-resistant crop varieties, flood barriers or insurance-linked financial instruments. This would be based on the hazard, sector and geography and could be drawn from customers' records, banks' own guidance, or external sources such as the Climate Bonds Initiative's list of investable activities for adaptation and resilience based on sector and peril.[61]

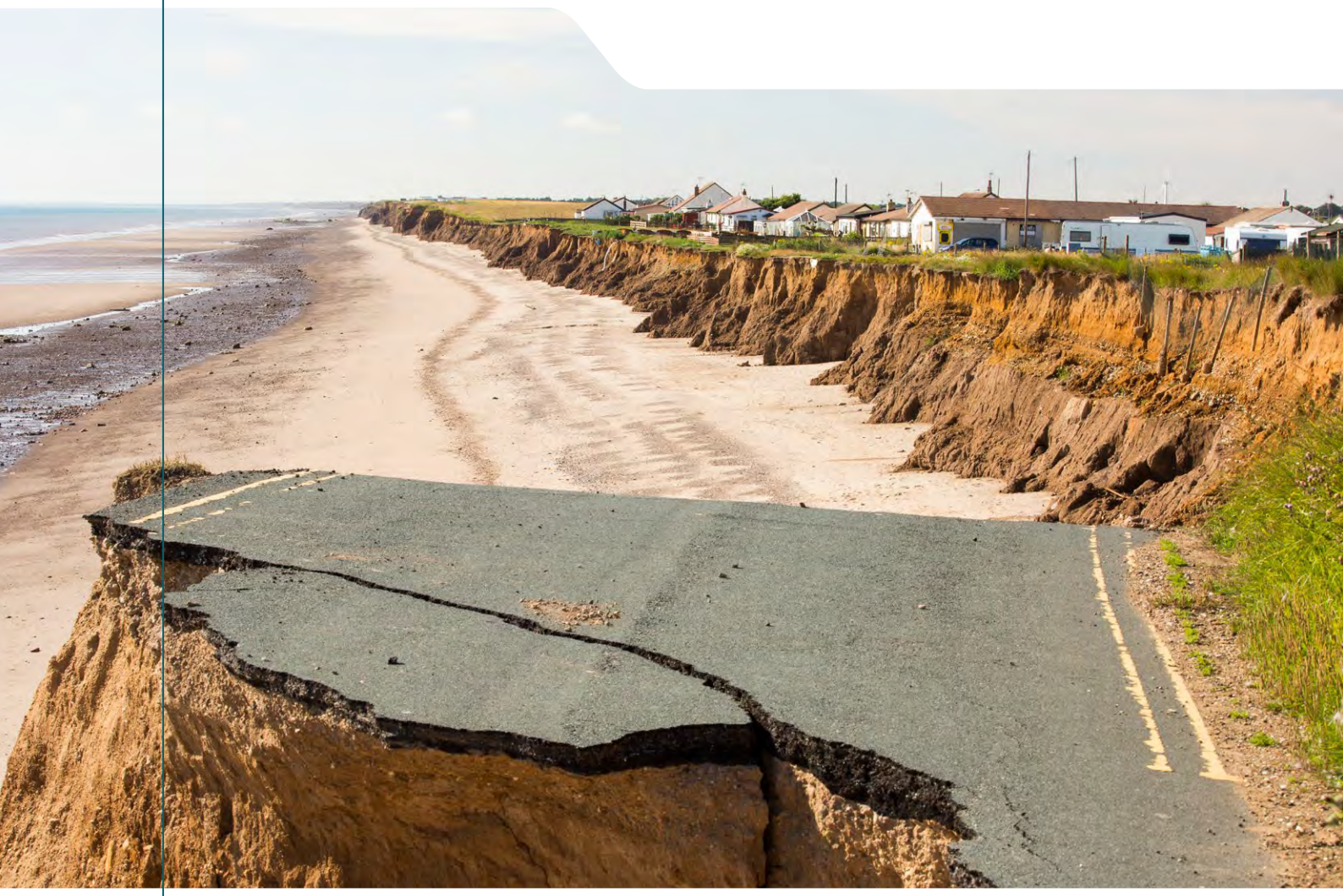
Key inputs:

- **Existing adaptive capacity:** Before assessing specific adaptation measures, it is useful to establish the borrower's existing capacity to absorb, respond to and recover from climate shocks, for instance, identifying if borrowers already have A&R measures installed.
- **Avoided loss quantification:** Estimating the reduction in expected loss from a given hazard that the adaptation measure produces. This may draw on a growing evidence base of A&R effectiveness data (such as the World Resources Institute (WRI)'s database of benefit–cost ratios of various adaptation and resilience investment[62]), a modelling exercise, for instance, by modelling the impact that a certain A&R measure aims to have, such as protection against a 1-in-100-year flood, as was done in an illustrative assessment of flood exposure by the Climate Financial Risk Forum (2025),[13] or by the use of digital twins.[63]
- **Residual risk assessment:** Even after A&R measures are applied, some risk remains. The improved residual risk score, not the gross risk score, is what should flow into the PD and LGD adjustment.

Two additional metrics may further support the A&R assessment: (i) A&R investment as a percentage of asset value provides a proportionality check; adaptation expenditure that is material relative to asset value warrants more rigorous avoided loss quantification; (ii) return on resilience, or the time for avoided loss or additional revenue benefits to recover the cost of investment, is relevant to loan structuring decisions, particularly the design of grace periods during which adaptation works are being completed.

Methodology requirements: The A&R component is the least data-mature of the three, and its implementation can be explicitly staged. Banks can begin with qualitative cataloguing of measures and conservative avoided loss estimates drawn from published evidence bases, applying a discount for uncertainty. As resilience certification frameworks mature and insurer data-sharing arrangements develop, these qualitative estimates can be progressively replaced by verified, quantitative inputs. Throughout, banks should document the evidence basis for each avoided loss estimate, both to satisfy supervisory expectations and to build the institutional track record that future model calibration will require.

Credit output: The A&R component produces three credit adjustments, all of which operate as reductions relative to the gross PCR scores: (i) A PD reduction, expressed in basis points, reflecting the lower probability of default following verified A&R investment, the primary mechanism through which resilience is priced as a credit-positive variable. (ii) An LGD reduction, reflecting preserved collateral value and reduced business interruption exposure after adaptation measures are applied. (iii) A pricing discount, expressed in basis points, available to borrowers who can evidence verified resilience investment meeting defined certification or avoided loss thresholds.



4.2. Potential metrics

Where Section 4.1 sets out what each RACR component assesses and how it adjusts PD and LGD, this section addresses the practical question that follows: what data is needed to produce those adjustments, and where can it be sourced today? The table below provides a reference summary of input metrics, potential sources and credit outputs for each component.

Table 2: Potential metrics and their sources

Component	Examples of input metrics	Potential sources	Examples of credit outputs
Physical Climate Risk (PCR)	Hazard probability (%)	Proprietary commercial vendors (eg Jupiter Intelligence, XDI, Moody's RMS); open source data (eg Environment Agency flood maps)	PD uplift reflecting increased likelihood of default under modelled hazard scenarios
	Asset damage ratio (%) / Direct asset damages (£)	Academic and engineering damage function libraries; reinsurer catastrophe models (eg Swiss Re, Munich Re); emerging open-source databases (eg CLIMADA)	LGD increase: (i) direct collateral value impairment, (ii) residual exposure after insurance
	Business interruption loss (£)	Insurer claims data (where shared); sector-specific business interruption studies; bank internal loss data	Revenue loss and debt service impairment during the recovery period
	Chronic revenue impairment (£)	Climate-economy impact models (eg NGFS scenarios); academic sectoral impact literature; commodity price projections under climate scenarios	PD uplift accumulating across loan tenor, reflecting structural reduction in borrower income, distinct from business interruption in that impairment does not reverse after a recovery period but compounds over time
	Collateral value impairment (%)	Climate-adjusted property valuation models (eg emerging tools from MSCI Real Estate); hazard maps combined with internal LGD recovery data	LGD increase: direct physical damage reducing recoverable collateral value, and market repricing of climate-exposed assets
	Supply chain exposure estimate	Borrower disclosure and supply chain mapping; sector-level supply chain risk assessments from data providers; CDP supply chain data; Input-Output model	PD uplift reflecting business interruption from climate-exposed suppliers or logistics routes

Table 2: Potential metrics and their sources

Component	Examples of input metrics	Potential sources	Examples of credit outputs
Insurance Adequacy	Coverage ratio (% of asset value)	Borrower disclosure; policy documents verified at origination; insurer confirmation for project finance facilities	LGD recalculated by removing insurance recovery assumption; insurance-adjusted collateral value
	Forward premium estimate (% change at next renewal)	Broker intelligence, reinsurance and financial market signals, loss data	Reduction in debt service capability due to increased premiums
	Uninsurability horizon (years)	Market signal such as CISL's currently developing Insurability Readiness Matrix; academic insurability threshold research; regulatory stress scenario assumptions	PD and LGD uplift under uninsurable stress scenario: assuming coverage ceases within the loan tenor, reflecting impaired collateral and loss of business interruption protection simultaneously
Adaptation and Resilience (A&R)	Avoided loss (£, per measure)	Scenario analysis (with and without A&R measures); commercial providers; CLIMADA; WRI benefit–cost ratio database for adaptation measures	Downward adjustment to PD reflecting reduced likelihood of default following verified A&R investment
	Residual risk (post-A&R)	Calculated by subtracting avoided loss estimates from gross PCR assessment	PD and LGD reduction: positive adjustment to both PD and LGD reflecting a more resilient business and better preserved collateral values
	Resilience certification status	Such as ongoing work with Flood Performance Certificates	Pricing discount (basis points): reduction in loan margin for borrowers who can evidence verified resilience investment meeting defined certification or avoided loss thresholds

The data landscape across the three components is uneven, and this unevenness has direct implications for implementation sequencing.

For *Physical Climate Risk metrics*, third-party data provision is the most developed method of sourcing. Hazard probability and asset damage ratio data are broadly operational: a growing market of specialist providers offers asset-level outputs, and open-source tools are available such as CLIMADA. However, comparability across providers remains a source of uncertainty; estimates for the same asset can vary materially depending on the underlying climate model, emissions scenario and damage function used for the said event.[18] Banks could select providers with documented methodologies, maintain explicit uncertainty ranges, and stress-test credit decisions at the high end of those ranges, as PRA SS5/25 expects. Business interruption and chronic revenue impairment metrics are less mature, currently dependent on sector-specific modelling and borrower disclosure.

Separately, translation from physical hazard to financial consequence is where banks and insurers share the most immediate common ground. Insurers hold the most granular available dataset linking hazard events to actual asset-level losses through their claims records, while banks hold the credit performance data that would allow those loss estimates to be connected to borrower default. Industry consortia, such as the Climate Financial Risk Forum in the UK, represent a natural vehicle for developing the shared damage functions and sectoral impact models that would allow this translation to be standardised across institutions.

For *Insurance Adequacy metrics*, the sourcing challenge is qualitatively different: the credit-relevant inputs, forward premium estimates and the uninsurability horizon are not publicly available and likely need to be developed through banks' internal analysis. This is consistent with the insurance blind spot identified in Section 3.3, where the core problem was banks' limited access to it. These are imprecise inputs, but modelling the metric explicitly, even with wide uncertainty ranges, may be preferable to the practice of treating insurance as a static condition of lending. Formalising data-sharing arrangements, as discussed in Section 4.4, is therefore valuable for making the metrics operational.

For *Adaptation and Resilience metrics*, the sourcing landscape is nascent but increasingly growing. Avoided loss requires combining hazard probability estimates from the PCR component with asset-specific damage functions and A&R effectiveness data from the resilience evidence base. The WRI benefit–cost ratio database and the Climate Financial Risk Forum's illustrative assessments[13] offer a starting point for effectiveness data, but coverage across sectors, hazard types and geographies is incomplete. Resilience certification, the most tractable near-term validation mechanism, remains nascent. Insurer resilience-adjusted premium can offer a credible market-based signal of A&R effectiveness, since a reduction in premium following verified adaptation investment represents an independent, financially grounded confirmation that risk has been reduced. This is why the resilience premium feedback loop discussed in Sections 3.5 and 4.4 is important.

This sourcing analysis maps directly onto the enablers identified in Section 3.5. The comparability problem in PCR data is what makes guidance of hazard methodologies important. The engagement-dependency of Insurance Adequacy metrics is what makes formalised insurer data-sharing arrangements necessary. The nascent nature of resilience metrics is what makes the development of standardised taxonomy, playbooks and resilience certification a priority for partnership and collective investment that the sector could make. The unevenness of the sourcing landscape should not be treated as a reason to defer RACR integration until all metrics are fully operational. Banks can begin with the metrics that are most available, and apply qualitative overlays and conservative stress assumptions where quantitative data is not yet available.

4.3. Potential credit levers

The RACR framework could translate into tangible changes to the terms and conditions of lending. The following credit levers represent the practical mechanisms through RACR output that can then be operationalised in lending decisions.

- **Pricing adjustments:** The most direct lever is interest rate pricing. Where RACR analysis identifies material, unmitigated physical climate risk, this could be reflected in a risk premium on the loan. Importantly, borrowers who can demonstrate effective A&R measures should also be eligible for a pricing discount. This creates a direct financial incentive for borrowers to invest in resilience.
- **Loan covenants:** Physical risk can be embedded at the outset into loan covenants that require borrowers to maintain insurance coverage above a defined threshold, or to report on the implementation of agreed A&R measures at annual review. Where covenants are breached – for example, if a borrower allows their flood insurance to lapse – this is a covenant breach that triggers a renegotiation of terms.
- **Loan loss provisions:** For portfolios with identified concentrations of physical climate risk, banks could consider forward-looking adjustments to loan loss provisions that reflect the probability of climate-related impairment over the loan tenor. This is an area where supervisory guidance, including the PRA's expectations on climate risk, is increasingly relevant.
- **Collateral haircut:** Similarly, collateral haircuts may be applied, accounting for a possible decline in value due to increased risk that is not mitigated and a decline in insurance cover.
- **Loan structuring:** For borrowers undertaking significant A&R investment, loan structuring can support the implementation of A&R measures. This may include grace periods during which adaptation works are being completed, or a drawdown facility linked to milestones in an agreed adaptation plan.

> "The origination structuring phase would be important because then you have the option to include it [consideration of physical risk and A&R] in your terms and conditions."
>
> Interviewee 5

- **Capital requirements:** Over the longer term, as regulatory frameworks evolve, RACR scores may feed into capital requirement calculations. The Infrastructure Supporting Factor in Europe and the Monetary Authority of Singapore's pilot represent signals of a direction in which resilient assets attract reduced capital charges, improving banks' ability to price those assets competitively.
- **Sustainability-linked loan targets:** The RACR framework provides a quantitative foundation for the design of sustainability-linked loans (SLLs) with adaptation targets. Currently, fewer than 5 per cent of sustainability-linked instruments include quantifiable resilience metrics.[13] The avoided loss and residual risk metrics set out in Section 4.2 could serve as robust KPIs for such instruments.

4.4. Engagement with other financial actors

The effective implementation of RACR depends on a broader ecosystem, in which regulators set expectations and create incentives, data providers develop and document methodologies, public institutions provide baseline hazard data and blended finance capacity, and insurers and investors contribute to the validation and capital. This section looks at the contributions that insurers and investors can make, and how they connect to the metrics and credit levers described in Sections 4.2 and 4.3.

4.4.1. Insurers as data and validation partners

Insurers hold a uniquely valuable position in the RACR architecture as well as a direct commercial benefit in its success. As RACR frameworks reward borrowers for verified adaptation investment, the pool of lower-risk and insurable assets grows, sustaining market viability where risks increase due to rising physical risk. Insurance sector access to granular claims data, asset-level risk assessments, and models for physical hazard frequency and severity represents the data resource that banks lack. The data and validation contributions that insurers can make to RACR are therefore an investment in the conditions that keep their own markets functioning. Three forms of engagement are particularly valuable:

First, on physical climate risk metrics, the sharing of anonymised claims data and risk scores, where appropriate commercial and legal frameworks exist, would materially improve the quality of PCR assessments at the asset level. Insurers' damage functions, which translate hazard intensity into expected loss for specific asset types and geographies, are among the most empirically grounded available and would significantly strengthen banks' financial impact modelling. Data-sharing agreements, potentially structured through industry data utilities to manage confidentiality and competition concerns, could be one of the highest-value near-term actions available to both sectors. Such a data-sharing framework could evolve through a multi-institution consortium, supported by central banks and development finance institutions, and build an open-source data infrastructure with consistent governance protocols.[64]

Second, on Insurance Adequacy metrics, insurers can provide the coverage verification that banks currently struggle to obtain independently. A structured reporting mechanism, such as a standardised annual declaration from insurers confirming coverage status for shared clients, would give banks the inputs needed to operationalise the Insurance Adequacy component of RACR. The establishment of a centralised register detailing the

insurance status of properties, as suggested by the Australian Prudential Regulation Authority (APRA),[39] also aligns with this. For the forward premium trajectory, banks will need to develop their own internal estimates, drawing on potential sources in Table 2. Greater collaboration and transparency with insurers on pricing signals could, however, improve the decision-usefulness of these estimates: forward-looking insurance cost trends, where accessible, strengthen the bankability of adaptation projects by evidencing the cost of inaction and supporting avoided loss calculations that financiers and corporate planners can act on.[59] Meanwhile, for the uninsurability horizon metric: a shared language that is able to assess and signal insurability status from the insurance sector would enable banks, as well as other actors, to more comprehensively assess risk and identify the need for A&R.

Third, on the resilience metrics, insurers are the validators of A&R measure effectiveness. Where adaptation investment demonstrably reduces the probability or severity of a covered event, a resilience dividend ensues – in which verified A&R investment is reflected in resilience-adjusted pricing, which in turn feeds into banks' PD and LGD adjustments, maintaining its insurability – giving resilience metrics critical independent grounding. This feedback loop also materially strengthens the financial case for borrowers to invest in adaptation, addressing the revenue paradox by creating a tangible, near-term financial return on resilience investment that appears in operating costs.

Beyond data, insurers and banks can collaborate on parametric insurance product design. Parametric products, which pay out on the occurrence of a defined hazard trigger rather than on assessed damage, provide more predictable and transparent coverage than traditional indemnity-based products. This predictability is directly valuable to banks: it makes the Insurance Adequacy component of RACR more tractable to model, since coverage outcomes are defined by observable hazard parameters rather than post-event claims adjustment. Joint product development in this area aligns the commercial interests of both sectors while improving the structural integrity of the credit risk and insurability framework. It is also a natural extension of existing bancassurance relationships, where banks and insurers already collaborate on integrated product offerings for shared clients. Parametric insurance products designed in partnership with lending teams could extend these existing bancassurance capabilities into the physical risk space.

> "You need to start to see the insurance market start to price differently for those higher and lower risk customers."
>
> Interviewee 7

The insurance sector's decades of experience in quantifying, pricing and transferring physical risks also offers a broader methodological resource for banks. The tripartite approach that insurers have developed – accepting diversified risks, actively strengthening asset and client resilience, and transferring concentrated tail risk via resilience-linked catastrophe bonds and insurance-linked securities – provides a tested architecture that banks can learn from as they build their own physical risk management capabilities.[65]

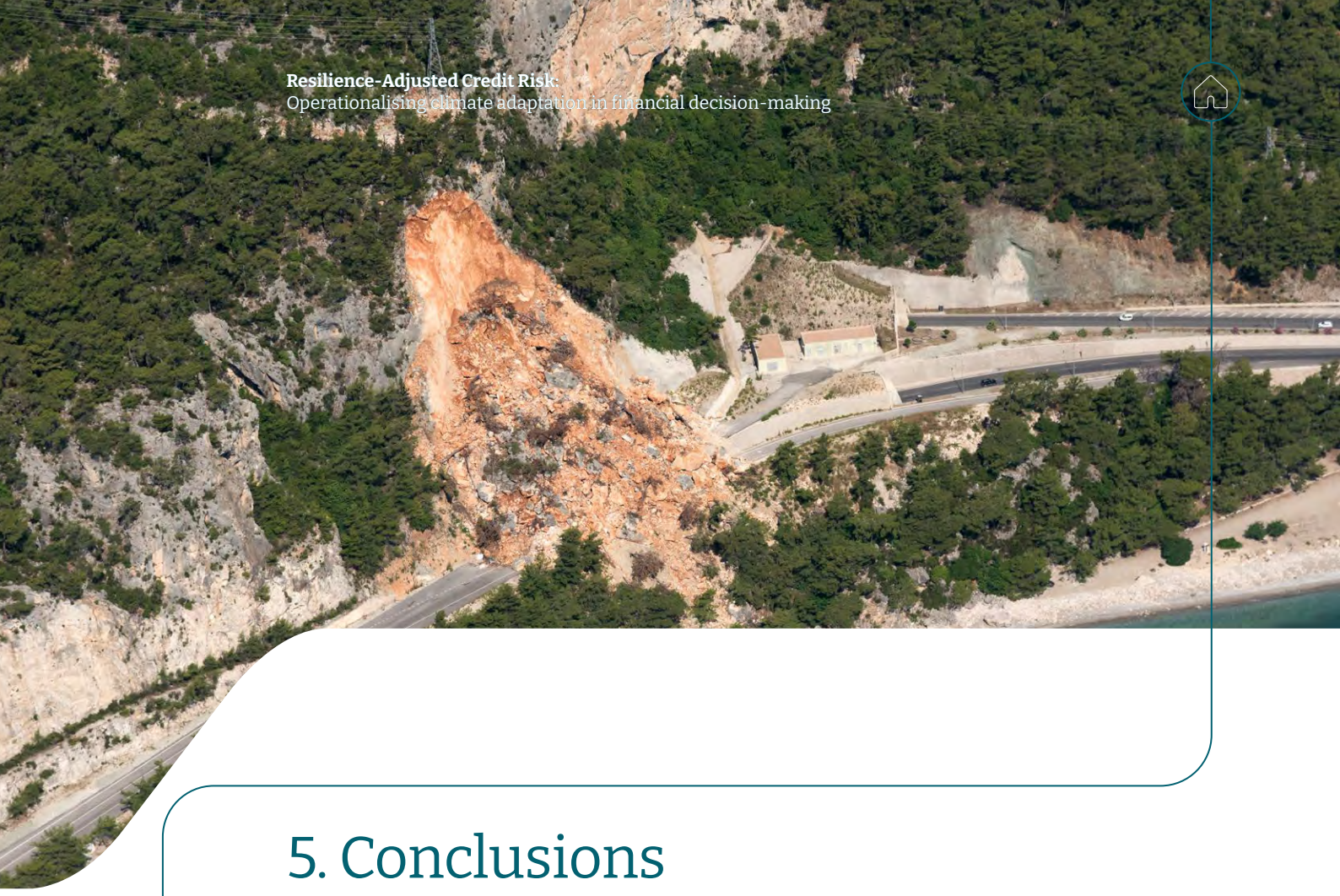
4.4.2. Investors as capital partners and market signal providers

Large asset managers and other institutional investors represent both a significant pool of capital for scaling A&R investment and an important source of market validation for the instruments that RACR enables at the loan level.

On the capital side, the revenue paradox (Section 3.2) means that some A&R projects may not fit within standard bank lending parameters alone. Blended finance structures, bringing together bank debt, public capital and private investment from asset managers, can adjust the risk-return profile of these projects sufficiently to make them bankable. In these structures, public or concessional capital absorbs first-loss risk, enabling banks to participate at a risk level consistent with their credit requirements, while asset managers provide the longer-tenor capital that adaptation projects often require. The avoided loss and residual risk metrics developed under the A&R component of RACR provide the quantitative foundation that such structures need to demonstrate impact and attract mainstream investors alongside concessional capital.

On the market signal side, investor demand for resilience-linked instruments has the potential to create a secondary market that reinforces the credit incentives that RACR establishes at the loan level. The UNEP FI Investors Resilience Challenge provides a common approach with a flexible set of criteria designed to make it easier for private investors to work together and mobilise private capital into adaptation and resilience.[66] Resilience-linked bonds, instruments whose coupon or principal terms are linked to verified resilience outcomes, adopt the same performance-linked principle as sustainability-linked bonds, which already have adoption across capital markets. The United Nations Office for Disaster Risk Reduction (UNDRR)'s proposed Contingent Resilience-Linked bonds represent one architecture for this.[67] A functioning resilience-linked bond market would therefore do two things simultaneously: create a pricing signal for what the market values in A&R outcomes, and validate the metric frameworks that underpin RACR, generating the evidence base that banks, regulators and insurers all currently lack.

The relationship between bank lending and capital markets here is mutually reinforcing: banks that develop RACR capability originate the resilience-linked assets from which bonds can be structured; investor demand for those bonds justifies the investment in RACR infrastructure; and market pricing of resilience outcomes feeds back into banks' pricing and capital levers, progressively closing the gap between the cost of adaptation investment and its financial return. This circularity, aligned with the investor's value enhancement loop,[57] creates the mechanism through which RACR can scale from individual credit decisions to a systemic repricing of physical climate risk across the financial system. It is also worth stating explicitly that realising this circularity requires a cultural shift in what financial institutions are structured to value: a move from frameworks that penalise measurable risk, towards frameworks that also recognise and reward its reduction. Realising it requires the co-ordinated engagement across banks, insurers, investors and regulators that this section, and the stakeholder framework in Section 6, sets out.



5. Conclusions

The assessment in this report points to a clear and compounding problem. Physical climate risk is materialising faster than financial systems are adapting to it. Banks continue to originate loans, price collateral and set provisions using frameworks calibrated on historical data that cannot, by construction, anticipate the forward-looking nature of climate hazards. A&R investment, the most direct mechanism available to reduce that risk, remains systematically undervalued in credit decisions. The result is a financial system that is, in aggregate, accumulating climate risk faster than it is pricing it.

This is not primarily a failure of intent. The interviews and analysis underpinning this research reveal institutions that are aware of the problem, increasingly engaged with its complexity, and in many cases actively seeking solutions. The barriers are largely structural: short capital horizons, the absence of standardised metrics, attribution gaps in loss data, the revenue paradox, and a regulatory architecture not yet calibrated to the pace of physical risk materialisation. These are solvable problems, but they require deliberate, co-ordinated action across banks, regulators, insurers, data providers, investors and others.

The RACR framework proposed in this report offers a potential architecture. By decomposing climate-adjusted credit risk into three interacting pillars – Physical Climate Risk, Insurance Adequacy and A&R – it provides a modular structure banks can implement progressively, beginning with qualitative overlays and triage screens, and scaling towards full quantitative integration as data infrastructure and methodological capacity develop. Crucially, it reframes adaptation investment beyond sustainability consideration and as a boost to borrower solvency and collateral value.

Several findings from the research merit particular emphasis:

The insurance assumption is a growing vulnerability. The historical treatment of insurance as a near-complete hedge against physical risk in credit models may no longer be tenable. Insurers are withdrawing from high-risk markets, and banks that have not begun modelling uninsurability as a stress scenario may carry an unacknowledged and growing exposure.

Attribution of losses matters as much as measurement. The systematic challenge in the classification of climate-driven losses as standard operational volatility is suppressing the evidence base that model calibration requires. Building robust loss attribution into credit data systems is important for the long-term credibility of any RACR-type framework.

Competitive advantage accrues to early movers. Borrowers in climate-exposed sectors will increasingly need lenders that can help them understand and manage physical risk as part of an ongoing credit relationship. Institutions that develop this capacity will differentiate their offering and gain a competitive advantage.

Standardisation is a collective good. The agreed-upon taxonomies or playbooks and resilience certification that underpin a mature RACR market cannot be built by an individual institution. Co-ordinated development, in partnership with regulators, insurers and industry bodies, represents important investments the sector could make.

The regulatory direction of travel is increasingly acknowledging this integration. From PRA supervisory expectations to the Infrastructure Supporting Factor and the Monetary Authority of Singapore capital relief pilot, the regulatory environment is moving towards recognition of physical climate risk and preferential capital treatment for resilient assets. This still needs to materialise into capital rules, accounting standards and supervisory expectations that explicitly recognise resilience adjustments in credit calculations. Banks that build RACR capability now will be better positioned to benefit from these frameworks as they mature.

6. Pragmatic takeaways for financial actors

The tables below summarise, for each actor, why integration of physical climate risk and A&R into financial decision-making is materially important to them, what actions are required and how those actions can be taken in practice:

Banks	
Why this matters	Physical climate risk is a growing driver of credit loss that current models are structurally ill-equipped to capture. Banks that do not act face model risk, regulatory scrutiny and the gradual accumulation of mispriced exposure across their portfolios. The insurance assumption underpinning modelling scenarios is eroding, creating latent risk that is not yet visible in loss data but is increasingly reflected in insurer behaviour. Beyond risk management, early movers gain a competitive advantage in climate-exposed sectors.
What to do and how	• Build Resilience-Adjusted Credit Risk by integrating physical climate risk, insurance adequacy and A&R assessment into credit underwriting processes. • Develop loss attribution systems that record climate-related credit events as a distinct category, building the internal evidence base. • Engage clients proactively on resilience investment as a component of credit relationships. • Participate in industry-level working groups to co-develop the shared taxonomies and resilience certification frameworks. • Engage proactively with regulators to help shape the frameworks for RACR, providing evidence on what works in practice, contributing to the development of standardised return periods, hazard methodologies and resilience certification standards, and advocating capital treatment that recognises verified resilience investment.

Insurers

Why this matters

Insurers have a direct commercial interest in the growth of resilient, insurable assets. As RACR frameworks incentivise borrowers to invest in adaptation, the pool of lower-risk, insurable assets expands, sustaining market viability and reducing the probability of coverage withdrawals that shrink insurers' addressable market over time. Unmitigated physical risk, by contrast, drives the claims inflation and reinsurance capacity constraints that make withdrawal the default response. Engaging constructively with banks on physical risk integration therefore serves both the immediate underwriting book and the long-term sustainability of the market insurers depend on.

What to do and how

- Share anonymised claims data with bank partners to improve asset-level PCR assessments within appropriate legal frameworks.
- Develop an insurance register that identifies the insurance status of properties, working with banks and the government.
- Validate A&R measure effectiveness by reflecting verified resilience investment in premium adjustments, creating a positive feedback loop.
- Co-design parametric insurance products with banks that provide more predictable coverage signals.
- Engage in joint stress-testing with banks on uninsurability scenarios.
- Engage with banks and regulators on developing the RACR framework, its enablers and insurance market dynamics. Insurers hold the most granular evidence of where insurability is deteriorating and at what pace; sharing this intelligence with regulators in a structured and timely way could improve the quality of supervisory stress scenarios and capital framework design.

Asset managers

Why this matters

Physical climate risk affects the long-term value of debt and equity assets across portfolios. Simultaneously, the adaptation financing gap – estimated at up to US$359 billion per year in developing countries alone – represents a significant and underserved investment opportunity, particularly as resilience-linked instruments mature and regulatory frameworks create clearer risk-return signals. Investors that develop the analytical capacity to assess physical risk and resilience at the asset level will be better positioned both to manage portfolio risk and to access the returns available from the growing adaptation investment market.

What to do and how

- Develop demand for resilience-linked bonds and sustainability-linked instruments with quantifiable A&R metrics.
- Participate in blended finance structures that de-risk adaptation investment.
- Engage portfolio companies on physical risk disclosure and resilience planning.
- Incorporate RACR-compatible metrics, such as avoided loss, into asset valuation and due diligence frameworks.
- Use stewardship activities to advocate the physical risk disclosure and resilience certification standards that would improve data quality across the market.

Regulators

Why this matters

Current prudential frameworks contain structural blind spots, the one-year capital horizon and backwards-looking calibration that leave the financial system at risk of being systematically under-capitalised for physical climate risk. The self-reinforcing cycle of misclassification, underpricing and under-investment in resilience identified in this research will not be broken by individual institutions acting unilaterally; it requires a regulatory architecture that creates aligned incentives across the sector. Regulators that act early, or the Bank for International Settlements (BIS) across the global regulators, can close these gaps and strengthen financial stability, support the adaptation investment flows that public climate commitments require, and position their jurisdictions to benefit from the competitive advantages of climate-resilient financial markets. Further, there is a role for the Financial Stability Board (FSB) to work with the BIS to identify best practices within leading regulators to develop a common approach to these risks.

At the same time, regulatory action in this area carries the risk of unintended consequences. Capital requirements or disclosure obligations that are not calibrated or inconsistently applied across jurisdictions could distort lending markets, risk insurance withdrawal from high-risk geographies, or disadvantage smaller institutions that lack the capacity to comply, outcomes that would undermine the resilience objectives the regulation seeks to advance. Careful sequencing, proportionality and cross-jurisdictional co-ordination are therefore as important as the ambition of the regulatory agenda itself.

What to do and how

- Issue guidance on physical risk data sources and methodologies, building on the expectations set out in PRA SS5/25 and extending them to cover insurance adequacy and A&R metrics.
- Establish standardised return periods against which banks are required to stress-test physical climate risk. For example, mandating assessment against 1-in-100-year and 1-in-200-year hazard scenarios. This provides a consistent methodological floor across institutions and reduces the comparability problem in current hazard assessments.
- Develop industry-standard loadings for physical risk impacts, including supply chain disruption and business interruption, where the evidence base is less developed and the range of current practice is wide.
- Co-develop, with industry, a resilience certification framework that banks and insurers can rely on in credit and underwriting decisions respectively.
- Explore capital incentives for resilient assets, building on early signals from other jurisdictions such as the EU and Singapore.
- Convene cross-sector working groups, bringing together banks, insurers, data providers and investors, to develop the shared metrics taxonomy that the sector cannot produce through uncoordinated individual effort.
- Align supervisory expectations across jurisdictions where possible, to prevent regulatory arbitrage and support the development of internationally comparable physical risk disclosures.

Glossary

Acute risk: Extreme weather events such as hurricanes, floods, wildfires and heatwaves that can cause immediate damage to infrastructure, supply chains and economic activity.[68]

Adaptation: The process of adjusting systems, assets and practices to actual or expected physical climate hazards and their effects, in order to moderate harm or exploit beneficial opportunities.[69] In the context of this report, adaptation and resilience (A&R) refers specifically to investment in measures that reduce borrowers' vulnerability to physical climate risk, such as flood defences, drought-resistant crop varieties, backup power systems or nature-based solutions.

Adaptive capacity: The potential or ability of a system, region or community to adapt to the effects or impacts of climate change.[70] In the RACR context, adaptive capacity is the key lever that A&R investment seeks to strengthen, and its baseline should be established before assessing specific adaptation measures.

Avoided loss: The reduction in expected financial loss resulting from a specific A&R measure, calculated by comparing expected losses with and without the measure in place. Avoided loss is the primary metric through which the A&R component of RACR translates resilience investment into a credit-positive variable.

Bancassurance: The distribution of insurance products through banking channels, typically involving collaborative product development between banks and insurers for shared clients. In the RACR context, existing bancassurance relationships provide a foundation for joint development of parametric and resilience-linked insurance products.

Basel III: An internationally agreed set of measures developed by the Basel Committee on Banking Supervision in response to the financial crisis of 2007–09. The measures aim to strengthen the regulation, supervision and risk management of banks.[71]

Blended finance: A strategic approach that combines public and private funding to mobilise private capital flows towards emerging and frontier markets. It aims to attract commercial capital to projects that benefit society while providing financial returns to investors.[72]

Business interruption: Revenue loss and operational disruption experienced by a borrower during the period following a physical risk event, before normal operations can resume.

Chronic physical risk: Long-term shifts in climate patterns, including rising temperatures, sea-level rise, prolonged droughts and ecosystem changes, which gradually affect sectoral productivity, asset values and financial stability.[68]

Collateral haircut: A risk management tool where a lender reduces the appraised value of an asset used as collateral, to offset the risk should the borrower fail to repay their debt.[73]

Compound risk: The combination of multiple risk drivers or hazards occurring simultaneously or in close sequence, where the resulting financial impact is non-linear and greater than the sum of the shocks considered individually.

Credit risk: The risk that a borrower will fail to meet their financial obligations in accordance with agreed terms, resulting in a financial loss for the lender.

Debt service coverage ratio (DSCR): A measure of a borrower's ability to service their debt obligations from operating income, calculated as net operating income divided by total debt service.

Expected credit loss (ECL): Accounting estimate that measures credit losses over the expected life of a financial instrument, required under accounting standards such as IFRS 9.

Flood Re: A UK public–private partnership and reinsurance scheme that makes flood insurance affordable for high-risk residential properties by pooling flood risk across participating insurers.

Infrastructure Supporting Factor (ISF): A regulatory mechanism in the European Union that applies a 25 per cent reduction to capital requirements for qualifying infrastructure loans.

Insurability: The condition where insurance cover is available and its premium is affordable.[75]

Internal ratings-based (IRB) model: A credit risk approach under which banks use their own internal estimates of risk components in determining the capital requirement for a given exposure.[74]

Loss given default (LGD): The proportion of a loan exposure that a lender expects to lose in the event of a borrower defaulting, after accounting for recoveries from collateral and other sources.

Probability of default (PD): The likelihood that a borrower will fail to meet their debt obligations within a defined time horizon, typically one year in standard credit models.

Residual risk: The level of physical climate risk that remains after adaptation and resilience measures have been applied.

Resilience: The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function and identity. Resilience is a positive attribute when it maintains capacity for adaptation, learning and transformation.[69]

Resilience-Adjusted Credit Risk (RACR): The integration of physical climate risk, insurance adequacy, and adaptation and resilience investment into standard credit assessment, adjusting the core credit metrics of probability of default and loss given default to reflect both the borrower's exposure to physical hazards and their capacity to manage and reduce that exposure. RACR is the central framework proposed in this report.

Risk-weighted assets (RWA): A bank's loans and other assets weighted according to risk to determine the minimum amount of capital it must hold.[76]

Wrong-way risk: A phenomenon in which a counterparty's credit exposure increases while its creditworthiness declines.[77]

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