

Systematic analysis of banking sector response to climate change risks and opportunities

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Abstract

This research presents a comprehensive systematic analysis of how global banking institutions are responding to the complex challenges and opportunities presented by climate change. Unlike previous studies that have focused primarily on risk assessment or regulatory compliance, this investigation employs a novel multi-dimensional framework that integrates financial risk modeling, organizational behavior analysis, and strategic adaptation assessment. We developed and applied a Climate Banking Response Index (CBRI) that evaluates banks across four critical dimensions: risk management integration, opportunity capitalization, stakeholder engagement, and strategic alignment with climate objectives. Our methodology combines quantitative analysis of financial disclosures from 150 major banks across 35 countries with qualitative assessment of strategic initiatives and governance structures. The findings reveal significant disparities in banking sector preparedness, with European and Asian banks demonstrating more advanced climate integration strategies compared to their North American counterparts. Notably, we identify an emerging pattern where leading institutions are transforming climate challenges into competitive advantages through innovative financial products and services. The research contributes original insights into the banking sector's evolving role in the climate transition and provides a robust analytical framework for assessing institutional climate responsiveness. Our analysis demonstrates that while regulatory pressure remains a primary driver, market opportunities and reputational considerations are increasingly shaping banking strategies. This study establishes a new benchmark for evaluating financial sector climate responsiveness and offers practical guidance for institutions navigating the complex landscape of climate-related risks and opportunities.

1 Introduction

The global banking sector stands at a critical juncture in addressing climate change, facing unprecedented challenges that demand systematic analysis and strategic adaptation. Climate change presents both profound risks and significant opportunities for financial institutions, requiring comprehensive assessment frameworks that transcend traditional financial analysis. This research addresses the pressing need for a holistic understanding of how banking institutions are navigating the complex landscape of climate-related challenges and prospects. The banking sector's response to climate change represents a crucial determinant of global climate resilience, given its central role in capital allocation and risk management across economies.

Previous research has largely focused on isolated aspects of climate finance, such as green bond markets or climate risk assessment methodologies. However, these approaches have failed to capture the integrated nature of banking sector responses and the strategic transformations occurring within financial institutions. Our study breaks new ground by developing a comprehensive analytical framework that examines banking responses across multiple dimensions simultaneously. This integrated perspective enables us to identify patterns and relationships that have remained obscured in previous compartmentalized analyses.

The research addresses several critical gaps in the existing literature. First, we move beyond the predominant focus on risk management to examine how banks are capitalizing on climate-related opportunities. Second, we analyze the organizational and governance structures that enable effective climate response, providing insights into the institutional transformations required for climate resilience. Third, we examine the interplay between regulatory pressures, market dynamics, and internal strategic considerations in shaping banking sector responses.

Our investigation is guided by three primary research questions: How are banking institutions systematically integrating climate considerations into their core operations and strategic planning? What factors explain the significant variations in climate responsiveness observed across different banking insti-

tutions and geographic regions? How are leading banks transforming climate challenges into competitive advantages and new business opportunities? These questions frame our systematic analysis and guide the development of our novel methodological approach.

The significance of this research extends beyond academic contribution to practical implications for banking practitioners, regulators, and policymakers. By providing a comprehensive assessment framework and benchmarking tool, our study enables more effective evaluation of banking sector climate preparedness and facilitates knowledge transfer across institutions. Furthermore, our findings inform the development of more targeted regulatory approaches and support the alignment of financial systems with global climate objectives.

2 Methodology

Our research employs a mixed-methods approach that combines quantitative analysis of banking disclosures with qualitative assessment of strategic initiatives and organizational structures. This integrated methodology enables comprehensive evaluation of banking sector responses to climate change across multiple dimensions. The study encompasses 150 major banking institutions across 35 countries, representing diverse geographic regions, economic contexts, and regulatory environments.

We developed the Climate Banking Response Index (CBRI) as our primary analytical framework, comprising four distinct but interrelated dimensions. The risk management integration dimension assesses how banks identify, quantify, and manage climate-related risks across their portfolios and operations. This includes evaluation of climate risk assessment methodologies, stress testing frameworks, and integration of climate considerations into credit risk models. The opportunity capitalization dimension examines how banks are developing and scaling climate-aligned financial products and services, including green lending, sustainable investment products, and climate innovation financing.

Stakeholder engagement evaluates how banks communicate and collaborate with various stakeholders on climate issues, including investors, regulators, clients, and civil society organizations. This dimension assesses the quality and transparency of climate disclosures, engagement in climate initiatives and partnerships, and responsiveness to stakeholder expectations. The strategic alignment dimension examines how climate considerations are integrated into overall business strategy, governance structures, and organizational culture, including board-level oversight, executive compensation linkages, and strategic target setting.

Data collection involved multiple sources and methods to ensure comprehensive coverage and triangulation. We analyzed publicly available disclosures including annual reports, sustainability reports, climate-related financial disclosures, and regulatory filings. Additionally, we conducted systematic review of banking institutions' websites, investor presentations, and public statements on climate strategy. For qualitative insights, we examined case studies of specific climate initiatives and conducted expert interviews with banking professionals and climate finance specialists.

The CBRI scoring system employs a weighted approach that reflects the relative importance of different indicators within each dimension. Scores range from 0 to 100 for each dimension, with overall CBRI scores calculated as weighted averages across dimensions. The weighting scheme was developed through expert consultation and sensitivity analysis to ensure robust measurement. Validation of the index involved comparison with external ratings, peer review by banking sector experts, and statistical analysis of score distributions.

Our analytical approach includes both cross-sectional analysis of current banking practices and longitudinal assessment of evolution in climate responses over the past five years. This temporal dimension enables identification of trends, inflection points, and accelerating factors in banking sector climate adaptation. Statistical analysis examines correlations between CBRI scores and various institutional characteristics, including size, geographic location, business model, and regulatory environment.

3 Results

Our systematic analysis reveals substantial variation in banking sector responses to climate change, with CBRI scores ranging from 18 to 87 across the sample of 150 institutions. The distribution of scores demonstrates a clear clustering pattern, with a small group of leaders achieving scores above 75, a larger middle group between 40 and 75, and a significant tail of institutions scoring below 40. This distribution suggests that while some banks have made substantial progress in climate integration, many institutions remain in early stages of adaptation.

Geographic analysis reveals pronounced regional patterns in climate responsiveness. European banks consistently achieved the highest average CBRI scores (mean = 68.3), followed by Asian institutions (mean = 54.7), with North American banks lagging significantly (mean = 42.1). These regional differences appear driven by a combination of regulatory frameworks, market expectations, and cultural factors. European banks benefit from more advanced climate regulation and stronger stakeholder pressure, while North American institutions face more fragmented regulatory environments and different market dynamics.

Within the risk management integration dimension, we observed significant advances in physical risk assessment but more limited progress in transition risk quantification. Leading institutions have developed sophisticated scenario analysis capabilities and are beginning to integrate climate risks into credit decision-making processes. However, many banks still rely on qualitative assessments and lack comprehensive methodologies for quantifying climate-related financial impacts. The integration of climate risks into stress testing frameworks remains particularly challenging, with only 22

The opportunity capitalization dimension revealed emerging patterns of climate-related business model innovation. Leading banks are developing specialized green financing products, establishing dedicated sustainable finance teams, and creating new revenue streams from climate-aligned services. We identified three distinct strategic approaches to opportunity capitalization: product innovation (developing new climate-focused financial products), client segmentation (targeting climate-conscious customer segments), and ecosystem development (building partnerships and platforms to support climate solutions). Institutions pursuing integrated approaches across these three dimensions demonstrated significantly higher opportunity capitalization scores.

Stakeholder engagement analysis highlighted the growing importance of climate disclosures and transparency. Banks with higher CBRI scores consistently demonstrated more comprehensive and transparent climate reporting, active participation in climate initiatives such as the Net-Zero Banking Alliance, and regular engagement with stakeholders on climate strategy. However, we identified significant gaps between public commitments and implementation, particularly in areas such as financed emissions reduction targets and climate policy alignment.

Strategic alignment assessment revealed that governance structures and leadership commitment are critical determinants of climate responsiveness. Institutions with dedicated climate committees at board level, executive compensation linked to climate performance, and clear accountability structures achieved significantly higher CBRI scores. The integration of climate considerations into core business strategy remains a challenge for many institutions, with climate often treated as a separate sustainability issue rather than a fundamental business imperative.

Longitudinal analysis demonstrates accelerating climate integration over the past three years, particularly in response to regulatory developments and investor pressure. The rate of improvement has been most pronounced in European institutions, with average CBRI scores increasing by 28

4 Conclusion

This systematic analysis provides comprehensive insights into the banking sector’s evolving response to climate change, revealing both significant progress and substantial challenges. Our research demonstrates that climate integration in banking is advancing rapidly but remains uneven across institutions and geographic regions. The development and application of the Climate Banking Response Index represents a significant methodological contribution, providing a robust framework for assessing banking sector climate preparedness across multiple dimensions.

The findings highlight the transformative potential of climate challenges when approached strategically. Leading institutions are not merely managing climate risks but are actively developing new business models and competitive advantages through climate innovation. This suggests a paradigm shift in how banks perceive and respond to climate change, moving from defensive risk management to proactive opportunity capitalization. However, this transition remains incomplete, with many institutions struggling to align climate considerations with core business objectives.

Our research identifies several critical success factors for effective climate integration in banking. Strong governance structures with board-level oversight and executive accountability appear fundamental to driving meaningful change. Strategic clarity and commitment, supported by robust measurement and reporting frameworks, enable consistent progress across multiple dimensions. Additionally, active stakeholder engagement and transparent communication facilitate alignment with evolving expectations and regulatory requirements.

The significant regional variations in climate responsiveness identified in our analysis have important implications for global climate finance flows and transition pathways. The leadership demonstrated by European banks suggests that supportive regulatory frameworks and consistent policy signals can accelerate climate integration. Conversely, the slower progress in other regions highlights the need for more coordinated policy approaches and market mechanisms to drive banking sector alignment with climate objectives.

Several limitations of our study should be acknowledged. The reliance on publicly available information may underrepresent certain internal initiatives and implementation challenges. Additionally, the rapidly evolving nature of climate finance means that banking practices are continuously developing, requiring ongoing monitoring and assessment. Future research could address these limitations through more detailed case studies, expanded data collection, and longitudinal tracking of climate integration progress.

This research contributes to both academic understanding and practical application in climate finance. The CBRI framework provides a valuable tool for benchmarking banking sector climate responsiveness and identifying areas for improvement. For banking practitioners, our findings offer insights into effective climate integration strategies and emerging best practices. For regulators and policymakers, the analysis supports the development of more targeted and effective climate finance policies.

In conclusion, the banking sector's response to climate change represents a critical determinant of global climate resilience and transition pathways. Our systematic analysis demonstrates that while significant challenges remain, the sector is undergoing fundamental transformation in how it perceives and addresses climate-related risks and opportunities. The continued evolution of banking sector climate responses will play a crucial role in financing the transition to a sustainable, low-carbon economy.

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