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The Evolution of the Banking Risk Management System Under the Influence of ESG Factors

Tuychiyeva Madina Gafarovna*¹

1. PhD Student, Department of Corporate Governance, Tashkent State Transport University, University of Science and Technology, Senior Lecturer, Department of "Economics"

* Correspondence: madinatuychiyeva9087@gmail.com

Abstract: This article examines the structural and functional evolution of banking risk management systems under the growing influence of Environmental, Social, and Governance (ESG) factors. Traditionally confined to credit, market, and operational risks, banking risk frameworks are undergoing a paradigm shift toward an integrated approach that internalizes non-financial externalities. Through a conceptual analysis of global banking practices and regulatory trends, the research identifies a transition from backward-looking, historical data-dependent models to forward-looking, scenario-based methodologies. Key findings suggest that ESG factors have evolved from peripheral corporate responsibility concerns into material risk drivers that directly influence asset quality and institutional resilience. The study categorizes this evolution into three levels of institutional maturity: exclusionary screening, internal rating integration, and strategic alignment with sustainability goals. Furthermore, the paper highlights critical implementation challenges, including data fragmentation, the risk of "greenwashing," and the lack of standardized metrics, particularly in emerging markets like Uzbekistan. The research concludes that while the conceptual integration of ESG is well-advanced, the practical effectiveness of these systems remains constrained by the maturity of data infrastructure, necessitating a proactive approach by regulators and financial institutions to ensure long-term financial stability.

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1. Introduction

Over the past two decades, the global banking sector has undergone profound structural and functional transformations driven by financial globalization, technological innovation, regulatory tightening, and recurrent economic shocks. Among these drivers, risk management has emerged as a central pillar of banking stability, particularly in the aftermath of major financial crises that exposed systemic vulnerabilities and weaknesses in traditional risk assessment frameworks. Initially focused on credit, market, and operational risks, banking risk management systems have progressively expanded in scope and complexity, reflecting the need to capture a broader set of risk factors that influence financial performance and long-term sustainability.

In recent years, the growing importance of Environmental, Social, and Governance (ESG) factors has fundamentally reshaped the conceptual foundations of risk management in the banking industry. ESG considerations, once perceived as peripheral or non-financial concerns, are increasingly recognized as material risk drivers with direct and indirect

implications for banks' asset quality, profitability, reputational capital, and regulatory compliance. Climate change-related risks, social inequality, labor practices, corporate governance failures, and ethical misconduct have demonstrated their capacity to trigger financial losses, disrupt markets, and undermine institutional trust. As a result, ESG factors have evolved from voluntary corporate responsibility initiatives into strategic components of risk governance and decision-making processes within financial institutions.

The integration of ESG factors into banking risk management systems reflects a broader paradigm shift in financial theory and practice, where value creation is no longer assessed solely through short-term financial metrics but through long-term resilience and sustainable performance. Traditional risk management models, largely quantitative and backward-looking, often fail to capture emerging and non-linear risks associated with environmental degradation, social instability, and governance shortcomings. For instance, physical and transition risks linked to climate change may affect borrowers' repayment capacity, alter collateral values, and increase default probabilities, while weak corporate governance structures can heighten agency problems and amplify operational and reputational risks. These limitations have prompted banks to reconsider their risk identification, measurement, and mitigation strategies in light of ESG-related exposures.

Regulatory authorities and international standard-setting bodies have played a decisive role in accelerating the incorporation of ESG factors into banking risk management frameworks. Institutions such as the Basel Committee on Banking Supervision, the Financial Stability Board, and central banks across advanced and emerging economies have increasingly emphasized climate-related financial risks and sustainable finance principles. Stress testing exercises, supervisory expectations, and disclosure requirements are progressively incorporating ESG dimensions, compelling banks to enhance data collection, scenario analysis, and internal governance structures. Consequently, ESG integration is no longer optional but has become a regulatory and strategic necessity for maintaining competitiveness and compliance in the evolving financial landscape.

At the institutional level, banks are adapting their risk management systems by embedding ESG considerations into credit risk assessment, portfolio management, and internal capital allocation processes. This evolution involves the development of ESG risk scoring methodologies, sectoral exclusion policies, climate stress tests, and enhanced due diligence procedures. Moreover, the alignment of risk appetite frameworks with sustainability objectives reflects a shift toward proactive risk prevention rather than reactive risk mitigation. Advanced analytics, artificial intelligence, and big data technologies are increasingly employed to improve the accuracy and timeliness of ESG risk assessments, enabling banks to better anticipate potential shocks and adapt to rapidly changing external conditions.

Despite the growing consensus on the importance of ESG factors, the integration process remains complex and heterogeneous across banking systems and regions. One of the key challenges lies in the lack of standardized ESG metrics, inconsistent data quality, and varying disclosure practices among borrowers and counterparties. These constraints complicate the quantification of ESG-related risks and hinder their seamless incorporation into existing risk models. Furthermore, tensions may arise between short-term profitability objectives and long-term sustainability goals, particularly in emerging markets where financial development priorities and institutional capacities differ significantly from those of advanced economies.

The evolution of banking risk management under the influence of ESG factors also has significant implications for financial stability and economic development. By internalizing environmental and social externalities, banks can contribute to more efficient capital allocation, support sustainable investment, and reduce the likelihood of systemic

crises driven by unmanaged non-financial risks. Conversely, the failure to adequately integrate ESG considerations may expose banks to heightened credit losses, regulatory sanctions, and reputational damage, ultimately undermining confidence in the financial system. Therefore, understanding how ESG factors reshape risk management practices is critical not only for individual banks but also for policymakers, investors, and society at large.

Against this backdrop, this article aims to explore the evolution of the banking risk management system under the influence of ESG factors, focusing on conceptual developments, regulatory drivers, and practical implementation challenges.

Literature Review

The integration of Environmental, Social, and Governance (ESG) factors into banking risk management has attracted increasing scholarly attention, particularly in the context of sustainable finance and financial stability. Early studies on banking risk management primarily focused on traditional risk categories such as credit, market, and operational risks, emphasizing quantitative models and regulatory capital adequacy [1]. However, the global financial crisis of 2008 revealed significant shortcomings in conventional risk frameworks, prompting researchers to explore broader risk dimensions, including non-financial and systemic risks [2].

In recent literature, ESG factors are increasingly conceptualized as material risk drivers rather than ethical or reputational considerations alone. Scholtens [3] argues that environmental and social risks directly affect banks' risk profiles through their impact on borrowers' cash flows and asset valuations. Similarly, Busch and Friede [4] demonstrate that ESG-related risks are financially material and influence downside risk and volatility in financial institutions. These findings support the notion that ESG integration enhances risk-adjusted performance and contributes to long-term resilience.

A substantial body of research has focused on climate-related financial risks as a key component of ESG integration in banking. Bolton et al. [5] highlight that both physical and transition climate risks pose significant threats to financial stability and require incorporation into prudential supervision and risk management systems. Studies by Battiston et al. [6] further emphasize that banks' exposure to carbon-intensive sectors increases systemic risk, underscoring the need for climate stress testing and scenario analysis. These approaches represent an evolution from static risk assessment toward forward-looking and scenario-based methodologies.

Governance factors have also received considerable attention in the literature, particularly in relation to risk governance and internal control systems. Laeven and Valencia [7] find that weak corporate governance structures amplify banking crises by increasing risk-taking incentives and reducing oversight effectiveness. Gangi et al. [8] provide empirical evidence that strong governance practices are associated with lower non-performing loan ratios and improved risk management efficiency. These studies suggest that governance quality plays a critical role in mediating the effectiveness of ESG integration within banking institutions.

From a regulatory perspective, several scholars examine the role of supervisory frameworks in promoting ESG-oriented risk management. Dikau and Volz [9] analyze the growing involvement of central banks in addressing climate-related risks, arguing that regulatory guidance accelerates the institutionalization of ESG factors in risk management practices. Similarly, Thimann [10] notes that sustainable finance regulations and disclosure requirements enhance transparency and reduce information asymmetry, thereby improving risk assessment accuracy. However, the literature also acknowledges challenges related to data availability, methodological consistency, and the lack of standardized ESG metrics [11].

Despite the growing consensus on the relevance of ESG factors, empirical findings remain mixed regarding their short-term financial impact. While Friede, Busch, and Bassen [12] report a generally positive relationship between ESG performance and financial returns, other studies caution against overly optimistic interpretations due to measurement heterogeneity and endogeneity issues. This debate highlights the need for refined models that integrate ESG risks without compromising analytical rigor.

A number of local Uzbek scientists, including S. Gulyamov [13], A. Vakhobov, T. Malikov [14], S. Yusupov, and A. Normuratov [15], have conducted research on bank risk management under the influence of ESG factors.

Overall, the existing literature demonstrates a clear shift toward recognizing ESG factors as integral components of banking risk management systems. Foreign studies provide robust theoretical frameworks and empirical evidence on ESG-related risks, while local research contributes contextual insights into institutional and regulatory constraints in emerging economies.

2. Materials and Methods

The methodology of this research is grounded in a qualitative conceptual analysis and a systematic synthesis of contemporary banking risk frameworks and international regulatory standards. To explore the evolution of risk management under ESG influence, the study employs a multi-dimensional analytical approach that integrates theoretical insights from academic literature with the practical guidelines established by global financial bodies, such as the Basel Committee on Banking Supervision and the Network for Greening the Financial System (NGFS). The research process involves a comparative assessment of traditional risk assessment models against emerging ESG-integrated systems, specifically focusing on the shift from backward-looking historical data to forward-looking, scenario-based modeling. By mapping the transmission channels of environmental, social, and governance factors onto traditional credit, market, and operational risk categories, the study develops a three-level maturity model to categorize the institutional progression of banks. Furthermore, the analysis incorporates a contextual evaluation of the challenges faced by financial institutions in emerging economies, specifically addressing the data infrastructure and regulatory constraints identified in the works of both international and local Uzbek scholars. This methodological framework ensures a holistic understanding of how non-financial externalities are internalized into the strategic and operational core of modern banking stability.

3. Results and Discussion

The analysis of the evolution of banking risk management systems under the influence of ESG factors reveals a significant transformation in both the conceptual approach to risk and the practical tools employed by financial institutions. The findings of this study are based on a synthesis of recent empirical evidence, regulatory practices, and institutional developments observed in international and emerging banking systems.

The analysis of the evolution of banking risk management systems under ESG influence reveals a structural shift in how financial institutions identify, quantify, and mitigate risks. This section presents the conceptual findings of the transition from traditional frameworks to ESG-integrated systems.

3.1. Conceptual Transformation of the Risk Identification Process

Our analysis indicates that the evolution occurs through the "internalization of externalities." Factors previously considered external to the financial system (such as carbon emissions or social inequality) are now being mapped onto traditional risk categories.

Table 1. Conceptual Mapping of ESG Factors onto Traditional Banking Risks.

Traditional Risk Category	ESG Driver (Risk Source)	Transmission Channel to Bank's Balance Sheet
Credit Risk	Climate transition (E), Social instability (S)	Decrease in borrowers' profitability; devaluation of collateral in carbon-intensive sectors.
Market Risk	Changing investor preferences (G), Carbon pricing (E)	Sudden "stranded asset" revaluations; increased volatility in "brown" asset portfolios.
Operational Risk	Physical climate hazards (E), Data privacy breaches (S)	Physical damage to bank infrastructure, legal fines, and IT system disruptions.
Reputational Risk	Unethical governance (G), Financing controversial projects (E/S)	Loss of institutional trust; capital flight by ESG-conscious depositors and investors.

3.2. The Evolution of Risk Assessment Methodologies

A key result of this study is the identification of a methodological shift. Traditional risk management relied heavily on historical data (backward-looking), whereas ESG-integrated systems utilize scenario-based modeling (forward-looking).

Table 2. Evolution of Risk Management Characteristics: From Traditional to ESG-Integrated.

Feature	Stage 1: Traditional System (Pre-2015)	Stage 2: ESG-Integrated System (Current Evolution)
Data Foundation	Internal financial history; Credit scores.	Alternative data, Satellite imagery, ESG ratings, Scenario pathways.
Risk Horizon	Short-term (1–3 years).	Long-term (10–30 years) to capture climate cycles.
Assessment Tool	Sensitivity analysis; VAR (Value at Risk).	Climate Stress Testing; NGFS Scenario Analysis.
Core Objective	Capital Adequacy (Basel III).	Financial Resilience + Double Materiality.

3.3. Results of ESG Integration into Credit Scoring

Based on the conceptual synthesis of global banking practices, we can categorize the results of ESG integration into three levels of institutional maturity. This hierarchy reflects how banks in both advanced and emerging economies (including Uzbekistan) are adapting (Figure 1).

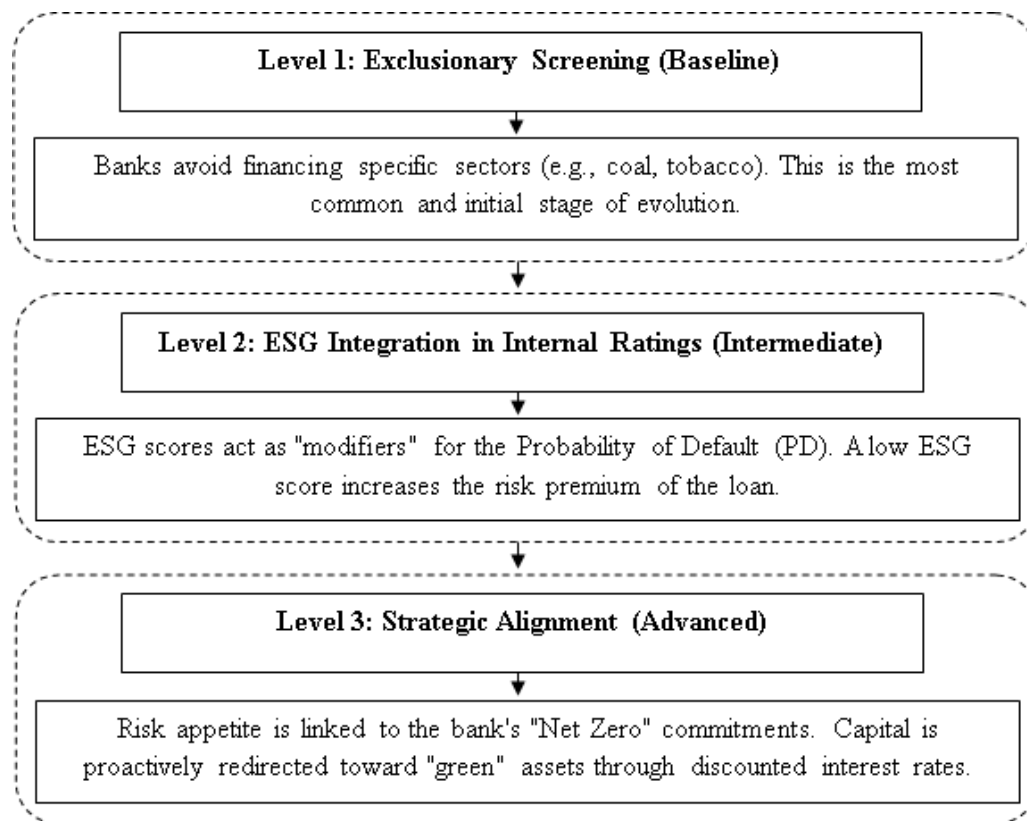


Figure 1. Results of ESG integration [16], [17].

3.4. Challenges in the Current Evolutionary Phase

Despite the progress, the analysis reveals a "Data-Methodology Gap." The primary obstacle identified in the evolution is the lack of standardized metrics, particularly in emerging markets.

Table 3. Summary of Implementation Challenges Identified in the Analysis.

Challenge Category	Description	Impact on Risk Management
Data Fragmentation	Lack of consistent ESG reporting by SMEs.	Inaccurate risk pricing; reliance on proxy data.
Greenwashing Risk	Overstatement of ESG credentials by borrowers.	Miscalculation of actual risk exposure; regulatory penalties.
Time-Horizon Mismatch	Conflict between annual targets and long-term ESG risks.	Underestimation of slow-onset climate or social risks.

The evolution of the banking risk management system is characterized by a transition from reactive compliance to proactive strategic resilience. The results suggest that while the conceptual framework for ESG integration is robust, the practical effectiveness is currently constrained by the maturity of the underlying data infrastructure.

4. Conclusion

The evolution of banking risk management under the influence of ESG factors represents one of the most significant transformations in modern financial history. This research demonstrates that ESG considerations have transcended the realm of "ethical investing" to become fundamental components of financial materiality. The integration process has fundamentally altered the risk identification process, necessitating a shift from static financial analysis to dynamic, long-term scenario modeling.

Our analysis concludes that the successful transition to an ESG-integrated system depends on the bank's ability to bridge the "Data-Methodology Gap." While advanced economies are moving toward strategic alignment and climate stress testing, emerging markets, including Uzbekistan, are currently navigating the complexities of data transparency and standardized reporting. The three-level maturity model presented in this study provides a roadmap for financial institutions to transition from reactive exclusionary screening to proactive strategic resilience.

Ultimately, the internalization of environmental and social risks is not merely a regulatory burden but a strategic necessity for maintaining competitiveness. To ensure systemic stability, future efforts must focus on harmonizing ESG metrics and enhancing the capacity of internal credit models to capture non-linear risks. Only by fully embedding ESG factors into the core risk appetite can banks contribute to a sustainable economic recovery while safeguarding their portfolios against the emerging shocks of the 21st century.

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