



# Green Bonds and Climate Funds: Evaluating Financial Instruments for Sustainable Development

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**Abstract-** This paper provides a comprehensive assessment of green bonds and climate funds as financial tools that facilitate sustainable development, with a focus on their emergence, market trends, and efficiency as tools that channel funds towards addressing the issue of climate change. Through the systematic assessment of market trends, regulations, and institutional innovations from 2021 to 2026, the research aims to evaluate the structural shift of sustainable finance from basic 'use of proceeds'-type financial tools to advanced performance-based financial tools. A Multi-Layer Sustainable Finance Evaluation Framework (MLSFEF) is developed to identify the following: instrument characteristics, issuer credibility, impact measurement infrastructure, and market ecosystem. The analysis reveals that the publication of the dedicated transition finance guidelines by ICMA towards the end of 2025 is a watershed moment that recognizes 'transition' as a standalone term that is able to channel funds towards hard-to-abate sectors while maintaining environmental integrity. Market data reveals the growth trajectory of Transition Funds, which have risen to \$318 billion globally as of H1 2025. Bank of Korea's assets under ESG have risen from \$5.45 billion (2020) to \$20.38 billion (2024). Yet, the basic problems remain the same. What is important is the issuer's credibility rather than the instrument type. Aberdeen Investments encapsulates the conventional wisdom: "We would prefer to buy a conventional bond from a green issuer than a green bond from a brown issuer." In the comparative analysis of the six analytical dimensions—instrument types, issuer perspectives, investor criteria, impact measurement, regulatory frameworks, and market access barriers—it is found that the efficacy of Sustainable Finance is based on the Monitoring, Reporting, and Verification ecosystem, where digital MRV technologies have the capability to reduce costs by 50-70% and allow SMEs to access climate finance markets.

**Keyword:** Green bonds, climate funds, transition finance, sustainable development, impact measurement, MRV infrastructure, climate mitigation, Paris Agreement, ESG investing.

## I. Introduction

The mobilization of private capital for addressing the issue of climate change has come to represent one of the biggest economic challenges facing the twenty-first century. With estimates suggesting that as much as \$10 trillion may need to be invested annually in the next two decades to support the global energy transition, the current investment figures of \$2.3 trillion in 2024, a record high, remain significantly below the amounts that need to be invested in addressing the issue. Green bonds and climate funds have come to represent the biggest financial instruments for bridging the gap in sustainable development [1].



The development of sustainable finance has witnessed a quantum leap in its growth trajectory in recent times in the 2021-2026 period. From being a marginal investment avenue for socially conscious investors, it has now become a new asset class in its own right with cumulative issuance of green bonds globally exceeding \$2.5 trillion in value. Nevertheless, this growth in sustainable finance has also seen a corresponding increase in complexity in its market structure, regulatory environment, and investor demand. The launch of the International Capital Market Association's Climate Transition Bond Guidelines in late 2025 has put in place a framework to support the financing of decarbonization in hard-to-abate sectors [2].

This paper seeks to evaluate green bonds and climate funds from a multi-dimensional perspective, not only focusing on the growth of the market but also on the effectiveness of the market. As the analysis is conducted, it is apparent that the effectiveness of the market is based on the issuer's credibility and the impact measurement mechanisms that are established. As NatWest analysis of over 60 transition funds established, "the imperative for issuers is clear... to improve their chances of being able to tap into that pool, they must be able to articulate a clear, evidence-based story about their transition pathway."

This paper has three major contributions. First, the paper offers a comprehensive analysis of the changing market dynamics of sustainable financial products, including green bonds, sustainability-linked bonds, transition bonds, and climate funds. Secondly, the paper offers a comprehensive analysis of the effectiveness of the market with the use of the Multi-Layer Sustainable Finance Evaluation Framework [3]. Lastly, the paper offers a comprehensive analysis of the market dynamics across developed and emerging economies, with special reference to the African and Asian economies. The rest of the paper is structured as follows. In Section 2, a literature survey of sustainable finance research is provided. In Section 3, the methodology for the Multi-Layer Sustainable Finance Evaluation Framework is described. In Section 4, analysis and discussion are provided, including five figures and a table for the comparative evaluation. Finally, in Section 5, the conclusions are drawn.

## II. Literature Survey

The literature on green bonds and climate finance has developed rapidly, shifting from descriptive studies of market development to critical analysis of impact integrity, regulation, and market efficacy. In this survey, we synthesize recent studies and developments from 2021 to 2026.

### **The Emergence of Transition Finance**

An important development in the sustainable finance landscape has been the recognition of transition finance as a new asset class. The International Capital Market Association has issued Climate Transition Bond Guidelines in late 2025, which outline the framework for transition finance to fund decarbonization projects, particularly for entities that are not yet low-emitting [4]. This fills an important gap in the sustainable finance landscape, given that conventional green bonds have successfully mobilized funds to clean technologies like electric vehicles, renewable energy, etc., but high-emitting sectors like steel, cement, chemicals, and transportation, which account for



40% of global greenhouse gas emissions, have traditionally struggled to access sustainable bond markets [5].

The ICMA guidelines include core provisions that require the demonstration of compatibility with taxonomies and pathways, the management of risks of carbon lock-in, and the explanation of the lack of feasibility of alternatives. Notably, the transition plans of entities serve as the basis of the credibility of the transition plans, as they provide strategic context in relation to how the financed projects contribute to the process of decarbonization in line with the overall corporate strategy [6].

Other related developments include the European Commission's proposed update of the Sustainable Finance Disclosure Regulation, which includes the 'transition' product category for funds investing in entities on credible transition paths, which may further fuel the demand for transition-themed instruments [7].

#### **Investor Perspectives and Issuer Credibility**

Investor behavior research suggests that investors believe "credibility trumps labeling." A study conducted by NatWest on more than 60 fixed income transition funds found a general consensus among investors that managers "primarily focus on the issuer or activity itself, rather than the nature of issuance" in deciding to invest in a transition bond [8]. The investor philosophy was well stated by Kate McGrath of Aberdeen Investments: "We would prefer to buy a conventional bond from a green issuer than a green bond from a brown issuer."

This has significant implications for corporate strategy. Companies that are perceived to be slow in developing transition plans are in danger of being left behind in an expanding transition capital market that reached \$318 billion globally in the first half of 2025, a 16 percent increase across asset classes. However, investors are not willing to compromise on financial performance to meet transition goals. This was well stated by Ritchie Thomson of Aegon Asset Management: "Few investors are willing to sacrifice financial return to support climate transition."

Lack of universal definitions with respect to transition strategies is creating ambiguity among issuers, which is making it difficult to structure debt securities. "New frameworks have resulted in ambiguity and uncertainty for issuers," though the market is moving with good momentum [9].

#### **Geographic Expansion and Emerging Markets**

The green bonds market is growing substantially in emerging markets. Nigeria has become a pioneer in the African continent after becoming the first African country to float a sovereign green bond in 2017, with four green bonds raised in the last three years. The issuance of the 2025 Series III Sovereign Green Bond was oversubscribed by over 200%, with subscriptions received of over N91 billion compared to an offer of N50 billion. The government is now planning to raise as much as N500 billion in green bonds in 2026 to finance air quality improvement initiatives, clean cooking fuel provision, and forest conservation [10].



In the African region, green bonds worth around \$9.6-10 billion had been raised by various African governments through around 70-80 green and sustainable bonds as of mid-2025. The African Development Bank had set aside \$5.5 billion for climate finance in 2024, close to half of its overall approvals, for initiatives such as renewable energy, green transport, and climate-resilient infrastructure.

In Asia, central banks are increasingly integrating climate risks into reserve management. The Bank of Korea invested in the BIS Climate Response Corporate Bond Fund as an initial investor. Its ESG assets have grown from 5.45 billion US dollars at the end of 2020 to 20.38 billion US dollars at the end of 2024. It invests in corporate bonds with high credit ratings, weighted towards those that perform well in climate response factors.

### **Measurement, Reporting, and Verification Infrastructure**

A third literature stream focuses on the infrastructure that is necessary for credible impact measurement. A key transition from manual to automated MRV systems is a fundamental enabler for performance-linked finance.

For manual MRV systems, verification cycles are 12-24 months, with costs amounting to 30-40% of project revenues for smallholder landowners. With the use of cloud databases for digitalized MRV, verification cycles can be as fast as 6-12 months. Moreover, with the use of IoT sensors, satellite imagery, and artificial intelligence in dMRV, verification cycles can be as fast as 1-3 months, in real-time, with costs estimated at 50-70% less compared to traditional manual MRV [5].

The European Central Bank has improved its climate indicators, including new breakdowns for sustainable bonds by maturity, types of interest rates, and currencies. It has also improved methodologies for physical risks and inflation-adjusted carbon intensity. This is in recognition that better data infrastructure is a prerequisite for the scaling of performance-linked finance.

### **Corporate Participation and the SME Paradox**

However, the level of corporate engagement in green bond markets, despite the role of the public sector, is still very low, especially in emerging economies. In the case of Nigeria, for instance, the level of public sector engagement far surpasses the level of private sector engagement, despite the successful issuance of a N8.5 billion corporate green infrastructure bond by North South Power [6].

Small and medium-sized enterprises have a structural problem. They cannot access climate finance because they lack the ability to measure their emissions, and they cannot measure their emissions because they lack access to finance. Small and medium-sized enterprises account for more than 90% of the world's productive fabric, but they remain the last mile where climate commitments come to life.

### **Synthesis and Research Gaps**

The literature reveals that there is significant market evolution and that challenges still need to be overcome. The main findings are as follows:



- Transition finance is recognized as a distinct market with formal guardrails;
- Investor credibility assessments are driven by issuer quality, not instrument type;
- Emerging markets are driving growth in green bond issuance, although they are still underrepresented;
- Strong MRV infrastructure is critical to scaling performance-linked finance;
- SMEs face structural barriers that need to be overcome through innovation.
- Research gaps identified are:
  - Lack of empirical data on the actual emissions reduction impact of green bond financing;
  - Lack of understanding of how transition plans drive measurable decarbonization;
  - Need for standardization of impact metrics to enable cross-instrument comparison;
  - Lack of analysis on the effectiveness of climate funds in comparison to bond instruments.

### **III. Methodology**

Based on the synthesis of literature, this paper develops the Multi-Layer Sustainable Finance Evaluation Framework (MLSFEF) to evaluate green bonds, climate funds, and other relevant products.

#### **Theoretical Foundations**

The Multi-Layer Sustainable Finance Evaluation Framework is grounded in three theoretical pillars. Agency theory helps to clarify information asymmetry issues between issuers and investors that give rise to greenwashing risks. Requirements around disclosure are a mechanism to ensure mutual interests are aligned.

Second, institutional theory helps to shed light on factors that influence the development of sustainable finance. The development of ICMA guidelines, EU taxonomy, and national transition taxonomies is a reflection of the institutionalization of best practices that were previously ad-hoc in nature.

Lastly, impact measurement theory helps to clarify output metrics (capital mobilized), outcome metrics (greenhouse gas emissions reduced), and impact metrics (Paris Agreement goals). A clear understanding of what is being measured is a necessary condition for effective evaluation.

#### **Framework Components**

The Multi-Layer Sustainable Finance Evaluation Framework comprises four analytical layers.

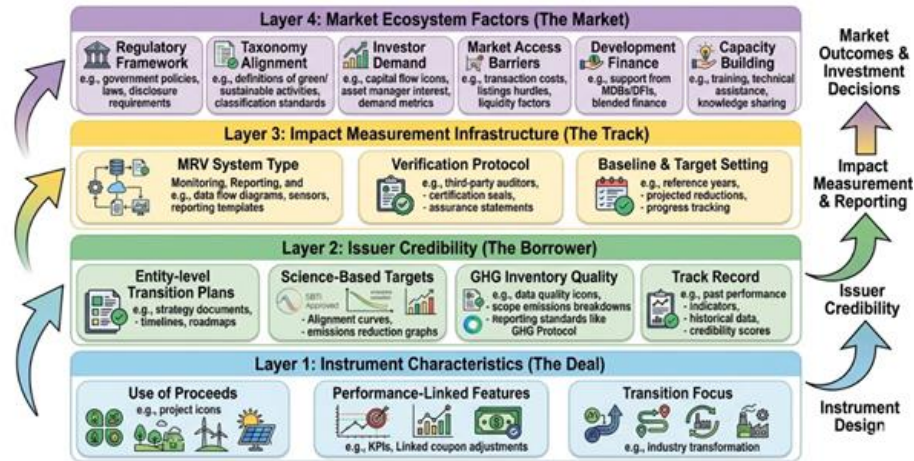


Figure 1: Multi-Layer Sustainable Finance Evaluation Framework (MLSFEF)

### Layer 1: Instrument Characteristics Analysis

This level looks at the structural aspects of the sustainable finance instrument:

- **Use of Proceeds Instruments:** These include green bonds, social bonds, and sustainability bonds. They commit to the allocation of funds to specific projects that have environmental benefits. The key analysis aspects include the criteria used to select the projects, allocation reporting, and impact reporting.
- **Performance-Linked Instruments:** These include sustainability-linked bonds and loans. They have financial conditions linked to the achievement of specific Sustainability Performance Targets. Key analysis aspects include the level of ambition, materiality, and verification.
- **Transition Focused Instruments:** These include climate transition bonds. They commit to funding projects that target the decarbonization of hard-to-abate sectors. Key analysis aspects include the level of alignment with the transition pathway, the level of carbon lock-in, and the level of integration with the entity's transition plan.

### Layer 2: Issuer Credibility Analysis

This level checks the reliability of the issuing entity:

- **Entity Level Transition Plan evaluation** checks if the issuer has a robust transition strategy to a low-carbon economy with interim targets, governance structures, and capital expenditure alignment.
- **Science Based Target evaluation** checks if greenhouse gas reduction targets are aligned with Paris Agreement targets (1.5°C pathways), using methodologies such as Absolute Contraction Method with a 4.2% annual reduction .



- GHG Inventory Quality evaluation checks scope coverage (1, 2, and material 3), data sources, verification level, and baseline year suitability.
- Track Record evaluation checks historical performance in environmental commitments, issuance history of green bonds, and disclosure levels.

### **Layer 3: Impact Measurement Infrastructure Analysis**

This level looks at the systems that make it possible to credibly quantify the impact:

- The assessment of the MRV System Type looks at whether the system is manual, digitalized, or automated (dMRV) and the implications thereof for the frequency of the verification cycles, the cost structures, and the integrity of the data.
- The assessment of the Verification Protocol looks at whether the verifier is accredited under international standards (ISO 14064-3, ISO 14065) and whether they apply principles of professional skepticism and impartiality.
- The assessment of the Baseline and Target Setting looks at the credibility of the counterfactual approaches, the application of ensemble modeling approaches, and the alignment with sector-specific pathways for decarbonization.

### **Layer 4: Market Ecosystem Factors Analysis**

This layer reviews the broader context within which these instruments are deployed:

- Regulatory Framework evaluation reviews the existence of green bond standards, taxonomies for transition bonds, and disclosure rules.
- Taxonomy Alignment evaluation reviews the match between project definitions and existing taxonomies (EU Taxonomy, national transition taxonomies for China, Australia, Singapore).
- Investor Demand analysis reviews the existence of market demand, pricing differences (greenium), and composition.
- Market Access Barriers evaluation reviews the current state for particular categories (SMEs, emerging market entities) and possible solutions (development finance).

## **IV. Result Analysis and Discussion**

The following section provides analytical results related to green bonds and climate funds, presented as a series of five illustrative figures and a table for comparative analysis.

### **Evolution of Sustainable Finance Instruments: 2021-2026**

The sustainable finance field has witnessed a revolution, evolving from a simple green bond to a diversified sustainable finance instrument.

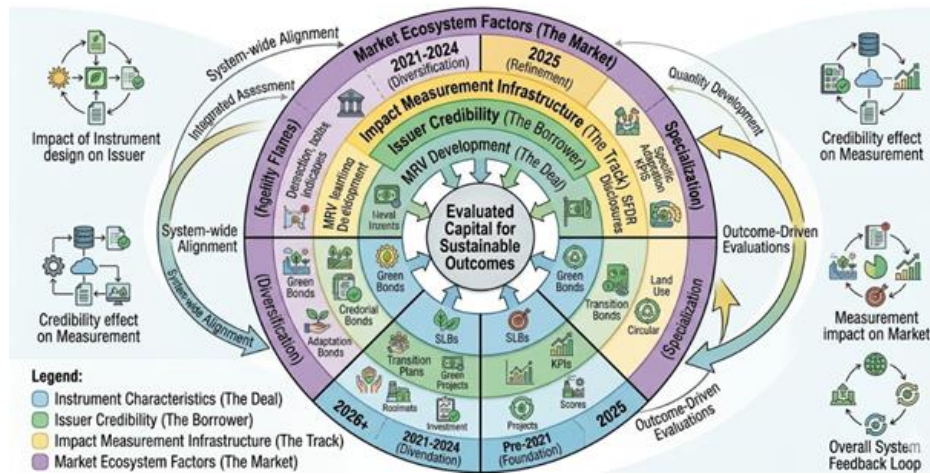


Figure 2: Evolution of Sustainable Finance Instruments (2021-2026)

Figure 2 demonstrates the significant development in the variety of sustainable finance products over the five-year period. The introduction of ICMA's Climate Transition Bond Guidelines in late 2025 can be seen as a watershed moment, providing clear guardrails for the funding of decarbonization in sectors that were unable to access sustainable debt products. Arturo Palacios, Carbon Trust, comments: "Transition bonds do not replace green bonds or sustainability-linked bonds; however, they complete the toolkit by ordering the financing of industrial transition under guardrails investors can trust."

The European Green Bond Standard, launched in 2025, has seen significant interest due to its perceived status as a 'gold standard,' although the proposed SFDR update including a 'transition' product category could also drive further momentum. In addition to transition finance, adaptation finance is also gaining momentum with the increased focus on physical risk, although sub-labels such as 'blue,' 'Amazonia,' and 'resilience' are likely to remain niche due to operational issues.

**Investor Priorities: Credibility Over Labeling**

NatWest's analysis of transition fund managers reveals fundamental insights about investor behavior.

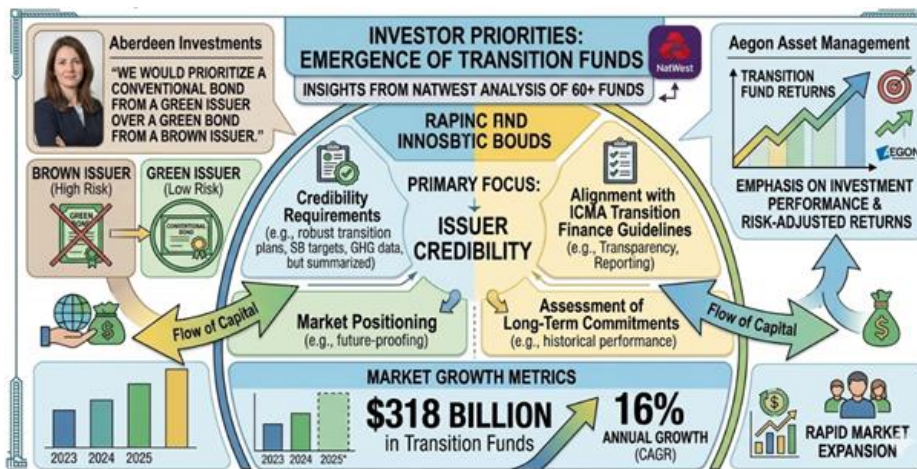


Figure 3: Investor Priorities in Transition Fund Allocation

Figure 3 captures the essential truth revealed by the study of investor behavior: "it's not the name that counts, it's the substance." The revelation that fund managers "primarily focus on the issuer or activity itself, rather than the nature of issuance" has profound implications. A green bond may be issued, but if the underlying entity's strategy remains unaligned with net-zero objectives, sophisticated investors will understand the disconnect.

This explains the focus on entity-level transition plans across multiple frameworks. Under the ICMA Climate Transition Bond Guidelines, the transition strategy forms part of the safeguard in the use of proceeds criteria; under the Transition Loan Principles, it forms part of the five pillars, with transition strategy being the first. There is a large market size: transition funds stand at \$318 billion, growing at 16%, with significant capital to be deployed. However, the requirement that "few investors are willing to sacrifice financial return" means that this impact cannot come at the expense of performance. Sustainable finance must deliver both.

### MRV Infrastructure: Enabling Performance-Based Finance

The transition from manual to automated MRV systems represents a critical enabler of scalable, credible climate finance.

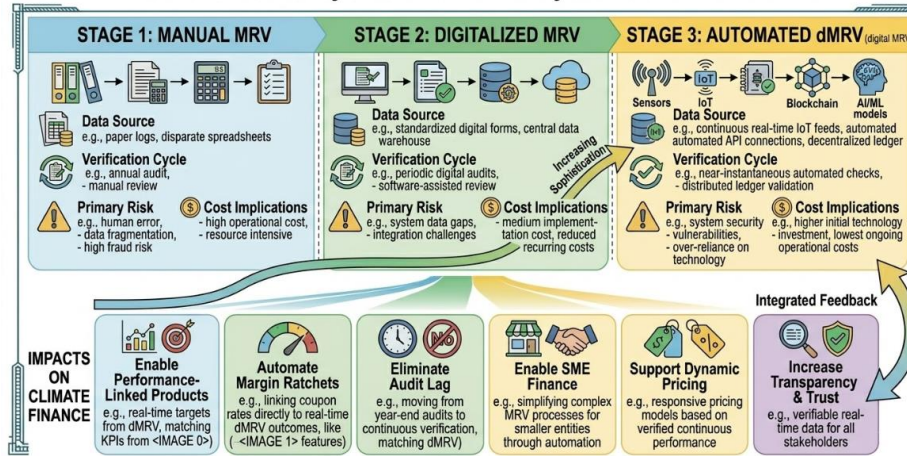


Figure 4: MRV System Evolution and Impact

Figure 4 demonstrates the importance of measurement infrastructure in the scalability of climate finance. According to the LSE Grantham Research Institute, margin ratchets in sustainability-linked loans "can shift adaptation from a discretionary initiative to a priced managerial obligation, making climate resilience a financial variable rather than a reputational afterthought." However, this is only possible with the implementation of robust MRV systems.

The difference in cost is substantial, with manual systems using 30-40% of the revenue generated by small landowners, thus preventing them from accessing climate finance markets. The implementation of dMRV systems with a cost reduction of 50-70% is what can make small-ticket sustainability-linked loans viable for the first time, thus accessing the SME market segment, which accounts for over 90% of the global productive fabric.

The process efficiency gains of early adopters such as BNP Paribas have been as high as 40% through pilot programs that reduce manual interventions. The integration of blockchain-based smart contracts allows interest rate adjustments to be automatically triggered as soon as the performance targets are verified on the blockchain.

#### 4.4 Geographic Distribution: Emerging Market Participation

While sustainable finance has grown globally, participation remains highly uneven, with significant opportunities in emerging economies.

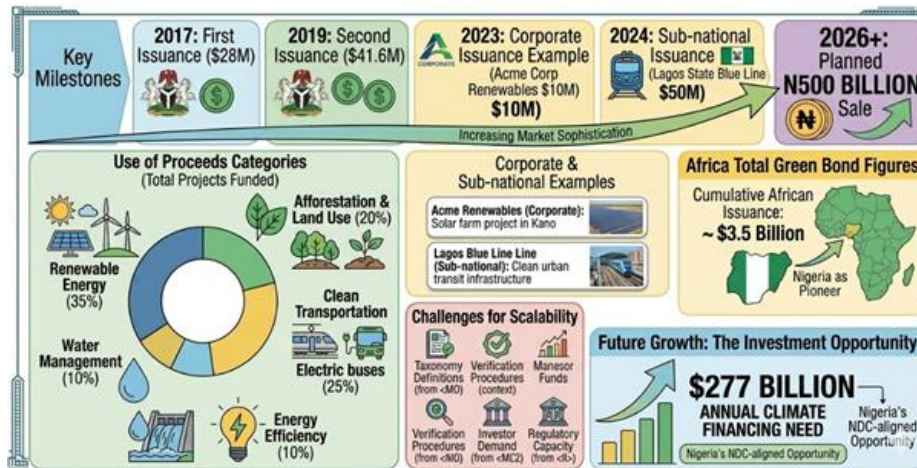


Figure 5: Sustainable Finance in Africa - Nigeria Case Study

Figure 5 shows that emerging markets are developing a green bond track record, with Nigeria's oversubscribed bonds indicating robust investor demand. The fact that the 2025 Series III green bond raised more than N91 billion compared to the offer of N50 billion—a more than 200% oversubscription—underscores the faith investors have in Nigeria's climate-related debt instruments.

While the amounts raised are still limited compared to the scale of the problem, the estimated annual climate finance needs in Africa are over \$277 billion, significantly higher than the current levels of funding. The \$5.5 billion in climate finance set aside by the African Development Bank in 2024 is a good sign of commitment by development finance institutions.

The dominance of public sector issuance is an encouragement for the corporate sector to participate in the green bond market. The North South Power issuance of an N8.5 billion corporate green infrastructure bond with credit enhancement provided by development finance partners is a good example of what can be done. The strategic imperative for Nigerian businesses is clear: they should incorporate ESG into their business strategy, develop projects with material climate impact, work with DFIs, and invest in ESG reporting capabilities.

**Central Bank Participation: Institutional Mainstreaming**

The participation of central banks in climate-aligned investing signals the mainstreaming of sustainable finance within institutional asset management.

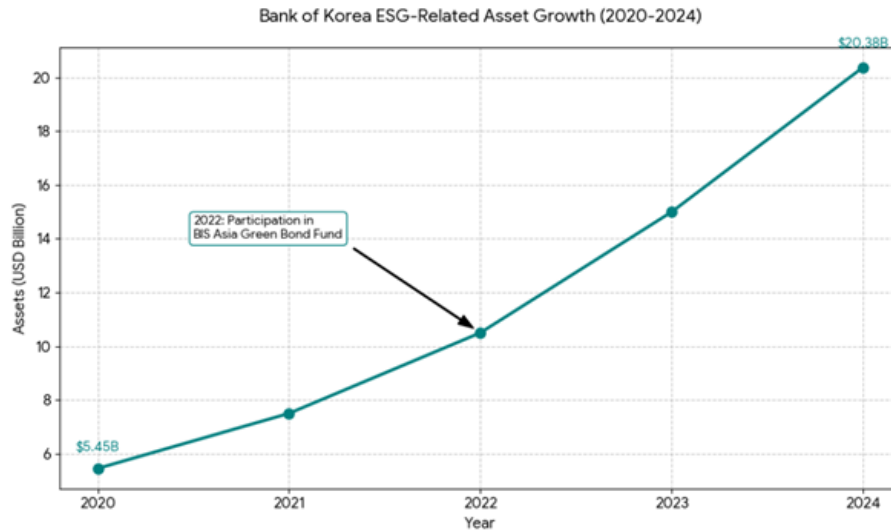


Figure 6: Bank of Korea ESG Investment Growth

Figure 6 shows the dynamic growth of central banks' engagement with sustainable finance. The Bank of Korea's ESG-related assets rose nearly four times over four years, from \$5.45 billion to \$20.38 billion .

The Bank's engagement with the BIS Climate Response Corporate Bond Fund as an initial investor, launched on February 2026, represents a strong institutional endorsement . The fund invests in corporate bonds with high credit ratings, with a bias towards issuers with high ratings for climate response factors. This reflects the implementation of the investor preference for credibility over labels, at an institutional level.

The Bank's rationale for participating, which includes "continuing participation in global climate response efforts, while strengthening external cooperation with the BIS and overseas central banks and enhancing its international standing" , indicates a shift towards considering climate alignment a key part of institutional legitimacy and external cooperation.

### Comparative Analysis of Sustainable Finance Instruments

Table 1 presents a comprehensive comparative analysis of sustainable finance instruments evaluated across six analytical dimensions.



Table 1: Comparative Analysis of Sustainable Finance Instruments

Instrument Type	Primary Mechanism	Target Issuers	Investor Focus	Impact Measurement	Market Size	Key Challenge
<b>Green Bonds</b>	Use of proceeds for eligible green projects	All sectors with green projects	Project credibility	Allocation & impact reporting	Largest segment	Limited to already-green activities
<b>Sustainability-Linked Bonds (SLBs)</b>	Financial terms tied to KPI achievement	Any sector willing to set SPTs	Issuer credibility	KPI performance against targets	Growing rapidly	Target ambition varies widely
<b>Climate Transition Bonds</b>	Use of proceeds for decarbonization projects	Hard-to-abate sectors (steel, cement, chemicals, transport)	Transition credibility + entity plan	Emissions reduction + alignment with pathways	Emerging (post-2025)	Requires entity-level transition plan
<b>Social Bonds</b>	Use of proceeds for social projects	Public sector, DFIs, corporations	Social impact credibility	Social outcome reporting	Established	Impact measurement challenges
<b>Sustainability Bonds</b>	Combined green + social use of proceeds	Diverse issuer base	Dual impact credibility	Combined reporting	Moderate	Complexity



<b>Climate Funds</b>	Pooled investment in climate-aligned assets	Institutional investors	Portfolio-level impact	Fund-level metrics	\$318bn (transition funds)	Strategy definition
<b>Sustainability-Linked Loans</b>	Margin ratchets tied to SPTs	Corporate borrowers	Borrower credibility	KPI verification	Large private market	Data infrastructure

**Analysis of Comparative Dimensions:**

Instrument Type Diversification – an indicator of market maturity, each structure designed for different uses. Green Bonds are used to fund specific projects, SLBs are designed to incentivize whole-entity transformation, and Transition Bonds are geared towards hard-to-abate sector decarbonization.

- Primary Mechanism – differs between use-of-proceeds (simpler and more transparent) and performance-linked (more consistent with whole-entity transformation, yet requires effective MRV systems). The transition bond mechanism includes both use of proceeds and safeguards related to the entity’s transition plan.
- Target Issuers – an expansion that is significant, as transition bonds are designed to include high-emitting sectors that were previously not included in sustainable debt, and could unlock capital for the 40% of global emissions that come from heavy industry sectors.
- Investor Focus – consistency in prioritizing issuer credibility over instrument labels. The NatWest study that found fund managers are focused on “the issuer or activity itself, rather than the nature of issuance” is relevant across instrument types.
- Impact Measurement varies in terms of structure. For Green Bonds, allocation reporting is required. For SLBs, verification of KPIs is required. For Transition Bonds, it is required to demonstrate that projects are aligned to recognized taxonomies and 1.5°C pathways.

Market Size estimates indicate that Green Bonds are the largest segment of the market, with Transition Funds totaling \$318 billion in H1 2025. The transition bond market is in its infancy and has growth potential in line with ICMA guidelines.

Key Challenge varies in terms of instrument-specific risks. For SLBs, ambition level varies significantly. For Transition Bonds, it may be challenging to require entity-level plans. For all instruments, data infrastructure is a binding constraint.



## V. CONCLUSION

This paper has sought to provide a comprehensive assessment of green bonds and climate funds as financial tools for sustainable development. The Multi-Layer Sustainable Finance Evaluation Framework allows for the analysis of the instrument's characteristics, issuer's credibility, impact measurement infrastructure, and market ecosystem.

### **Some key observations have been derived from this analysis.**

Firstly, the sustainable finance ecosystem has fundamentally changed, moving from the traditional green bonds to a more diversified ecosystem that includes sustainability-linked bonds, transition bonds, and sub-labels. The introduction of the ICMA Climate Transition Bond Guidelines in the latter part of 2025 is a watershed moment that sets the formal guardrails for the financing of the energy transition in hard-to-abate sectors. Second, investors' priorities invariably place credibility with the issuer above instrument type. The NatWest study's discovery that fund managers focus on "the issuer or activity itself, rather than the nature of issuance" has significant implications for corporate strategy. Firms must be able to clearly articulate transition paths to access growing transition capital pools, which globally exceeded \$318 billion in H1 2025.

Third, well-functioning MRV systems are the key to enabling credible and scalable climate finance. The shift from manual systems that can capture 30-40% of project revenues to dMRV systems that can lower costs by 50-70% has the potential to mobilize SME participation in climate finance markets. Automation can transform measurement from a cost to a strategic asset.

Fourth, emerging markets are developing an impressive track record while still struggling with challenges. Nigeria's oversubscribed green bonds and planned issuance of a N500 billion 2026 green bond are examples of increasing investor confidence. Yet, the ability of the private sector to participate is limited by the lack of project structuring expertise, inadequate ESG data infrastructure, and risks. The \$277 billion annual climate finance need in Africa is both an obstacle and an opportunity.

Fifth, institutional mainstreaming is gaining pace, with central banks such as the Bank of Korea increasing ESG assets under management from \$5.45 billion to \$20.38 billion in four years and investing in BIS climate funds. The mainstreaming of climate considerations in the management of reserves is an indicator of the long-term commitment of institutions.

Sixth, the underlying trade-off between impact and return remains unresolved. Although "few investors are willing to sacrifice financial return to support climate transition," the scale of the investment need—up to \$10 trillion annually—means that sustainable finance needs to deliver on both fronts. The problem for those developing instruments, making offerings, and formulating policies is how to create alignment between financial performance and climate impact.



However, certain limitations of this review must be acknowledged. First, there is a scarcity of empirical evidence regarding real-world emissions reductions achieved through certain instruments. The evolution of frameworks is also very swift, making it difficult to keep up with evaluations. There is also a scarcity of geographical data from emerging markets. The interaction of various instrument forms in issuer capital structures also needs to be examined.

Future research directions that can be derived from this analysis are: research on the performance of transition bond-funded projects over time in terms of emissions reduction; research on comparing MRV infrastructure effectiveness in various industries; research on the relationship between transition plan effectiveness and financial performance; research on catalytic roles in emerging markets by development finance institutions; and research on how digital MRV technology can be used to enhance SME climate finance.

"The potential mainstreaming of Climate Transition Bonds may be arriving late in the global debate, but if it happens, it may be on time for Mexico and Latin America," observes Arturo Palacios, Carbon Trust. The same might be said for Africa, Asia, and other regions where industrial transformation needs to be sped up. The tools are available, the frameworks are developing, and the capital is prepared. The question is whether or not issuers can develop a credible story for transition and the measurement tools to gain investors' trust.

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