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Comparative Study of Green Bond Markets in Developed and Emerging Economies

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Abstract

This paper presents a comparative, data-driven analysis of green bond market development in developed and emerging economies from 2015 to 2024. Using published datasets from Climate Bonds Initiative (global green bond issuance) and IFC/World Bank (emerging market green bond issuance), we conduct a 10-year trend analysis covering growth dynamics, volatility, and the changing share of emerging markets in global issuance. Results indicate rapid market expansion with step-changes around 2021 and sustained high issuance in 2022-2024. Emerging market issuance grew strongly up to 2023, increasing its share of global issuance to above 20% in 2022-2023, before a notable contraction in 2024. The study examines drivers such as policy frameworks, taxonomies, and disclosure regimes, as well as investor demand, issuer diversification, and macro-financial conditions. It concludes with policy and market recommendations to deepen liquidity, reduce verification costs, and expand credible pipelines of bankable green projects, particularly in emerging economies.

Keywords: Green bonds, Sustainable finance, Developed markets, Emerging markets, Climate Bonds, IFC, Trend analysis, ESG, Taxonomy, Climate finance

1. Introduction

The transition to sustainable development has become one of the defining economic challenges of the twenty-first century. Climate change, biodiversity loss, air and water pollution, and resource depletion are no longer viewed only as environmental issues; they are increasingly understood as systemic economic and financial risks. Climate-related disasters can damage infrastructure, disrupt supply chains, reduce agricultural productivity, and raise public health expenditures. In addition, policy measures to reduce greenhouse gas emissions, such as carbon pricing, emissions regulations, and fossil fuel phase-downs, can reshape industrial competitiveness and the cost of capital across sectors. Consequently, the financial system is expected to play a central role in mobilising resources for both climate mitigation (reducing emissions) and climate adaptation (reducing vulnerability and improving resilience).

Green finance refers to financial products, policies, and investment practices that support environmentally sustainable outcomes. Within green finance, green bonds have gained exceptional prominence because they combine the scale and efficiency of debt capital markets with a clear environmental purpose. A green bond is a fixed-income instrument where the issuer commits to allocating the proceeds toward eligible green projects such as renewable energy, energy efficiency, clean transport, sustainable water and wastewater management, pollution prevention, and climate-resilient infrastructure. Green bonds often require additional disclosure, tracking of proceeds, and reporting on allocation and impact. Many issuances are supported by external reviews or verification processes, which can improve credibility and investor confidence.

Since the first labelled green bonds were issued in the late 2000s, the market has evolved rapidly. Over the last decade, issuance volumes have increased from tens of billions of dollars annually to hundreds of billions. This expansion has been accompanied by increasing diversity in issuers, sectors, and geographies. Sovereign green bonds have emerged as benchmark instruments that signal national climate commitments, while corporates and financial institutions have scaled issuance to finance energy transition investments and sustainable infrastructure. At the same time, investor demand has grown due to ESG integration, climate risk awareness, and net-zero portfolio strategies.

A key feature of this evolution is the uneven development of green bond markets between developed and emerging economies. Developed economies typically have deeper and more liquid capital markets, larger institutional investor bases, and stronger disclosure frameworks. These conditions enable frequent issuance, support secondary market trading, and reduce the costs of reporting and verification. Emerging economies, in contrast, often have higher sustainable infrastructure needs but face barriers such as limited domestic market depth, higher cost of capital, currency volatility, and constraints in bankable green project pipelines. Despite these constraints, emerging markets have demonstrated strong growth in green bond issuance in recent years, suggesting significant potential when enabling conditions are strengthened.

2. Literature Review

Early works by Flammer (2021) and Ehlers & Packer (2017) trace the evolution of green bonds, highlighting how investor demand for climate-aligned assets and international policy commitments (e.g., the Paris Agreement) catalysed market expansion. Global issuance surged when institutional investors increasingly incorporated environmental, social, and governance (ESG) criteria into portfolio strategies (Karpf & Mandel, 2018). Research also underscores the importance of credible market standards such as the Green Bond Principles (ICMA, 2021) and voluntary national taxonomies in reducing information asymmetry and supporting investor confidence. (Zerbib (2019) and Baker et al. (2018) provide empirical analyses showing a modest yield discount for green bonds relative to conventional bonds with similar characteristics in developed markets, suggesting that investor preference for “green” can translate into pricing benefits. Tang & Zhang (2020) argue that the existence of greenium is contingent on liquidity and credit quality, and it may diminish in smaller or less liquid emerging markets. Their work suggests that pricing differences often reflect market microstructure and investor behaviour rather than intrinsic environmental value alone. Hachenberg & Schiereck (2018) and Schonborn & Kuhn (2020) emphasize that robust disclosure regimes and taxonomies such as the EU Taxonomy reduce uncertainty and enhance market integrity. The absence of harmonised standards in emerging markets contributes to fragmentation and greenwashing risk (Fatica, 2021; Flammer, 2022) Such literature underscores the interplay between regulatory clarity and investor confidence, highlighting why developed

economies with stronger frameworks exhibit more stable issuance (Delis et al., 2021; Yao et al., 2022) Scholars argue that robust external review processes and post-issuance impact reporting are essential to maintain credibility. Second-party opinions, certification standards (e.g., Climate Bonds Standard), and increasing digital transparency are identified as best practices to mitigate greenwashing and sustain investor confidence.
Zerbib (2021) and Krueger et al. (2020) suggest that developed markets benefit from deeper capital pools and institutional frameworks that support large, diverse issuance bases and stable secondary markets.

2.1 Statement of the Problem

Although green bonds have grown rapidly as a sustainable finance instrument, their development remains uneven across developed and emerging economies. Developed markets benefit from deep capital markets, strong regulatory frameworks, and diversified institutional investors, resulting in stable issuance and better disclosure practices. In contrast, emerging markets face constraints such as limited liquidity, higher borrowing costs, currency risk, verification expenses, and weaker reporting standards. The literature also highlights mixed evidence on green bond pricing advantages and rising concerns about greenwashing and inconsistent impact reporting. Hence, there is a need for comparative analysis to explain these structural differences and market volatility.

2.2 Objectives

1. To map the 10-year (2015-2024) issuance trend for global green bonds and for emerging market green bonds.
2. To estimate the issuance trend attributable to developed markets plus supranational and compare growth patterns.
3. To assess the changing share of emerging markets in global green bond issuance and identify periods of acceleration/deceleration.
4. To discuss key market, policy, and institutional drivers of observed trends.

3. Research Methodology

This study employs an analytical research methodology to examine the growth and progress of the green bond market as a key instrument of sustainable finance during the

period 2015–2024. The study is based on secondary data sources, data collected from such sources as journals, annual reports, books, research articles, and websites, etc. A combined dataset is constructed using these sources, and the collected data is analysed through trend analysis and statistical indicators such as year-on-year (YoY) growth rates, compound annual growth rate (CAGR), and the share of emerging markets in global green bond issuance.

3.1 Limitations

The developed-market issuance series is derived from Global minus Emerging based on two different published datasets. Differences in market coverage, classification, and alignment screening may introduce measurement error. Future work can improve precision by using a single harmonised database with consistent regional classifications.

4. Results

4.1 Data Analysis of 10-Year (2015-2024) Issuance Trend for Global Green Bonds and for Emerging Market Green Bonds.

This section analyses green bond issuance trends over 2015–2024, covering both the global market and emerging economies. This analysis highlights how green bonds evolved from a niche instrument into a mainstream channel for sustainable finance over the last decade.

Table 1 Issuance trends and derived indicators (USD bn; %)

Year	Global (USD bn)	Emerging (USD bn)	Developed + Supranational (derived)	EM share (%)	Global YoY (%)
2015	41.8	3.7	38.1	8.9	
2016	81.0	20.1	60.9	24.8	93.8
2017	155.5	25.1	130.4	16.1	92.0
2018	167.6	28.2	139.4	16.8	7.8
2019	257.7	40.0	217.7	15.5	53.8
2020	269.5	33.9	235.6	12.6	4.6
2021	517.4	77.1	440.3	14.9	92.0
2022	509.5	101.2	408.3	19.9	-1.5
2023	587.6	135.3	452.3	23.0	15.3

2024	670.9	99.0	571.9	14.8	14.2

Source: Climate Bonds Initiative (CBI) and IFC/World Bank

Figure 1 shows The 2015-2024 period can be interpreted through three broad phases of market development, each shaped by different drivers and constraints.

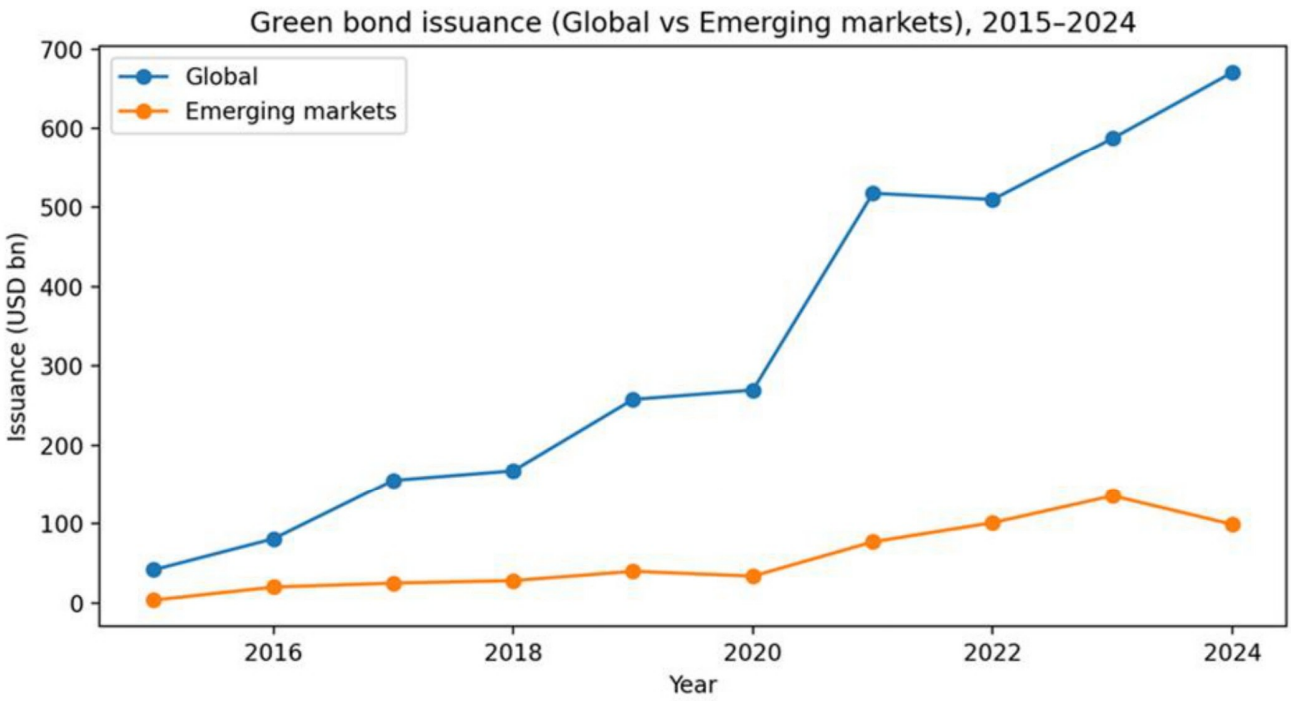

Figure 1: Global vs Emerging market issuance (2015–2024)

Phase 1: Rapid early expansion (2015-2017)

During 2015-2017, global green bond issuance expanded rapidly from USD 41.8 billion to USD 155.5 billion. This period reflects early adoption by supranational institutions, European agencies, and pioneering corporates. The rapid growth suggests strong demonstration effects: early successful issuances helped build investor confidence, improved market awareness, and encouraged replication by new issuers. Emerging markets also began to participate more actively during this phase, though issuance remained concentrated among a small number of countries and issuers.

Phase 2: Consolidation and resilience (2018-2020)

Between 2018 and 2020, issuance growth continued but at a more moderate pace, reaching USD 269.5 billion in 2020. The market began to consolidate with greater issuer

diversity and broader sectoral participation. Green bond frameworks became more standardised, and external review practices strengthened. Importantly, the 2020 issuance level indicates resilience even under pandemic-related disruptions. While global economic uncertainty increased, the continued issuance suggests that green bonds had become sufficiently institutionalised within sustainable finance strategies to remain viable.

Phase 3: Acceleration and maturity (2021-2024)

The step-change in 2021, with issuance rising to USD 517.4 billion, marks a shift to a higher issuance regime. This phase reflects increasing alignment with net-zero commitments, stronger national and regional policy frameworks, and increased investor allocation to sustainable assets. In 2022-2024, global issuance remained above USD 500 billion annually, indicating market maturity. Emerging markets played a stronger role during 2022-2023, but the decline in 2024 highlights continued structural vulnerabilities. Higher global interest rates, tighter liquidity conditions, and changing relative costs between labelled and conventional issuance can influence issuer decisions, especially in markets where investor demand is less deep.

Figure 2 highlights the green bond issuance fluctuating trend from 2015 to 2024. In the year 2015, market participation was lowest at around 9%, indicating the dominance of developed economies. A sharp rise occurred in 2016, reaching nearly 25%, reflecting strong growth in EM green bond activity. However, the share declined during 2017-2020, falling to about 12-13% in 2020 due to economic slowdown and pandemic uncertainty. From 2021 onwards, EMs recovered steadily, rising to about 20% in 2022 and peaking again near 23% in 2023. In 2024, the share dropped to around 15%, showing volatility.

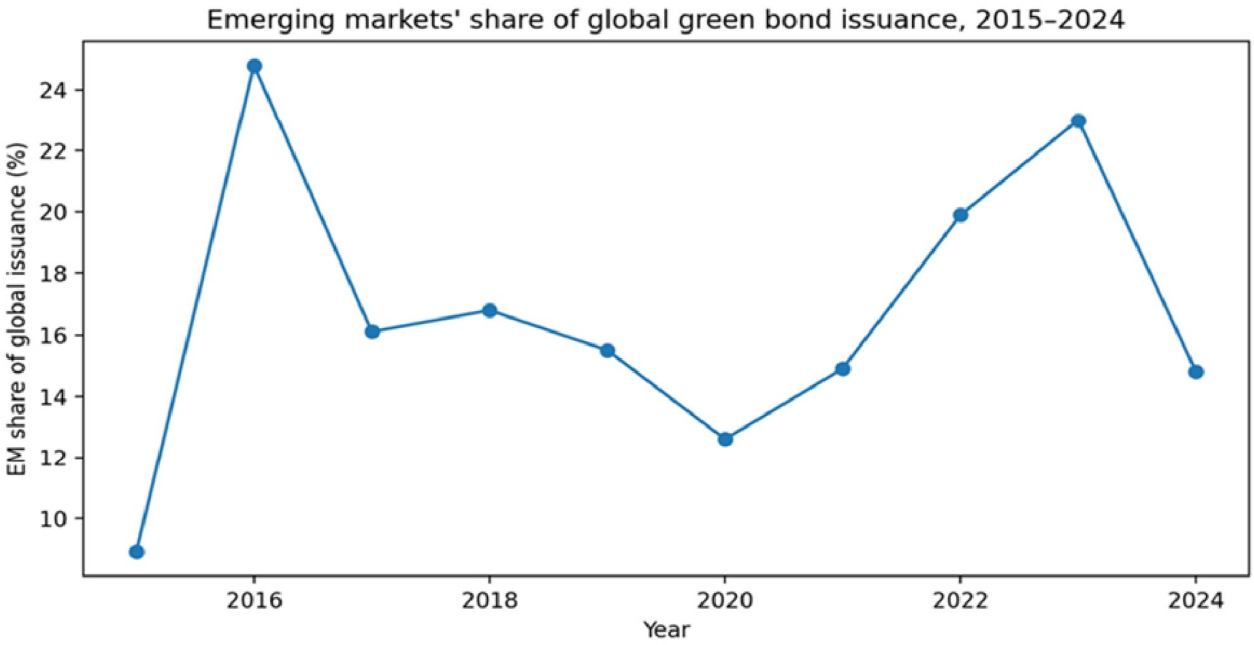

Figure 2: Emerging market share of global issuance (2015-2024)

4.2 Comparative Trends Analysis Reveal the following Insights

First, both developed and emerging markets exhibit strong long-term growth in green bond issuance, indicating that green bonds have become an established mechanism for sustainable finance. However, the scale of issuance remains heavily concentrated in developed markets and supranationals, reflecting differences in market maturity and institutional capacity.

Second, emerging market issuance growth has been more volatile. While emerging markets achieved strong expansion in 2021-2023, the decline in 2024 suggests that market participation is sensitive to borrowing cost differentials, liquidity conditions, and issuer incentives. Developed markets, with deeper investor bases and more diversified issuers, have maintained more stable issuance even during changing macro-financial conditions.

Third, the emerging market share of global issuance is not steadily increasing but fluctuates. The rise above 20% in 2022-2023 indicates meaningful progress in emerging market participation, but the decline to around 14.8% in 2024 suggests that structural

resilience is not yet fully established. This has implications for global climate finance distribution, as emerging economies often face the greatest climate investment needs.

Fourth, the step-change in global issuance around 2021 suggests that policy and investor alignment can shift markets into higher issuance regimes. Net-zero commitments, ESG integration, and improved market infrastructure can generate rapid scaling. For emerging markets, similar step-changes may be possible if enabling conditions such as taxonomy clarity, disclosure quality, credit enhancement, and project pipelines are strengthened.

Finally, the trends highlight the importance of credibility. As markets scale, concerns about greenwashing increase. Investors increasingly demand robust reporting, credible external reviews, and evidence of environmental impact. Markets with stronger credibility frameworks are likely to attract more stable demand and sustain issuance growth over time.

4.3 Developed Economies: Strengths and Market Drivers

Developed economies have generally led the growth of green bond markets due to several structural advantages that support both issuance scale and market resilience.

First, developed economies have deeper and more liquid capital markets. Large sovereign bond markets, well-established corporate bond segments, and sophisticated market infrastructure enable frequent issuance and facilitate secondary market trading. Liquidity is a crucial determinant of investor participation because it reduces transaction costs and enables portfolio rebalancing. Liquid markets also support better price discovery, which can attract more issuers and investors over time.

Second, developed economies have large institutional investor bases. Pension funds, insurance companies, sovereign wealth funds, and asset managers in developed markets often have explicit ESG mandates and long-term investment horizons. This investor demand supports stable issuance volumes and may contribute to tighter pricing for credible green bonds. In addition, many investors in developed markets have stronger

internal capacity for ESG analysis, enabling them to evaluate the credibility of green bond frameworks and impact reporting.

Third, developed economies have stronger regulatory and disclosure ecosystems. Many developed jurisdictions have implemented sustainability reporting frameworks, green bond guidelines, and taxonomy systems that improve transparency and reduce information asymmetry. Such frameworks reduce greenwashing risk and support investor confidence. The existence of clear disclosure expectations also encourages issuers to develop robust internal systems for tracking and reporting on the use of proceeds.

Fourth, issuer diversity is greater in developed markets. Sovereigns, municipalities, development banks, utilities, banks, and corporates all participate. This diversity enables market scaling across sectors and reduces reliance on a small set of issuers. Developed markets also often have stronger credit profiles, enabling lower borrowing costs and greater issuance capacity. Municipal green bonds, for example, can finance public transport, energy efficiency retrofits, and water infrastructure, while corporate green bonds can finance renewable energy, green buildings, and sustainable industrial processes.

Finally, developed economies benefit from policy support and climate commitments. Net-zero targets, renewable energy incentives, and green infrastructure programmes generate demand for financing and encourage issuers to use green bonds as a funding mechanism. Policy initiatives can also reduce uncertainty, enabling issuers to plan long-term capital investment programmes. These strengths help explain why developed markets and supranational remain the dominant contributors to global green bond issuance over the 2015-2024 period.

4.4 Emerging Economies: Opportunities and Constraints

Emerging economies face both significant opportunities and substantial constraints in green bond market development. Understanding this dual nature is essential for interpreting issuance patterns and designing policies that strengthen market resilience.

4.4.1 Opportunities in Emerging Markets

Emerging economies have large green investment needs. Rapid urbanisation, growing energy demand, and infrastructure expansion create opportunities to finance renewable energy, sustainable transport, water systems, and resilient urban development through green bonds. Emerging markets are also often more climate-vulnerable, making adaptation investments critical. Financing climate resilience, such as flood protection, drought-resistant water systems, and resilient transport networks, requires long-term capital that green bonds can help mobilise.

Emerging markets can benefit from sovereign green bond issuance, which provides benchmark pricing and signals government commitment. Sovereign issuance can catalyse private issuance by improving market visibility and developing investor confidence. In addition, sovereign green bonds can support the development of local currency green bond markets by establishing reference yields and promoting domestic investor participation.

Multilateral development banks (MDBs) and development finance institutions (DFIs) play an important role in emerging market green bond markets. They can provide credit enhancement, guarantees, and technical assistance to support emerging market issuers. They can also invest as anchor investors, improving deal execution and lowering perceived risk. Over time, such participation can strengthen market confidence and encourage greater private investor involvement.

Another opportunity arises from increasing global ESG demand. International investors increasingly seek exposure to emerging market green assets to diversify portfolios and support global climate objectives. If emerging market issuers can meet disclosure and credibility expectations, they may attract international capital and potentially reduce financing constraints.

4.4.2 Constraints and Challenges in Emerging Markets

Despite these opportunities, emerging markets face constraints that can limit issuance scale and stability. Domestic capital markets may be less liquid, and institutional investor bases may be smaller. Limited liquidity increases investor risk perception and can raise yields demanded by investors. In addition, emerging market bond markets may have

shorter maturities, limiting the ability to finance long-duration infrastructure projects. Currency risk is a major concern, particularly for issuers relying on foreign currency financing. When revenues are in local currency, but debt is denominated in foreign currency, exchange rate depreciation can increase debt servicing burdens. This risk may discourage foreign currency green bond issuance or raise financing costs. Developing local currency green bond markets can mitigate this risk, but requires domestic investor depth and supportive market infrastructure.

Higher borrowing costs and refinancing risks can reduce incentives to issue labelled green bonds if conventional funding is cheaper. In some cases, issuers may choose conventional bonds rather than green bonds if the additional costs of verification and reporting are not compensated by pricing benefits or investor access advantages. This issue becomes more pronounced when interest rates rise and liquidity tightens, as seen in periods of global monetary tightening.

Verification and reporting costs are another barrier. Green bonds often require external reviews, impact reporting, and internal monitoring systems. These costs can be significant for first-time issuers and smaller entities. In addition, inconsistent disclosure practices and weak enforcement mechanisms may raise greenwashing concerns, reducing investor confidence and limiting demand.

Project pipeline constraints also matter. To issue green bonds, issuers need a pipeline of eligible projects that meet taxonomy requirements and are financially viable. In some contexts, limited project preparation capacity and regulatory uncertainty restrict the availability of bankable green projects. Without a strong pipeline, issuers may struggle to sustain repeat issuance.

These constraints contribute to volatility in emerging market issuance, as observed in the 2024 decline after strong growth in 2022-2023. Strengthening market infrastructure and reducing structural barriers are therefore essential for stabilizing and scaling emerging market green bond markets.

4.5 Policy and Market Implications for Strengthening Green Bond Markets

The comparative analysis highlights several policy and market implications for strengthening green bond markets and ensuring more inclusive climate finance mobilisation.

1. Strengthen taxonomy and disclosure regimes

Clear and credible taxonomies help define what qualifies as "green" and reduce greenwashing risk. Harmonising taxonomy principles and improving disclosure comparability across jurisdictions can attract international investors and improve market confidence. Regulators can also encourage standardised impact reporting metrics to improve transparency.

2. Reduce transaction and verification costs

Standardised issuance frameworks, templates, and technical assistance can reduce costs for issuers, especially first-time issuers and sub-sovereign entities. Subsidising external review costs or creating public verification support mechanisms may also help. In emerging markets, capacity-building programmes for issuers and regulators can improve the quality of frameworks and reporting.

3. Deepen domestic investor bases and improve liquidity

Developing domestic institutional investor participation and supporting market-making capacity can improve secondary market liquidity. Greater liquidity reduces investor risk perception and can lower borrowing costs. Policies that encourage pension funds and insurance companies to invest in green bonds can strengthen demand.

4. Expand credit enhancement and blended finance

Guarantees, first-loss structures, and blended finance mechanisms can crowd in private capital, especially for emerging market issuers facing higher risk premiums. MDBs and DFIs have a key role in supporting such mechanisms. Credit enhancement can also support longer maturities and local currency issuance.

5. Build robust pipelines of bankable green projects

Strong issuance growth requires continuous pipelines of eligible projects. Improving project preparation capacity, regulatory clarity, and revenue models for green infrastructure is essential. Governments can support project pipelines through clear policy signals, procurement frameworks, and investment planning.

6. Improve impact reporting and transparency

Investors increasingly demand evidence of environmental impact. Strengthening impact reporting frameworks can enhance credibility and expand investor demand for green bonds. Digital reporting platforms and independent audits can improve trust and reduce reporting burdens over time.

5. Conclusion

The 2015-2024 period reflects the rapid growth of green bond markets, with global issuance expanding from USD 41.8 billion in 2015 to USD 670.9 billion in 2024. Emerging markets increased their participation markedly through 2023, raising their share of global issuance above 20% in 2022-2023, before a notable contraction in 2024 reduced their share to approximately 14.8%. The comparative evidence indicates that developed markets remain the primary drivers of global green bond issuance due to deeper capital markets, stronger regulatory ecosystems, diversified issuers, and large institutional investor bases. Emerging markets, despite large opportunities and climate investment needs, face structural constraints such as limited liquidity, higher borrowing costs, currency risks, verification costs, disclosure gaps, and project pipeline challenges.

Strengthening green bond market credibility and inclusiveness requires coordinated policy and market interventions. Improving taxonomy and disclosure frameworks, reducing transaction costs, deepening investor bases, expanding credit enhancement mechanisms, and building pipelines of bankable green projects are essential for sustaining market growth. A more resilient and inclusive green bond market will play a vital role in financing the global transition to sustainable development and achieving climate goals, especially by mobilising capital toward emerging economies where climate investment needs are most pressing.

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