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REPORT

Emerging Market Green Bonds

IFC-Amundi Joint Report

JULY 2023

Amundi
ASSET MANAGEMENT

IFC | International Finance Corporation
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Amundi, the leading European asset manager, ranking among the top 10 global players, offers its 100 million clients—retail, institutional and corporate—a complete range of savings and investment solutions in active and passive management, in traditional or real assets. This offering is enhanced with IT tools and services to cover the entire savings value chain. A subsidiary of the Crédit Agricole group and listed on the stock exchange, Amundi currently manages more than €1.9 trillion of assets. With its six international investment hubs, financial and extra-financial research capabilities and long-standing commitment to responsible investment, Amundi is a key player in the asset management landscape. Amundi clients benefit from the expertise and advice of 5,400 employees in 35 countries.

Emerging Market Green Bonds

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Foreword

This fifth edition of the 'Emerging Market Green Bonds Report' reviews key green, social, sustainability, and sustainability-linked (GSSS) bond market trends in 2022 and outlines our expectations for 2023 and beyond. It also discusses the implications for the asset class of recent developments in policy, regulation, and technology. As in the previous four editions, this year's report is also the result of joint work by Amundi, a leading European asset manager, and the International Finance Corporation (IFC), a member of the World Bank Group.

Collaboration with financial institutions, the private sector, and governments is integral to IFC's focus on mobilizing private capital for sustainable development and climate-focused goals. IFC was an early adopter of green bonds and has issued over $10 billion of them across 178 securities in 20 currencies.

In addition, IFC provides technical assistance to issuers and investors in developed and emerging markets and promotes integrity in the green bond market through its role chairing the executive committee of the Green, Social, and Sustainability-Linked Bond Principles.

Amundi remains committed to the development of the market for green bonds and other instruments of sustainable finance. Its collaboration with IFC on both the Amundi Planet Emerging Green One and the Build-Back-Better Emerging Markets Sustainable Transaction funds (launched in 2018 and 2021, respectively) is designed to stimulate both demand and supply for green bonds in emerging markets.

However, this is not an easy time for the asset class amid economic, financial, and geopolitical instability around the world. Last year was one of just five in the last century in which both U.S. Treasuries and the S&P 500 declined. This was the result of a sharp monetary tightening from major central banks in response to growing inflationary pressures. Higher rates on a global scale alongside more restrictive funding conditions depressed bond valuations and led to sharp currency swings across emerging markets. This, together with mounting geopolitical risk on the back of Russia's invasion of Ukraine, translated into meaningfully lower fixed-income issuance, as well as the first-ever annual decline in GSSS issuance.

This was mostly driven by lower GSSS supply from supranational issuers as well as borrowers in emerging markets outside China. On the positive side, Chinese GSSS

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issuance, mostly comprising green bonds, was exceptionally strong, overtaking the United States and Germany to make it the world's largest green bond issuer for the first time.

Nevertheless, geopolitical and financial pressures alongside the corrosive influence of greenwashing risks, continue to threaten growth in the GSSS asset class. Any reversal in this market would be a major setback for global efforts to meet the climate goals set out in the Paris Agreements of 2015. Sustainable finance markets are pivotal in making up for shortfalls in capital available for funding economic and energy transitions in emerging markets because they channel private sector investment to areas where it is needed most. Therefore, considerable effort needs to be dedicated to keeping growth in the GSSS market on track, improving regulation, harmonizing best-practice guidelines, mobilizing policy, and promoting awareness.

Over the medium term, we do expect green bond issuance in emerging markets to continue to grow. Driving this growth will be: (1) an acceleration in the energy transition; (2) a pricing advantage for issuers relative to developed markets; and (3) favorable macroeconomic conditions—notably higher nominal yields in a context of lower growth which is often supportive of fixed income relative to equities.

Robust investor appetite and supportive policy environments will remain critical for green and sustainable finance to continue building on the momentum generated in recent years. This report discusses potential actions aimed at increasing GSSS bond penetration in emerging markets.

Key Messages

- Demand for funding to finance energy transitions as developing-country governments and corporates pursue environmental goals set by the Paris Agreement will drive growth in issuance of green, social, sustainability, and sustainability-linked (GSSS) bonds. Green bond issuance will bounce back in 2023 to 14 percent growth in emerging markets outside China, easing to around 11 percent in 2024, according to our central forecast. However, new green bond deals will be markedly slower in China, largely on account of weaker-than-expected economic recovery from the pandemic. Given the country's economic weight, this will bring overall growth in emerging market green bond issuance to -1 percent in 2023, followed by a recovery to around 11 percent the following year.

- Bolstering the GSSS bond market in developing countries should be a priority for governments, monetary policy makers, and multilateral institutions. The asset class is crucial for channeling private investment toward green transitions and the need for this type of funding is especially acute in emerging markets where fiscal resources are scarcer than in developed economies. Failure to underpin these markets will leave them struggling to meet climate targets. As such, a 13 percent reversal in global GSSS issuance in 2022, while more modest than the 26 percent fall in the broader fixed-income market, was the first-ever annual decline for the asset class, highlighting the fragility of private investment flows.

- A crucial step in enhancing the credibility of the GSSS asset class and luring more private funding to sustainable projects in emerging markets will be to address the problem of 'greenwashing' whereby issuers misstate the extent to which an activity meets sustainability criteria. There are encouraging signs of progress in addressing greenwashing across the green finance market. For example, mandatory disclosure practices related to sustainability are becoming more common in different regions, while entities are using voluntary guidelines more. There have also been advances in developing global guidelines on common definitions and methods.

- Fragmentation of emerging financial markets is a hurdle for international investors because of a lack of comparability between different countries or regions, each with their own regulations and market conditions. Fragmentation brings higher screening costs and reduces overall investment as a result. Standardization of sustainable finance taxonomies globally would make comparability easier, increase transparency, provide regulatory consistency, and ultimately reduce

transaction costs for investors. A number of jurisdictions have already moved toward strengthening GSSS bond taxonomies and are seeking to make them compatible with international peers.

- Central banks may be pivotal in making emerging market financial markets supportive of green transitions. In terms of monetary policy, they could also face a challenge to price stability from 'greenflation,' or the rising prices associated with overhauling economies and implementing green transitions. In any case, they will need to incorporate climate risks into regulatory and supervisory frameworks. These, in turn, could shape the data disclosure and risk management practices required by regulators of the financial institutions that they supervise. In addition, they could also actively support the greening of economies by adapting their lending operations, collateral frameworks, and asset purchase programs to favor green assets, thereby underpinning GSSS demand.

- Financial technology can enhance the development of GSSS issuance in emerging markets by improving transparency, enhancing data collection, and enabling comparability across markets. This would increase these markets' appeal to international money managers as they assess potential allocations for their funds. Distributed ledger technologies, or blockchains, are already being used in financial transactions as they enable more efficient monitoring and accreditation. Blockchain can provide a tamper proof, encrypted, and transparent system that will appeal to private investors.

- Synthetic securitizations, backed by public sector guarantees, are also a promising solution to the challenge of attracting more private capital into riskier assets such as emerging market debt. The experiences of Italy and Greece, which used this approach to repackage non-performing loans on bank balance sheets and sell them on as securities to investors, thereby successfully unlocking lending into the real economy, could be used as models for emerging markets. Development finance institutions could play an active role by backstopping riskier portions of the debt, thereby improving the risk-reward profile of more senior tranches of the securitization and making them viable for investors.

Executive Summary

Green bonds and other debt instruments used to raise money for sustainable causes are key to ensuring enough capital is channeled from international investors toward funding the energy transition in emerging markets. This burgeoning segment of the international capital market has achieved remarkable progress since the first green bonds were issued more than a decade ago.

Even so, 2022 was a troubled year for international capital markets amid growing geopolitical tensions in the wake of Russia's invasion of Ukraine and tightening monetary policy in major economies as they wrestled with inflationary pressures. All this rattled investors and global fixed-income issuance fell by 26 percent from a year earlier. Encouragingly, issuance of green, social, sustainability, and sustainability-linked (GSSS) bonds proved more resilient, falling a more modest 13 percent. But this was still the sector's first-ever annual fall in issuance and a significant setback in the context of the 68 percent growth seen the previous year.

We do not anticipate this loss of momentum for GSSS issuance will last, however. We expect growth in the asset class to resume, driven by an acceleration in the energy transition reflecting a greater sense of urgency around meeting climate targets. We also foresee growing demand for GSSS assets given macroeconomic dynamics—notably higher nominal yields in a context of weaker growth—supportive of the broader emerging market fixed-income asset class.

In our central scenario, we forecast green bond issuance will bounce back in 2023, growing 14 percent year-on-year in emerging markets outside China, before easing to a more modest 11 percent increase in 2024. However, including China in the outlook presents a markedly different picture on account of its economic weight. We expect green bond issuance growth for the broader emerging markets category including China to see a 1 percent fall in 2023, followed by a recovery of around 11 percent growth in 2024, bringing the cumulative increase to around 10 percent over the next two years.

Even so, setbacks to GSSS markets in developing countries during the past year are an ominous development, given that they represent a reversal of private investment flows toward sustainable projects in economies that face difficulties funding their own energy transitions.

This highlights an urgent need to boost the viability of the GSSS asset class in emerging markets where local investment is scarcer, governments' fiscal resources are less ample, and the proportion of GSSS bonds rated by internationally recognized rating agencies is also smaller than in advanced economies. However, it also highlights the equally urgent need to boost local fixed-income markets in general. Failure to underpin these needs will leave emerging market countries struggling to meet climate targets.

In order to address these challenges and minimize the risk of greenwashing, the report recommends imposing tighter disclosure requirements and pursuing greater homogenization of green taxonomies to reduce the fragmentation of the asset class. It also discusses ways to increase relative demand for GSSS bonds and boost their penetration in local markets. In addition, the report examines the role central banks can play by "tilting" their monetary policy operations toward GSSS assets, before assessing

how blockchain-based and other technologies can help reduce transaction costs while increasing transparency and improving record keeping. The report also examines financial instruments such as synthetic securitizations that can help reduce the cost of capital for emerging market projects and increase their appeal to developed market investors.

Finally, the report also looks at actions taken by select emerging market governments. First of all, we discuss how Brazil's newly elected government is pursuing an ambitious environmental overhaul of the economy which includes plans for an inaugural green bond in 2023. A successful sovereign issue along these lines is likely to boost the broader Brazilian GSSS market. Meanwhile, Uruguay recently carried out an issuance of sustainability-linked bonds with a coupon structure tied to performance on pre-determined environmental goals. The structure incorporates a step down in interest payments if those targets are met, but a step up otherwise. The offering was oversubscribed, attracting new investors to Uruguay for the first time and encouraging other corporate issuers in the region to consider using a similar structure for issues of their own. Other recent innovations include a climate budget tagging strategy adopted by Indonesia enabling the evaluation of climate-related expenditure by the government. This has proved effective at preventing greenwashing and making Indonesian GSSS assets more attractive to international fund managers.

Highlights of GSSS Issuance in 2022:

- Global GSSS bond issuance fell 13 percent in 2022, the first annual fall in issuance, though the sector outperformed the broader fixed-income market which fell 26 percent. This drove global GSSS bond penetration up to 13.6 percent, an all-time high.

- Within the GSSS segment, the setback was particularly acute among supranational issuers, which fell 38 percent year-on-year as well as across emerging markets outside China where issuance declined 30 percent. On the positive side, China's green bond issuance was exceptionally strong, rising 61 percent.

- As a result of this, China not only remained the largest green bond issuer in emerging markets—73 percent of the total—but it also became, for the first time, the largest green bond issuer globally after overtaking Germany and the United States.

- Green bonds remained the largest GSSS sub-segment at 69 percent of total GSSS issuance in emerging markets, with sustainability bonds coming in second with 21 percent. In emerging markets excluding China, however, sustainability bonds became the largest sub-segment at 41 percent, ahead of green bonds with 38 percent.

- Unlike in the previous two years, when non-financial corporates led emerging market green bond issuance, financial institutions took over in 2022, accounting for 52 percent of the total.

- The emerging market greenium —the lower spread on a green bond yield compared with that on a conventional bond from the same issuer—widened during the year, from 4.2 basis points on average in 2021 to 7.2 basis points by the end of 2022.

- The low proportion of emerging market green bonds carrying internationally recognized credit ratings remained a key barrier for investing in the asset class in 2022. Only 14 percent of green bonds issued in China carried investment-grade ratings (by internationally recognized rating agencies) in 2022, down from 16 percent in 2021. In other emerging markets, the proportion was up to 33 percent, from 30 percent the previous year.

1

Introduction

The year 2022 proved a challenging one for international capital markets. For only the fifth time in the last 100 years, U.S. Treasuries and the S&P 500 both ended the year lower than where they started.

Much of the turmoil can be attributed to the sharp monetary tightening pursued by the U.S. Federal Reserve and other central banks as they grappled with the inflationary pressures that took hold in the wake of the COVID-19 pandemic. But Russia's invasion of Ukraine in late February and the resulting geopolitical frictions also dampened the mood, sending bond spreads wider as investors took fright at the heightened sense of risk, making it more costly to borrow in financial markets. As a result, country authorities in emerging markets currently face difficult choices between sustaining financial stability and supporting growth in an environment of tighter global liquidity, increased geopolitical frictions, and slower global growth.

Unsurprisingly, total fixed-income issuance fell by 16 percent from the previous year. The upheavals and primary market shutdowns did not spare the market for green, social, sustainability, and sustainability-linked (GSSS) bonds, as defined in Box 1.1. Bond issuance in this category fell 13 percent from a year earlier, the first ever decline for this still nascent asset class and a sharp reversal from the 68 percent growth recorded in 2021.

This represents an outperformance by GSSS bond issuance versus the broader fixed-income asset class. But it is, nevertheless, an ominous development for sustainable finance, particularly in emerging markets where the capital needed to fund the green transitions is most scarce. Such resources are crucial to put economies on track to meet international climate goals.

Among the challenges faced by GSSS bonds we also acknowledge the ongoing political debate surrounding investment decisions based on environmental, social, and governance (ESG) factors more broadly. Specifically, we highlight legislation passed in Florida (May 2023), along with other U.S. states like Kansas (July 2023) and Indiana (April 2023), which prohibit the consideration of ESG factors in state investments and procurement processes. This reflects the polarized opinions on the topic. In this context, it is worth noting the concerns raised by the Glasgow Financial Alliance for Net Zero (GFANZ), a grouping of insurance companies and pension funds convened by the United Nations. GFANZ warns that political attacks against ESG

could have negative impacts on investors, policyholders, and economies.

However, these setbacks mask a series of encouraging developments. We estimate the so-called greenium in emerging markets widened to 6.4 basis points in 2022, from 4.2 basis points in 2021. This suggests a growing imbalance between supply and demand which continues to make the green bond market attractive for investors, relative to the conventional bond market, in emerging markets.

Meanwhile, a significant development was that overall global funding via green bonds and loans to sustainable projects surpassed that of the fossil fuel sector for the first time in 2022, a sign that the market for green financing is maturing.

GSSS issuance will continue to grow as energy transitions accelerate, and investor demand rises.

Looking ahead, we expect GSSS issuance will continue to grow over time, driven by an acceleration in the energy transition, a wider greenium in emerging markets relative to advanced economies, and macroeconomic dynamics (high nominal rates in a context of weak economic growth) supportive of the fixed-income asset class in developing economies.

Our central scenario forecasts green bond issuance to grow, cumulatively, by 27 percent in emerging markets excluding China over 2023–2024, on the back of an easing of global inflationary pressures driven by a global slowdown and weaker credit growth. In particular, we see green bond issuance bouncing back in 2023 to grow around 14 percent, slowing to a more normalized increase in 2024 of about 11 percent. However, green bond issuance in China will be slower, due to the combination of a weaker-than-expected post-COVID-19 recovery and lower attractiveness of locally issued bonds (on account of relatively low yields versus the United States and Europe). Given China's economic weight, this will bring overall growth in green bond issuance for emerging markets down to around 10 percent in 2023–2024, amounting to a 1 percent decline in 2023, followed by a recovery back to about 11 percent growth the following year.[1]

In the medium term, we expect green bond issuance to be a key beneficiary from an acceleration in the energy transition driven by a greater sense of urgency around tackling climate change. Most recent analyses[2] point to an increase in global temperatures of about 2.7 to 2.8 degrees Celsius above pre-industrial levels under current policies, well above the 1.5 degrees Celsius targeted in the Paris Agreement, adding pressure on policy makers to act.

According to Bloomberg NEF, global investment in the energy transition reached $1.1 trillion in 2022, an all-time high and a 31 percent increase from 2021 (See Exhibit 1-a).[3] While this is encouraging—as it matches global fossil fuel investments for the first time—it also falls short of the $4.55 trillion that needs to be invested annually for the remainder of this decade to get on track under BNEF's Net Zero Scenario.

Three drivers are contributing to most of this acceleration. First, the energy transition is likely to be supported by ongoing global progress at the policy level. During the last COP27 international climate summit, held in Egypt in November 2022, governments agreed to establish a fund to compensate developing countries for the loss and damage that climate change has wrought. Key details on how this will be funded or how to deploy the financial assistance are yet to be agreed and will be up for discussion at COP28 in Dubai, which starts in November 2023. Furthermore, the UN

1 Green bond issuance forecasts have been run by Amundi.

2 See for example, Climate Action Tracker, November 2022 or CDP and OliverWyman, 2022, "Missing the Mark Report,"

3 If we add investments in the power grid, overall energy transition investments would reach $1.4 trillion. See Bloomberg NEF, 2023, "Global Low-Carbon Energy Technology Investment Surges Past $1 Trillion for the First Time," January 26, 2023.

Secretary General has also called for a "Climate Ambition Summit" in September 2023 for governments to seek agreement on new country pledges or nationally determined contributions (NDCs).[4] The Inflation Reduction Act in the United States and the REPowerEU package in the EU should also be viewed as two crucial steps in this direction.

Second, a wider greenium will continue to make green bonds more attractive to issuers than conventional bonds. This is particularly the case in emerging markets where the greenium is widening, as we show in Section 2 of the report, relative to developed economies where the spread advantage appears to be shrinking.[5]

Third, high nominal rates in a context of easing inflationary pressures and weaker growth (on a combination of a weaker-than-expected recovery in China and slacker credit growth in developed markets reflecting events in the U.S. and European banking sectors since mid-March 2023) are likely to be supportive of emerging market fixed income in 2023–2024 in absolute terms. Moreover, emerging market bonds could also outperform local equities as the cumulative rate hikes implemented so far by emerging market central banks feed through to the real economy, translating into weaker growth and downward earnings-per-share revisions.

This is, as discussed earlier, our central scenario. However, as in previous editions of the report, we also run two alternative scenarios for emerging markets. The first of these is the more optimistic ("catch-up") scenario, defined by a faster normalization of inflation rates alongside higher inflows of funds into emerging market debt. Under these conditions, we would expect green bond issuance to grow by close to 20 percent cumulatively in 2023–2024, with 8–10 percent growth in both years.

Our more pessimistic ("slowdown") scenario is defined by a global economic slump driven by much tighter financial conditions than in our central scenario. In this case, we would expect green bond issuance to remain broadly flat, cumulatively, over the next two years, with an 11 percent year-on-year decline in 2023, offset by a 12 percent rebound in 2024.

Policy action, new technology, and better-aligned guidelines can help deepen GSSS markets.

In 2022, GSSS bond issuance was around 0.4 percent of China's gross domestic product (GDP), compared with 0.3 percent a year earlier. For the rest of the emerging market category, the proportion was equivalent to 0.2 percent of GDP, falling from 0.4 percent in 2021. In light of these numbers, bond penetration as a proportion of GDP seems broadly similar in China compared to the rest of the emerging market space. This class of bonds remains more established in developed markets, with issuance in 2022 equivalent to around 1.2 percent of GDP in 2022, down from 1.4 percent in 2021.

Interestingly, bond penetration as a proportion of total debt issuance seems much lower in China than in other emerging markets. China stood at 6 percent in 2022, rising from 3 percent in 2021. In other developing economies, the rate was 16 percent in 2022 and 15 percent in 2021. This puts these emerging markets excluding China ahead of developed country levels of penetration, which were around 13 percent in 2022 and 11 percent in 2021. This also highlights the importance of further developing local fixed-income markets across emerging markets as a pre-condition for sustained growth of the GSSS segment going forward.

Importantly, the low proportion of green bonds carrying internationally recognized credit ratings remained a key barrier for investing in the asset class in 2022. Only 14 percent of green bonds issued in China carried investment-grade ratings (by internationally recognized rating agencies) in

4 UN News, December 19, 2022, "Guterres announces 'no nonsense' climate action summit; calls for practical solutions,"

5 Financial Times, 2023, "Green Bonds: the Disappearing Greenium is a Welcome Development," January 2, 2023.

2022, down from 16 percent in 2021. In other emerging markets, the proportion was up to 33 percent, from 30 percent the previous year.

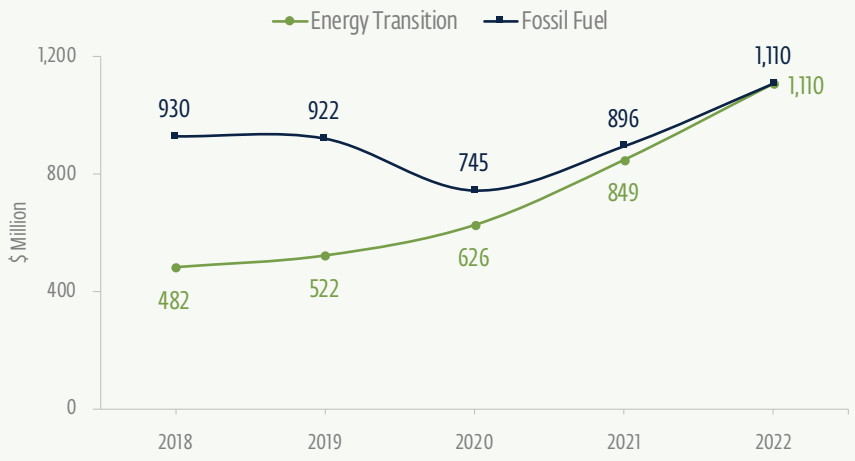
Against this backdrop, the report reviews potential actions to increase GSSS bond penetration across emerging markets.

First, the potential for reputational damage associated with so-called greenwashing, whereby an issuer misstates the extent to which an activity meets sustainability criteria, is also a significant concern for investors. To counter this risk, the report discusses the benefit of tighter data disclosure requirements related to sustainability and a potential shift from voluntary to more formal guidelines on green definitions.

EXHIBIT 1-a

Investment in Energy Transitions Has Caught Up with Fossil Fuels

Annual investments in energy transitions versus fossil fuels, 2018–2022



Source: Bloomberg NEF, "Low-Carbon Energy Technology Investment Surges Past $1 Trillion for the First Time," January 26, 2023

Second, another problem investors face is the potential fragmentation of the asset class via a lack of comparability between different countries or regions, each with their own regulations and market conditions. Fragmentation carries higher screening costs and reduces overall investment as a result. In this context, the report argues for further standardization of taxonomies globally. Furthermore, we also discuss the Assessing Sovereign Climate-related Opportunities and Risks (ASCOR) Project, the first coordinated investor framework to assess sovereign bond issuers on climate change.

Third, we discuss how central banks in developing countries can support energy transitions, referencing the European Central Bank's proposal for greening its bond portfolios.[6] Clearly, any move by a central bank to sell conventional debt to buy green bonds would increase demand for the latter, driving down yields and eventually prompting issuers to sell more into a receptive market. This would ultimately lead to greater penetration of green bonds into local capital markets. We note, however, that we are agnostic about whether central banks should indeed follow this path and acknowledge that there is no consensus on the question.

Fourth, we look at how new technologies could help mobilize savings in emerging markets. Both fintech and blockchain-based technologies could help develop local capital markets while tilting incremental investments toward sustainable assets, including GSSS bonds. In particular, we review some of the leading initiatives in the field.

6 Schnabel, I. 2023, "Monetary Policy Tightening and the Green Transition," Speech to the international Symposium on Central Bank Independence," Sveriges Riksbank, Stockholm, January 10, 2023,

BOX 1.1

Labeled Bonds: Definitions and Guidelines

Green bonds: Fixed-income instruments with proceeds earmarked exclusively for projects with a positive environmental impact. The Green Bond Principles, guidelines developed by the International Capital Market Association (ICMA), have four components: use of proceeds, process for project evaluation and selection, management of proceeds, and reporting. These principles were last updated in June 2022. Several countries and jurisdictions have developed guidelines for green bond issuance, many of which align with the Green Bond Principles. A related category, blue bonds, focuses on financing water-related sustainable projects.

Social bonds: Proceeds from social bonds are directed toward projects that aim to achieve positive social outcomes, especially, but not exclusively, for a target population. ICMA's Social Bond Principles have four components analogous to the Green Bond Principles: use of proceeds, the process for project evaluation and selection, management of proceeds, and reporting. The 2017 Social Bond Principles were updated in June 2020 to reflect changes in the market in light of COVID-19, notably by expanding social project categories and target populations.

Sustainability bonds: Sustainability bonds are debt instruments that raise money to finance or refinance a combination of green and social projects. The Sustainability Bond Guidelines established by ICMA are aligned with the core components of both Green and Social Bond Principles.

Sustainability-linked bonds: These instruments are performance-based bonds whereby their financial or structural characteristics, such as the coupon rate, are adjusted depending on whether the issuer achieves predefined sustainability objectives. The objectives are measured through key performance indicators and assessed against sustainability performance targets. Failure by the issuer to meet those goals may result in a higher coupon. These bonds can also be structured to reward better-than-expected performance with a lower coupon. Unlike social or green bonds, proceeds are not earmarked for specific projects. In June 2020, ICMA published the Sustainability-Linked Bond Principles, providing guidelines on structuring features, disclosure, and reporting.

Climate transition bonds: This category of debt aims to finance the transition to a low-carbon economy. The "Climate Transition Finance Handbook" published by ICMA in December 2020 recommends disclosures for issuers marking either use-of-proceeds or sustainability-linked instruments with a climate transition label. There are four key elements to the recommended disclosures: the issuer's climate transition strategy and governance, the environmental materiality of its business model, the climate transition strategy that must be science-based and include targets, and the transparency of implementation.

Other labels: Some issuers have used other marketing labels for sustainable debt funding, such as adaptation, or SDG (Sustainable Development Goals) bonds. Most of these are use-of-proceeds bonds aligned with ICMA principles, but their branding has been adapted to single out a specific feature. Some bonds labeled "sustainable development bonds" depart from ICMA principles, as they are not "use-of-proceeds" bonds but are general purpose securities from issuers who wish to flag that their mission is inherently sustainable. The proliferation of labels requires vigilance from investors around project eligibility, allocation, and impact reporting commitments.

Fifth, a traditional challenge facing foreign investors with some exposure to emerging markets is the relatively high cost of capital associated with investing in projects in the region.[7] The report looks at synthetic securitizations with some government or supranational participation as a potential way to reduce the cost of capital for projects in emerging markets and increase their appeal to developed market investors.

Finally, the report reviews initiatives to deepen sustainable capital markets in three developing countries. This segment examines Brazil's GSSS bond ambitions under the new government that assumed office at the start of 2023. It also outlines key features of Uruguay's sustainability-linked bond, which includes an innovative step-up-down coupon structure, before assessing Colombia's new green bond framework and Indonesia's climate budget tagging strategy.

7 See data from International Energy Agency, 2023, "Cost of Capital Observatory Report,"January 2023

2

Market Analysis and Outlook

This section starts with a review of GSSS developments observed in 2022, considering regional patterns and evolving trends in market structure while detailing the performance of sub-components to identify outliers. The second part covers the performance of green bonds, the direction in which yields are moving, and the implications for future issuance. The final part sets out our expectations for short-to-medium-term issuance around three alternative views, one optimistic and the other more pessimistic, around the most likely central scenario.

While this report covers the entire market for GSSS bonds, much of the analysis of issuance trends in this section focuses on green bonds. This reflects the fact that green bonds remain the best-established, largest, and most liquid component of the GSSS market. While their dominance has been somewhat eroded, particularly in the wake of COVID-19 when pandemic recovery spending by governments led to a rise in social bond issuance, green bonds still account for around two-thirds of the overall GSSS market.

State of the Market in 2022

Global fixed-income issuance fell by 16 percent globally in 2022, due to monetary tightening by core central banks, widening spreads, financial market volatility, and primary market shutdowns in the wake of Russia's invasion of Ukraine in late February. Unsurprisingly against this backdrop, issuance of GSSS bonds also declined, by some 13 percent to $877 billion, the first-ever sequential fall and in sharp contrast to the record 68 percent growth seen the previous year. This was well under the forecast of a 20 percent increase in 2022 detailed in last year's report.[8]

Even so, global GSSS bond issuance in 2022 remained 46 percent higher than 2020 levels. Furthermore, market penetration—its share of overall fixed-income issuance—increased from less than 12 percent to almost 14 percent in 2022, an all-time high (See Exhibit 2-a).

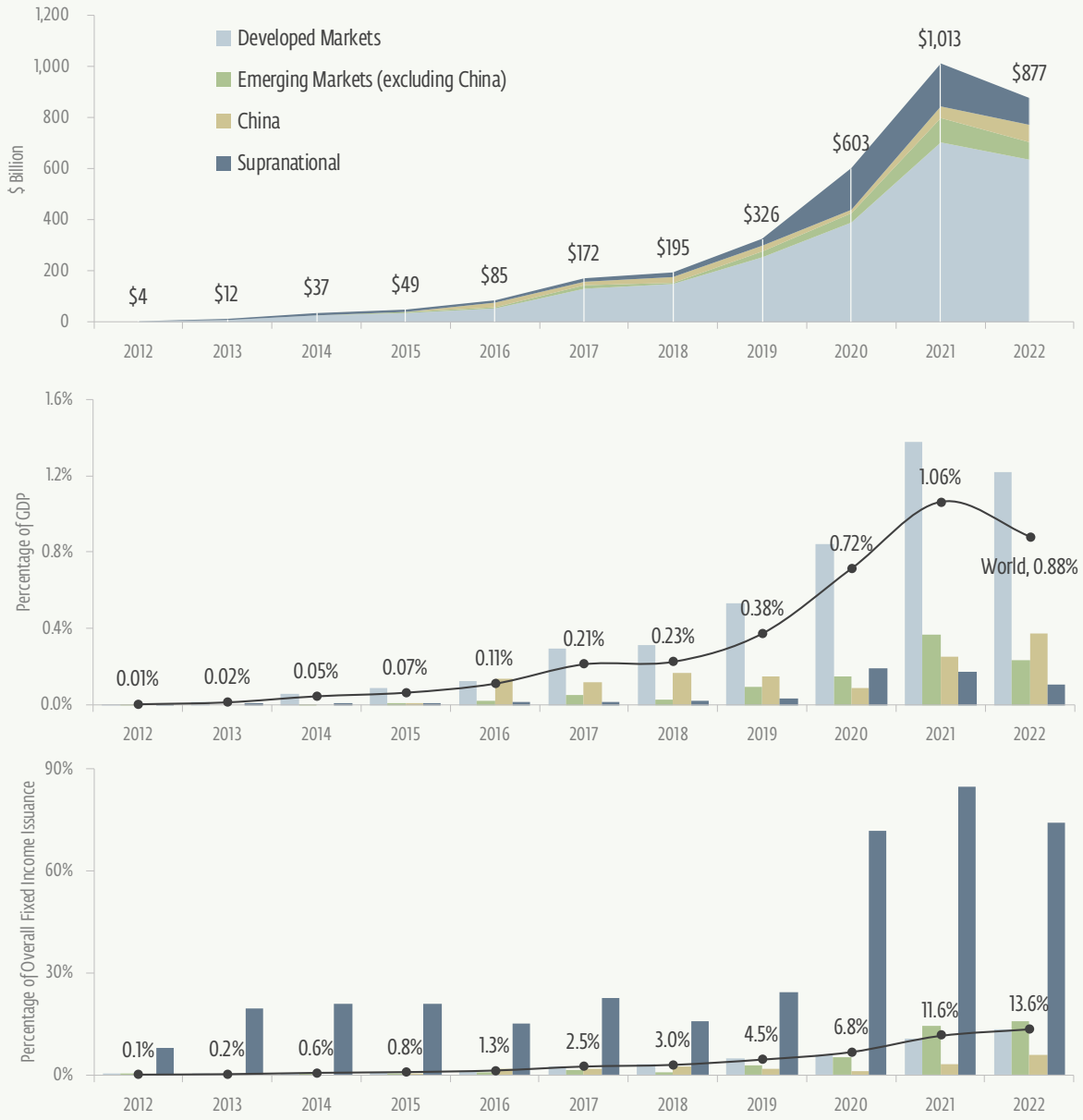
Focusing on emerging markets, only China posted accelerating GSSS issuance, with an advance of 53 percent over the year to $69 billion, driven mainly by green bonds (See Exhibit 2-c).

8 Amundi and IFC, 2022, "Emerging Market Green Bonds - Report 2021," June 2022.

EXHIBIT 2-a

Issuance of GSSS Bonds Saw Its First-Ever Annual Fall in 2022

Annual Global GSSS Issuance 2012–2022



Source: Bloomberg, CBI, Environmental Finance, IFC

Declining issuance in other emerging markets highlights the impact of idiosyncratic pressures that added to the global headwinds outlined above. While failing to dampen the country's green issuance, spillovers from China's repeated COVID-19 lockdowns contributed to a 33 percent drop in green bond issuance from neighboring South and East Asian countries, to $6 billion.

Elevated global core yields and currency volatility in some Latin American countries was a primary reason behind a 49 percent decline for that region. At the same time, Russia's invasion of Ukraine, while unleashing global market headwinds, was felt most across Eastern European and Central Asian countries where issuance halved.

Crucially for emerging market sustainable finance, supranational issuers reduced GSSS issuance meaningfully in the year. GSSS issuance by multilateral institutions declined 38 percent, with a 46 percent rise in green bond issuance only partially offsetting declines across other sub-segments, particularly social bonds, which saw a 74 percent drop. This was mostly driven by some de-risking on the part of supranational entities with meaningful exposures to Russia or Ukraine, higher funding costs, and lower demand, as these institutions tend to issue in local currency.

In terms of sectors, the fall in GSSS issuance was mostly driven by lower supply from public sector entities, which declined by 24 percent. Sovereign issuance, meanwhile, fell even further, by 46 percent, only partially offset by a 180 percent jump attributed to government agencies, albeit from a low base. This may be partly explained by emerging market governments seeking to contain fiscal deficits or high-yielding countries finding it prohibitively expensive to issue.

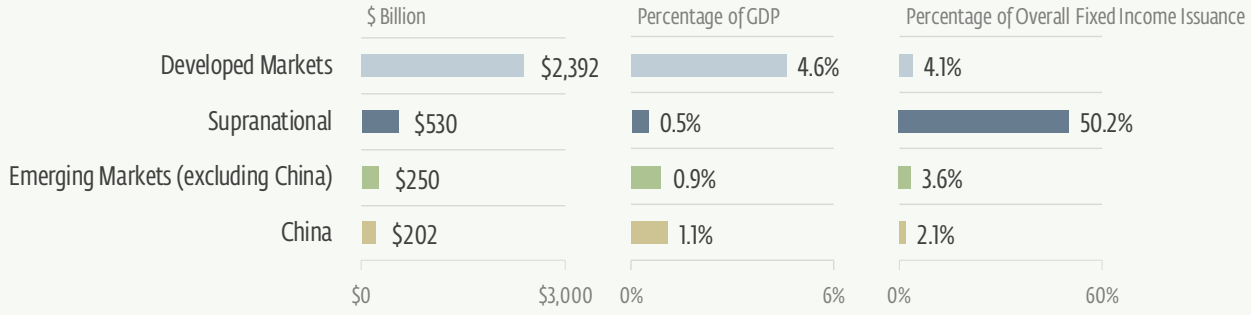
The year saw a 6 percent rise in issuance from the private sector in emerging markets, dominated by financial institutions that almost doubled their bond issuance. Financial firms surpassed non-financial corporations' GSSS issuance accounting for 42 percent of the total versus 31 percent for the latter.

Most of the emerging market growth experienced by financial institutions in the GSSS segment was driven by a 155 percent jump in green bond issuance. In addition, green

EXHIBIT 2-b

Global Issuance of GSSS Bonds Remains Dominated by Developed Markets

Global GSSS issuance 2012–2022 (cumulative)

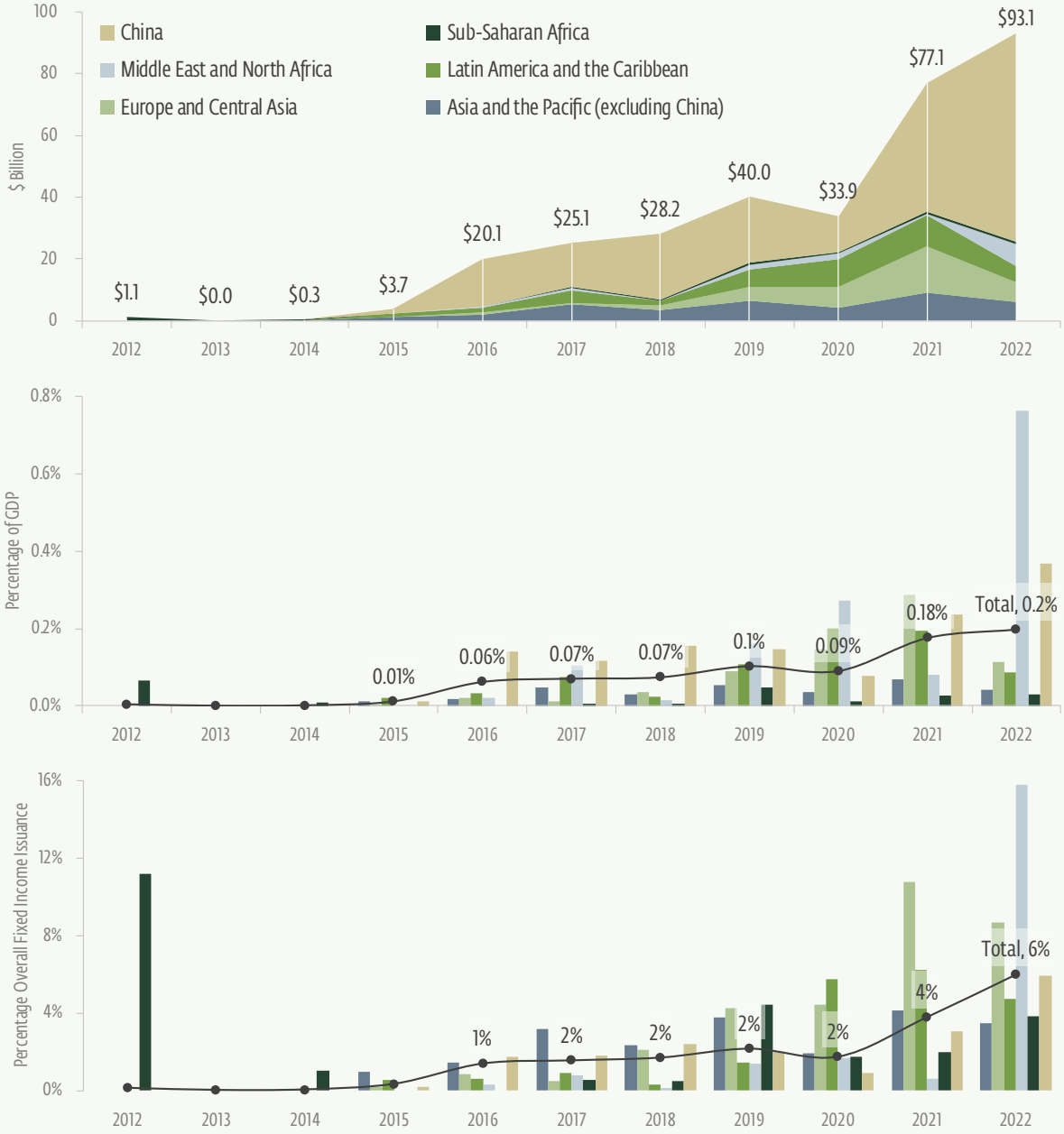


Source: Bloomberg, CBI, Environmental Finance, IFC

EXHIBIT 2-C

China Was the Only Emerging Market to Increase Green Bond Issuance in 2022

Annual green bond issuance in emerging markets 2012–2022

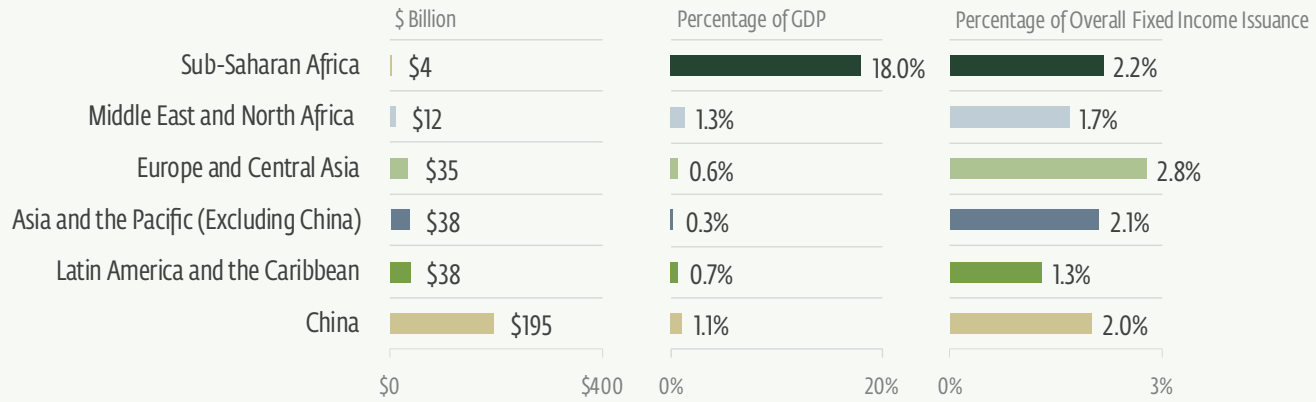


Source: Bloomberg, CBI, Environmental Finance, IFC

EXHIBIT 2-d

China Dominated Emerging Market Green Bond Issuance Over the Last Decade

Green bond issuance in emerging markets 2012–2022 (cumulative)



Source: Bloomberg, CBI, Environmental Finance, IFC

bond issuance by government agencies grew 152 percent, albeit from a relatively low level. This was, however, only partially offset by meaningfully lower issuance by both non-financial corporates, down 31 percent year-on-year, and sovereigns which were 57 percent lower (See Exhibit 2-h later in this section).

Around 90 percent of all 2022 emerging market green bond issuance could be attributed to just six countries. China remained the largest issuer over the year, with 73 percent of the total, up from 54 percent the previous year. Among the other top five, Hungary almost doubled its tally to $3.3 billion, followed by Brazil, which saw a 65 percent increase from 2021, also reaching $3.3 billion. The United Arab Emirates (UAE) saw issuance multiply 4.3 times to $3.2 billion. Saudi Arabia achieved $3.1 billion from no issuance in 2021, while Indonesia grew 2.4 times to $2.6 billion. Beyond the top six, other key emerging markets saw green bond issuance decline, with Chile, Czech Republic, India, and Poland all down between 60–90 percent (See Exhibit 2-e).

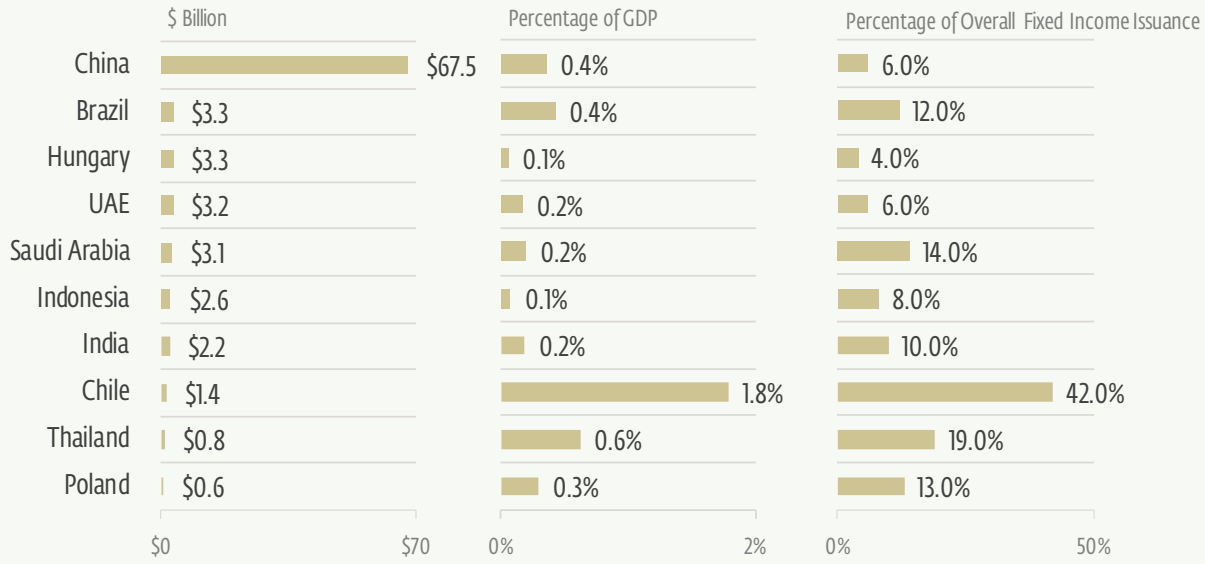
Cumulatively through the end of 2022, emerging market issuers had sold green bonds worth $323 billion. China, the largest, accounts for $195 billion, or 60 percent of the total. Other large developing economy issuers include India at $20 billion, Chile at $15 billion, and Brazil, which had issued $13 billion (See Exhibit 2-f).

Among other GSSS categories, social bond issuance contracted the most in emerging markets outside China—by 88 percent year-on-year—while sustainability bonds proved the most resilient segment with a 14 percent rise. This implies some substitution between the two, with

EXHIBIT 2-e

Emerging Market Green Bond Issuance is Highly Concentrated in Six Countries

Top 10 emerging market green bond issuers in 2022



Source: Bloomberg, CBI, Environmental Finance, IFC

issuers swapping social for sustainability bonds because the challenging market and economic outlooks made the latter more attractive to borrowers, which offer greater flexibility in how proceeds can be used.

A key feature of sustainability bonds is that they offer more flexibility than green bonds in that the proceeds can be used on either green or social projects without the issuer having to pre-commit to a specific green-social split. As a result, sustainability bonds became the largest GSSS sub-segment across emerging markets outside China, representing 41 percent of the total versus 25 percent in 2021. This puts it ahead of green bonds, which rose one percentage point in 2022 to 38 percent of the total.

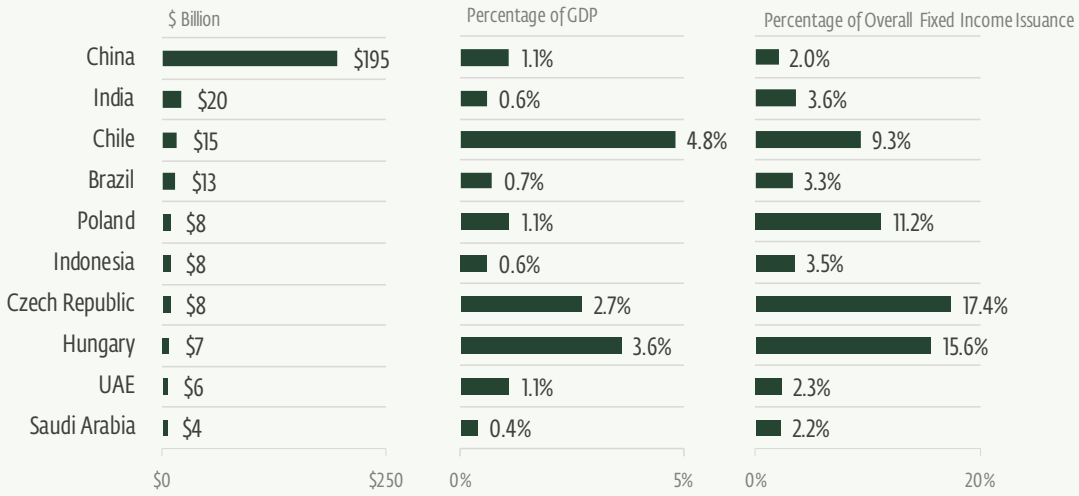
However, when China is included, the issuer composition changes considerably. Green bonds accounted for 98 percent of China's overall GSSS issuance last year, with overall GSSS issuance growing by 61 percent. For all emerging markets, including China, green bonds remained the largest GSSS sub-segment, rising to 69 percent of total GSSS issuance in 2022 from 55 percent in 2021. Sustainability bonds were second, claiming 21 percent of total GSSS issuance in 2022 from 18 percent a year earlier.

A significant development in the market is that overall global funding via green bonds and loans to sustainable projects surpassed that of the fossil fuel sector for the first time in 2022 (See Exhibit 2-g). On the one hand, funding for green projects fell by 6 percent in 2022 after almost doubling in 2021. On the other hand, the global fossil fuel sector posted a 19 percent decline in 2022, taking the drop since 2018 to 31 percent. This highlights the speed at which

EXHIBIT 2-f

China Accounts for 60 Percent of Emerging Market Green Bonds Since 2012

Top 10 emerging market green bond issuers in 2012–2022 (cumulative)



Source: Bloomberg, CBI, Environmental Finance, IFC

green funding—including green bonds—is fast becoming a central component of international capital markets as green agendas take center stage and funding for conventional energy sources diminishes. Indeed, when the Paris Agreement was signed in 2015, green funding was less than one-tenth of the size of the market for fossil fuel-related funding.

Increasing investment in clean energy and the declining relative importance of fossil fuels, suggest the energy sector is likely to remain a major driver of GSSS issuance growth in years to come.[9]

Surprisingly, issuance of sustainability-linked bonds in emerging markets outside China were materially lower—declining 35 percent from a year earlier—despite high expectations for this sub-segment. This is likely to reflect a combination of factors, including a lack of pricing advantage for issuers as well as investor skepticism about the effectiveness of the penalties imposed on issuers for not meeting sustainability targets. At the time of writing, just one issuer—Poland's PKN Orlen, in November 2022—has paid a so-called step-up penalty, the additional interest charged to the borrower for failing to meet sustainability goals.[10] Box 2.1 provides an update on the sustainability-linked bond

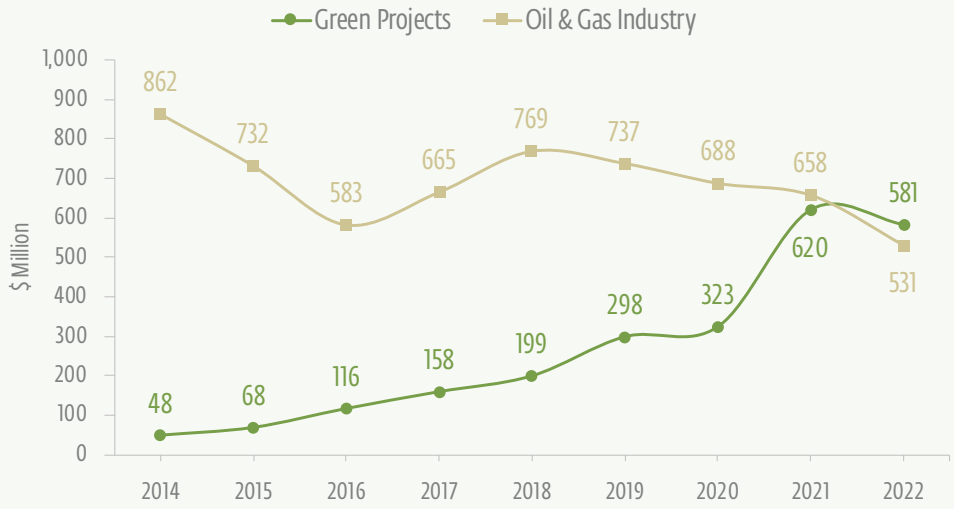
9 According to the IEA's 2023 World Energy Investment report, global energy investment in clean energy is expected to reach $1.7 trillion in 2023.

10 Bloomberg, 2022, "ESG Downgrade Sparks New Penalty in $200 Billion Bond Market," November 29, 2022

EXHIBIT 2-9

Funding for Sustainable Projects from Green Debt Overtook the Oil and Gas Sector in 2022

Bonds and loans for green projects versus oil and gas industry



Source: Bloomberg's Green Lending Tops Fossil as Big Oil Gets Cash Elsewhere, by Tim Quinson, January 4th, 2023.

Methodology: "Green Projects" data comes from Bloomberg's "Green League" tables and include bonds and loans where 100 percent of the proceeds or an amount equal to the net proceeds are being used for eligible green projects. "Oil & Gas Industry" data include bonds and loans for any issuer in the "Coal Operations," "Exploration & Production," "Integrated Oils," "Oil & Gas Services & Equipment," "Pipeline," and "Refining & Marketing" sectors while excluding any green bonds they may have issued (there are only 32 green loans issued out of these sectors, and 48 green bonds).

market, including a discussion about the opportunities and challenges it currently faces.

An important topic to consider is the future of use-of-proceeds bonds in light of rising interest in sustainability-linked bonds and other structures. Use-of-proceeds securities still account for the bulk of GSSS issuance but concerns are mounting around areas such as how to define what constitutes an "authorized" use of proceeds and how this is monitored. This can introduce a degree of rigidity to the market by pairing specific expenditures with specific sources of funding, resulting in entities issuing a wider variety of financial instruments, thereby weakening their liquidity. On paper, sustainability-linked bonds seem to avoid these issues. However, for these instruments to become a true alternative to use-of-proceeds bonds, they need to effectively address some of the challenges highlighted in Box 2.1.

A Regional View

China remains the biggest green bond market among developing countries, accounting for more than 60 percent of total issuance in 2022 and 73 percent since 2012. Meanwhile, the Middle East and North Africa has become the most significant regional contributor to green bond issuance from emerging markets outside China.

Asia and the Pacific

The dominance of China's green bond market follows several government initiatives in the country aimed at widening the investor base and encouraging bank lending to energy transition projects. Significant developments underpinning green bond issues included publishing a second version of the Common Ground Taxonomy by the People's Bank of China and the European Commission in June 2022. Another boost came from China's continued monetary easing, which boosted the performance of onshore green bonds and put the country at odds with the monetary tightening seen in other large economies. Furthermore, the country's central bank has started assessing local lenders according to their holdings of green bonds, an initiative known as the Green Finance Evaluation Plan, while offering cheap funding to subsidize green loans from November 2021.

Dynamics in the rest of Asia were radically different, however, with green bond issuance falling 33 percent to $6 billion in 2022, around 8 percent below the level seen in 2019, before the market disruptions that came with the COVID-19 pandemic.

This was explained mainly by lackluster issuance from India—down 63 percent—amid poor performance of the local fixed-income market related to monetary tightening, the government's announcement of enhanced borrowing plans for 2022–2023, and significant currency volatility.

Even so, India took the significant step of publishing its sovereign green bond framework in early November 2022, which was followed by the country's first-ever sovereign

BOX 2.1

Sustainability-Linked Bonds in Emerging Markets

Governments and corporations are under increasing pressure to meet climate goals. This leaves them facing the mounting challenge of balancing these priorities with their economic or business interests. Sustainability-linked bonds, a relatively new category of debt that first emerged in 2019, can help organizations achieve that balance, raising fresh capital from investors while making credible commitments on environmental or social goals.

Sustainability-linked bonds are distinct from other GSSS categories, such as green or social bonds, because their terms do not specify how proceeds from debt issuance should be deployed. Instead, issuers commit to achieving predetermined sustainability goals by a deadline within the bond's term. Failure to meet that commitment can result in a higher coupon, or in cheaper borrowing costs if the target is achieved.

The flexibility around how the borrower deploys the money they raise makes this type of debt appealing to issuers that may not have an extensive pipeline of green projects that would qualify for the proceeds of green or social bonds. For example, investments in sectors such as housing, education, and infrastructure may not always meet the specific requirements set out in the terms of green bonds. Meanwhile, governments can use the instrument as a source of funds for general public spending or to mitigate balance sheet risks by reducing maturity or currency mismatches.

A weak but resilient year for issuance amid global headwinds

The significant underperformance of sustainability-

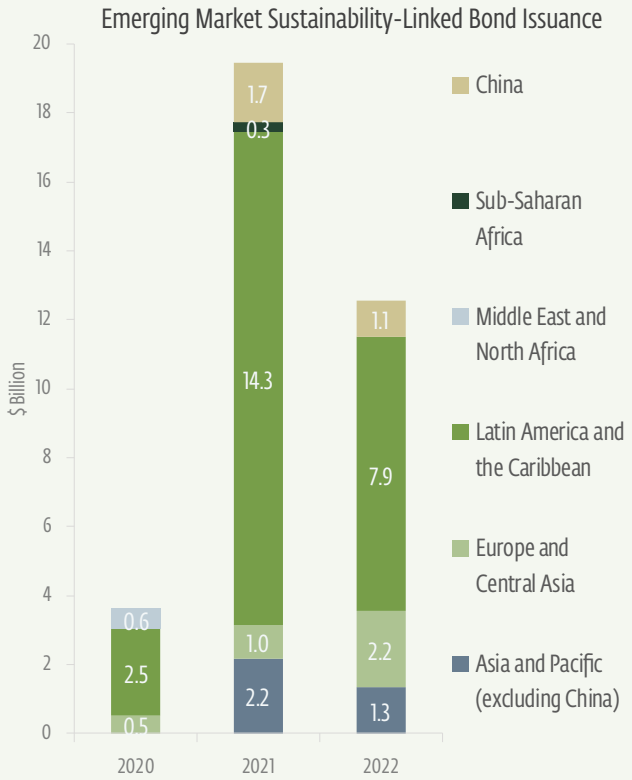
linked bonds (-22 percent) relative to the broader GSSS asset class (-13 percent) in 2022 was driven by two factors: the instrument's relative illiquidity—leading to higher volatility—and increasing concerns about the asset class's prospects.

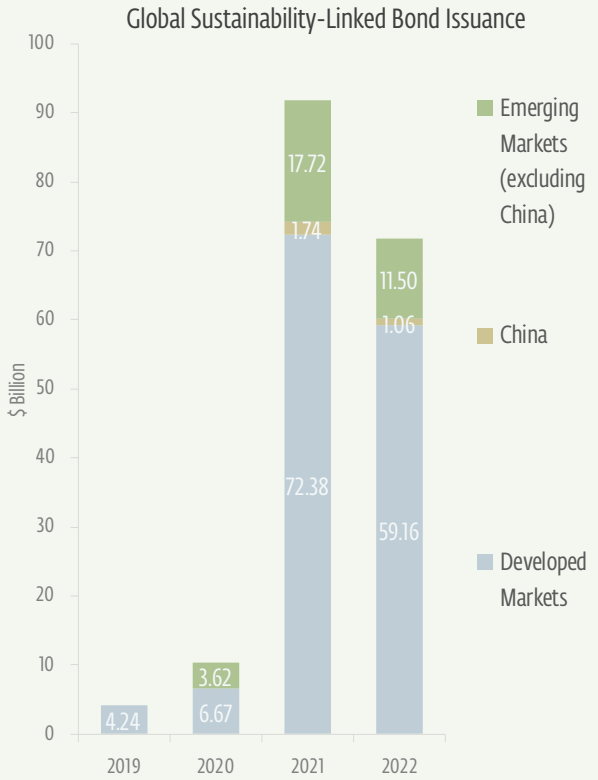
On the positive side, however, the market remained open, and issuers continued to issue sustainability-linked bonds throughout the 2022 turmoil, with emerging markets representing 16 percent of total issuance ($11.5 billion) over the year. Non-financial corporates accounted for 69 percent of the market, with sovereigns, led by Chile and Uruguay, making up 30 percent. There was a substantial reduction in sustainability-linked bond deals from financial institutions, down to just $130 million, from $1.85 billion in 2021.

On a regional basis, Latin America represented 71 percent of the 2022 total. Asia accounted for $1.4 billion, or 11 percent of the total, mainly from Thailand and India, which issued $850 million and $400 million, respectively.

The spotlight shifted from corporate to sovereign borrowers.

While sustainability-linked bonds have become popular among corporations, they are far less established among sovereign borrowers. However, the success of Chile's offering in 2022, which was more than four times oversubscribed, means more sovereign issuers are likely to follow.





Indeed, Uruguay issued a sustainability-linked bond worth $1.5 billion in October 2022. The debt, which matures in 2025, has performance targets that affect the coupon and is linked to the country's contributions to battling climate change under the Paris Agreement. Notably, the Uruguay structure includes an innovative two-way pricing feature. While failure to meet the performance targets by the deadline incurs a 'step-up' penalty, rewarding investors with higher interest payments, exceeding the targets results in a 'step-down' in the coupon, benefiting the issuer.

Debates will inevitably arise around whether investors should be willing to accept a lower coupon if a borrower exceeds targets. Issuers would argue that it is only fair for a product to incentivize both parties. Thus, investors would encourage a more significant commitment to achieving broader sustainability goals by accepting a step-down coupon.

The Chile and Uruguay deals marked significant progress toward demonstrating how sovereigns and quasi-sovereigns can attract funding via sustainability-linked bonds aligned to NDC targets. There is now a greater likelihood that more non-sovereign issuers from those markets will follow.

Sovereign and corporate sustainability-linked bond issuers face several challenges

- Given that proceeds can be used for general expenditures, performance indicators' clarity, robustness, ambition, and verifiability are crucial for ensuring credibility. In some cases, key performance targets may be effectively achieved, for example, by selecting backdated indicators. The availability and timely disclosure of relevant data are critical for investors to assess the issuer's progress in achieving the goals.
- The penalty in terms of stepped-up coupon payments for failure to achieve the performance targets is often too modest relative to the issuer's overall cost of debt, thus limiting the effectiveness of this mechanism to achieve sustainability objectives.
- The market needs a broader consensus and standardization on structural issues such as the timing of observation dates and the size of financial incentives to help investors more easily assess each bond and minimize worries around greenwashing.
- Many issuers cease engaging with investors beyond the roadshows undertaken immediately prior to a bond's initial issue. This opacity and lack of communication have impacted credibility and lowered investor confidence.
- The greenwashing risk is even higher around sovereign issuers than corporates because sustainability performance targets may be abandoned with a change in government that brings a shift in policy.

Scrutiny of investors is intensifying, with a greater focus on whether they refuse to buy bonds that do not meet their minimum criteria and to what extent they engage with issuers to help improve broader standards.

green bond issue in January 2023.[11]

Only Indonesia increased its green bond issuance, by 2.4 times to $2.6 billion over the year. This was driven mainly by the two sovereign issues worth $1.9 billion following the publication of the country's Green Taxonomy in January 2022.[12] Indonesia operates a mechanism that enables tracking and evaluating public expenditure from climate migration and adaption.

Europe and Central Asia

Green bond issuance in Europe and Central Asia more than halved in 2022, retreating 56 percent because of concerns around Russia's invasion of Ukraine that began in February. Well-established issuers like the Czech Republic and Poland saw issuance of green bonds fall by 86 percent and 79 percent, respectively. The only notable exception was Hungary, which saw issuance rise by 1.9 times to $3.3 billion, driven by the sovereign's successful $2.5 billion multi-currency issuance strategy. This involved a multi-tranche Japanese yen-denominated green bond transaction in mid-February 2022, a green bond denominated in the Chinese currency, and a $1 billion green euro-denominated deal. We expect Russia's invasion of Ukraine to result in increased issuance of social bonds over green bonds in this region due to the considerable funding needs for Ukraine's reconstruction.

Latin America and the Caribbean

Green bond issuance in Latin America and the Caribbean also halved, falling 49 percent over the year due to increasing socio-economic tensions that prompted radical political changes in select countries. In particular, Chile's green bond issuance fell 76 percent to $1.4 billion, bringing it down in the rankings of emerging market issuers to eighth from third in 2021, when it was exceeded only by China and India. Following the new government's appointment in early 2022, the year was dominated by significant currency volatility, lower international copper prices reflecting weaker demand from China, and concerns around government plans to push through a tax reform bill to fund social programs. The year was also marked by political uncertainty stemming from a government proposal to reform the constitution that was ultimately rejected in a referendum.

Meanwhile, Chile's weaker issuance was partially offset by Brazil, where green bond issuance was up 65 percent at $3.3 billion. The flow of new bonds was diversified across several private-sector issuers, mostly non-financial corporates. These included fertilizer company Yara's $600 million green bond following the firm's first Green Financing Framework publication in July 2022. Among financial institutions, lender Itaú issued its first green bond in the country, via a private placement to the IFC, and financial firm Sicredi's first-ever green Tier-2 bond sold in a private placement to IDB Invest.

Middle East and North Africa

The Middle East and North Africa region became the largest source of new green bonds in emerging markets outside China in 2022, with $7.2 billion issued, or 9.3 times the amount sold in 2021. The region was a marginal player in the asset class until 2021, printing around $1.4 billion on average per year between 2019 and 2021. The dramatic jump in bond issuance was attributed to just two countries, namely the UAE, which saw a 4.3 times increase to $3.2 billion, and Saudi Arabia, which issued $3.1 billion. The year before, Saudi Arabia did not issue any green bonds.

UAE's issuance came from four financial institutions and one corporation. This included an inaugural $500 million green bond by Abu Dhabi Commercial Bank and strong issuance by well-established users of the green bond market, such as First Abu Dhabi Bank, which sold $1.5 billion. In January 2022, a $700 million green project bond was sold to finance the

11 Government of India, 2022, "Framework for Sovereign Green Bonds."

12 Sustainable Finance Indonesia, 2022, "Indonesia Green Taxonomy Edition 1.0."

Abu Dhabi Sweihan Photovoltaic Independent Power Project.

Saudi Arabia's issuance was attributed to the state's Public Investment Fund raising $3 billion from its debut green bond, including a $500 million tranche with a 100-year tenor. The fund, which manages over $600 billion in assets, plays a central role in government moves to diversify the country's economy away from oil. The fund expects to invest more than $10 billion in eligible green projects by 2026.[13]

It is indeed encouraging to see this region placing more focus on green finance in response to investor demand.

Sub-Saharan Africa

By far the smallest component of the emerging green bond market, issuance of the instruments from Sub-Saharan Africa increased by 20 percent in 2022, to $600 million. Almost all came from South Africa, where Absa Bank printed $270 million, and Redefine Properties raised $180 million. Outside South Africa, there were just four other issues—three from Namibia and one in Nigeria.

Supranational Entities

Supranational entities skewed their GSSS issuance toward green bonds, leading to a 46 percent increase in issuance of the instruments. But at the same time, they cut back across all other GSSS sub-segments, notably with a 74 percent drop in social bonds. All in all, supranational entities reduced their GSSS issuance by 38 percent in 2022, becoming a key driver of lower overall GSSS issuance.

These weak dynamics in 2022 reflect a combination of factors, including de-risking by supranational institutions with significant assets or liabilities in Russia or Ukraine, credit rating downgrades, and broader tightening of funding conditions.[14] Also, supranational entities are relevant players in the local currency bond market, which was particularly hit in 2022.

Market Trends in Emerging Market Bond Issuance

Green bonds denominated in the Chinese currency increased 1.2 times from the previous year, reaching 61 percent of total emerging market issuance, from 33 percent in 2021. This implies some substitution away from U.S. dollar-denominated debt that reflects relatively better funding conditions in local currency.

Meanwhile, bond deals significant enough to qualify for inclusion in benchmark indexes, typically over $300–500 million, accounted for around 20 percent of the total from emerging markets outside China, down from 23 percent in 2021. In China, the proportion was 28 percent, falling from 32 percent in 2021.

Credit quality dynamics diverged, meanwhile, with the proportion of investment-grade bonds increasing from 30 percent to 33 percent in emerging markets outside China. In comparison, China fell from 16 percent to 14 percent. Finally, the share of new bonds with medium-term maturities of between three and five years was little changed at around 54 percent.

Overall green bond issuance in emerging markets was up 21 percent in 2022, driven mainly by financial institutions, which saw a 155 percent year-on-year increase, and government agencies, up 152 percent, albeit from a low level. This was only partly offset by meaningfully lower issuance by non-financial corporates, down 31 percent year-on-year, and sovereigns which were 57 percent lower (See Exhibit 2-h).

Within the non-financial corporate segment, utilities and energy accounted for the bulk of green bond issuance in emerging markets in 2022, at 56 percent in China and 76 percent in other developing countries (See Exhibit 2-i). In advanced economies, however, while these sectors generally account for a lower share of overall green bond issuance,

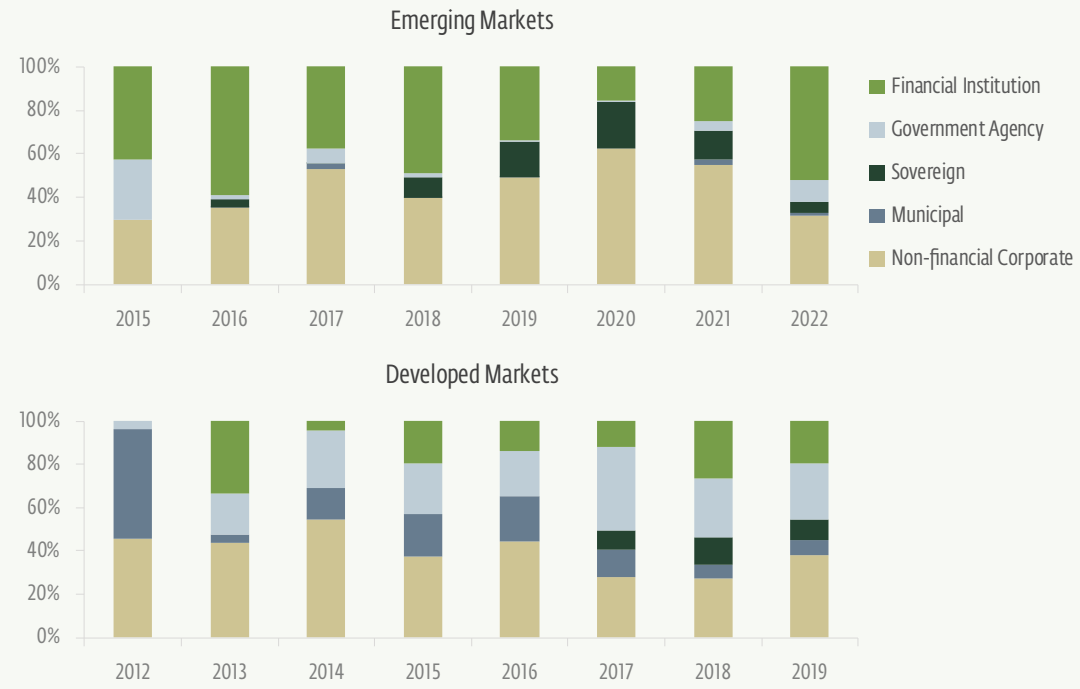
13 Reuters, 2023, "Saudi Wealth Fund to Raise $5.5 Billion With Second Green Bond Sale," Accessed March 1, 2023.

14 Standard & Poor's, 2022, "Supranationals" report, Special Edition, October 2022.

EXHIBIT 2-h

A 21 Percent Rise in Green Bond Issuance Was Mostly Driven by Financial Institutions in 2022

Green bond issuance by sector



Source: Bloomberg, CBI, Environmental Finance, IFC

they did increase markedly in 2022 from 31 percent in 2021 to 43 percent in 2022, driven mainly by utilities. Among other developed market sectors, real estate firms cut back their share of green bond issuance to 13 percent, from 23 percent in 2021, likely reflecting tightening funding conditions and consequently lower home sales. The auto industry saw the opposite trend in developed markets, rising to 8.6 percent, from 5.7 percent a year earlier, reflecting economic recoveries as the COVID-19 pandemic receded.

Use of Proceeds

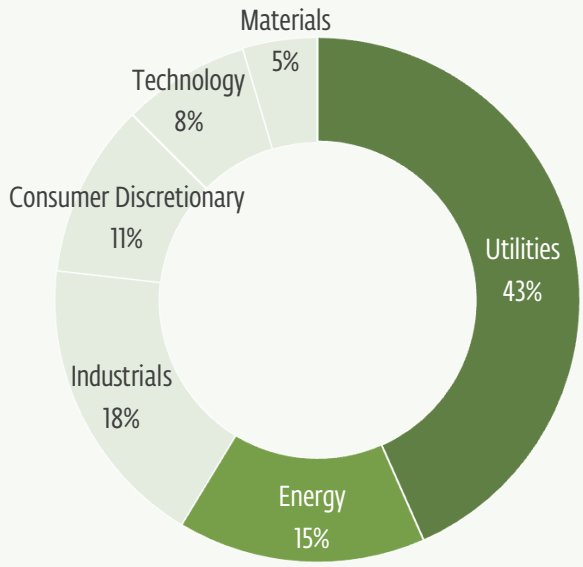
Issuers of green bonds are committed to spending the money they raise on projects and investments with a positive environmental impact. Cumulatively, the largest share of the proceeds in emerging markets outside China was designated for spending on renewable energy, accounting for 44 percent in 2022. One explanation is that the average issuance size for such projects tends to be larger than other deals.

Low-carbon transportation projects also represented an important destination for money raised in green bond issues,

EXHIBIT 2-i

Utilities and Energy Account for the Bulk of Emerging Market Green Bond Issuance

Emerging markets non-financial corporates issuance by sector 2022

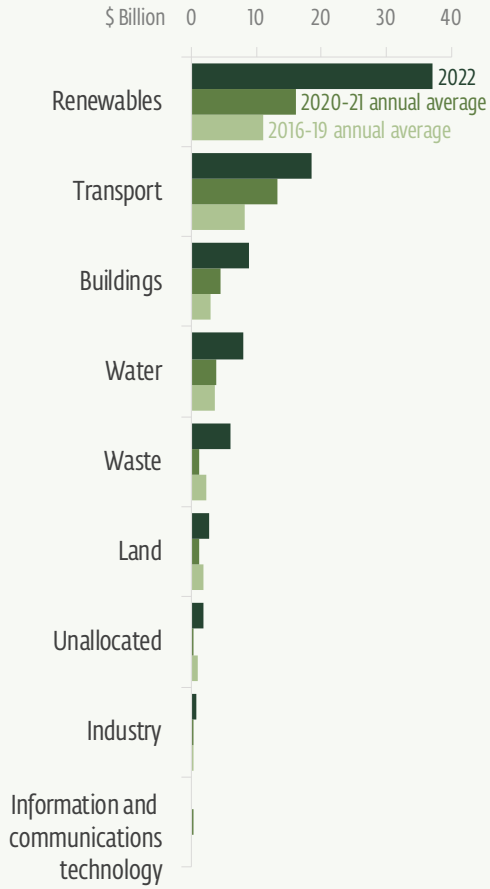


Source: Bloomberg, CBI, Environmental Finance, IFC

EXHIBIT 2-j

Renewable Energy Claims the Largest Share of Green Bond Proceeds

Emerging market and developing economies green bond issuance by use of proceeds



Source: Bloomberg, CBI, Environmental Finance, IFC

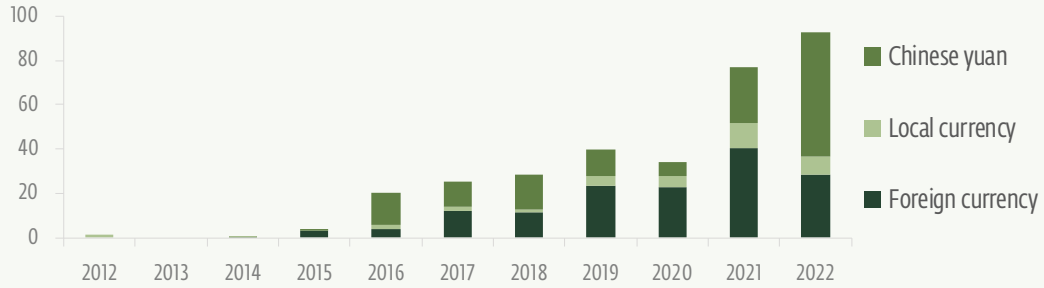
at 22 percent of proceeds in 2022. Other categories to receive funds from green bonds included green buildings, at 11 percent, water, at 10 percent, waste, at 7 percent, while a further 3 percent went toward land use.

In developed markets, while the share of green bond proceeds designated for renewables and low-carbon transport was smaller, at 30 percent and 16 percent respectively, the percentage assigned to green buildings was significantly higher, at 36 percent.

EXHIBIT 2-k

The Chinese Currency Accounted for 61 Percent of Emerging Green Bond Issuance

Emerging market and developing economy green bond issuance by currency, 2012–2022



Source: Bloomberg, CBI, Environmental Finance, IFC

Currency

Emerging market green bonds denominated in Chinese yuan increased 1.2 times in 2022, reaching 61 percent of total developing economy issuance and almost double their 33 percent share of a year earlier. With foreign currency-denominated issues down by 29 percent, to 31 percent of the total, from 53 percent in 2021, this implied some substitution of foreign currency bonds for yuan debt by Chinese issuers, primarily motivated by relatively better funding conditions in local currency. Interestingly, local currency-denominated green bonds also fell by 30 percent to reach 8 percent of the total. A year earlier, the share was 14 percent.

U.S. dollar-denominated green bonds from emerging market issuers lost market share, sinking to 25 percent from 39 percent. Emerging market euro bonds also retreated to 6 percent from 17 percent.

The Brazilian real was the next most common currency used by emerging market green bond issuers, losing a percentage point to account for 3 percent of issuance in 2022, followed by the Indonesian rupiah, which represented 1 percent of the market. The Hungarian forint and the Thai baht claimed similar shares. These four accounted for 5 percent of all local-currency denominated issues, excluding the Chinese yuan.

Issue Size

The most liquid bonds, those that are sufficiently large to be considered as benchmarks by international investors, provide greater access to external financing as they can be included in major indexes. Of the green bonds issued in emerging markets other than China in 2022, there were 29 benchmark-size bonds of more than $300 million, representing 20 percent of the total, with half exceeding $500 million. A year earlier, there were 45 benchmark bonds, representing 23 percent. The proportion of benchmark-size bonds was larger in China, 28 percent, versus 32 percent in 2021, likely reflecting borrowing for large renewable projects in the country.

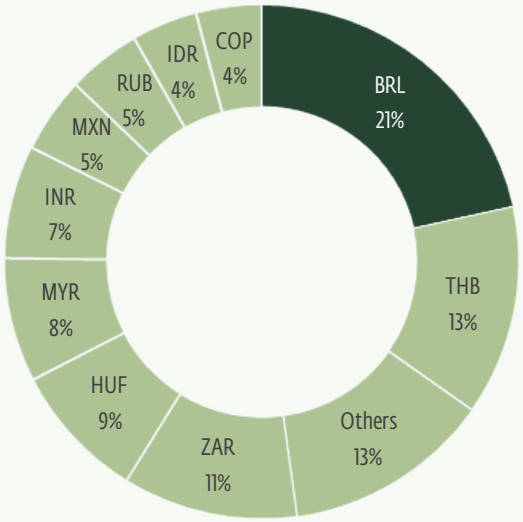
Ratings

A key barrier to investing in green bonds issued by emerging market borrowers is the low proportion of debt securities carrying internationally recognized credit ratings. In fact, only 14 percent of green bonds sold by Chinese issuers carried investment-grade ratings in 2022, down from 16 percent in

EXHIBIT 2-l

The Brazilian Real Was the Most Common Local Currency Emerging Green Bond, Excluding the Chinese Yuan

Emerging market and developing economy local currency green issuance by currency excluding the Chinese yuan, 2012–2022



Note: BRL is the Brazilian real, THB refers to the Thai baht, ZAR the South African rand, HUF the Hungarian forint, MYR the Malaysian ringgit, INR the Indian rupee, MXN the Mexican peso, RUB the Russian ruble, IDR the Indonesian rupiah and COP the Colombian peso

Source: Bloomberg, CBI, Environmental Finance, IFC

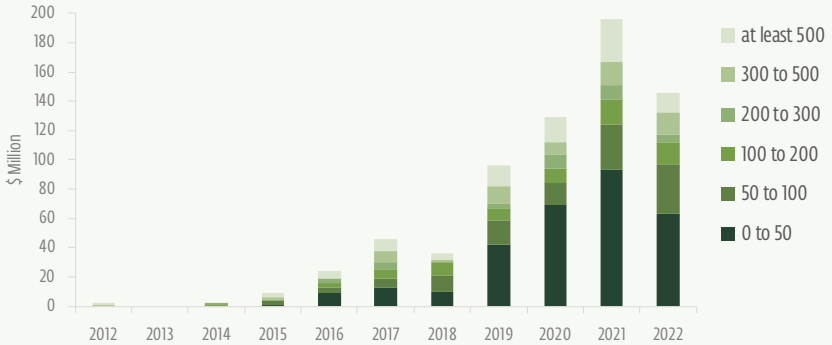
2021. The remaining 86 percent were unrated, as many issuers in China rely on local credit assessments, which makes their valuation difficult for international investors. However, dynamics are different in other emerging markets, with 33 percent of newly issued green bonds rated investment grade, up from 30 percent the previous year.

Defaults have been rare in the green bond market as a whole. Among emerging markets, there have been three defaults on bonds within the category: two in 2021 by a Chinese solar power firm and a property developer, and one in 2020 by an Indian irrigation firm.

EXHIBIT 2-m

The Most Common Issue Size for Emerging Green Bonds Was Under $50 Million

Emerging market and developing economy green bond issuance size



Source: Bloomberg, CBI, Environmental Finance, IFC

Tenor

Through 2019, most emerging market green bonds were medium-term instruments issued by financial institutions, with the majority maturing in three-to-five years. Over the past three years, however, the range of tenors widened as new entrants came to market including a larger number of non-financial corporates and sovereigns. This illustrates the extent to which the green bond market is deepening as it matures, attracting a broader range of both issuers and investors.

In 2022, 54 percent of issuance was medium-term, while another 27 percent was in the range of five to 10 years. Meanwhile, 12 percent were longer dated, at over 10 years, and the remaining 7 percent were for less than three years.

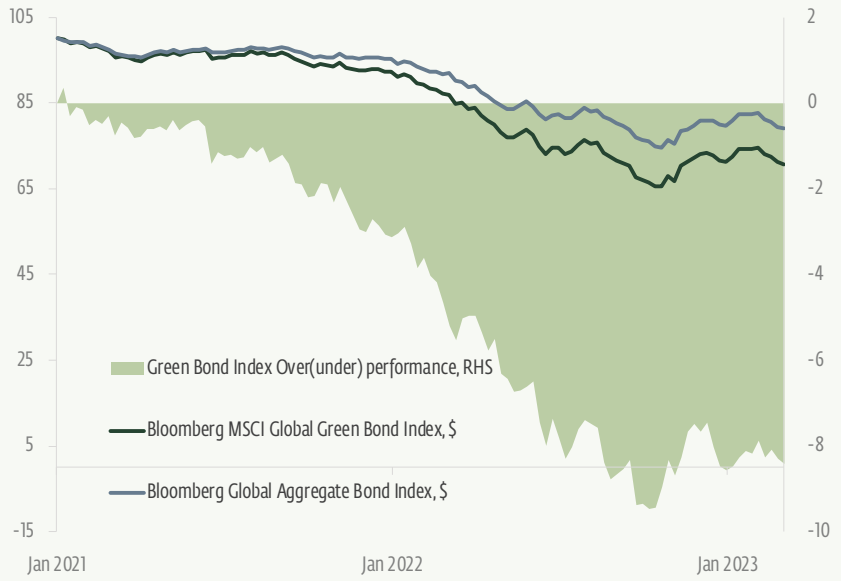
Market Performance

In 2022, green bond performance was diametrically different in developed and emerging markets. Green bonds underperformed the broader fixed-income asset class by around 600 basis points globally (See Exhibit 2-n). At the same, however, green bonds from emerging market issuers outperformed the broader asset class in developing economies by around 450 basis points (See Exhibit 2-o). This is likely to reflect a combination of strong demand for emerging market green bonds on the back of much lower penetration and weak supply.

EXHIBIT 2-n

Green Bonds Underperformed Fixed Income Globally

Total return of green bonds versus the global aggregates index



Source: Bloomberg, CBI, Environmental Finance, IFC

Green bonds and other sustainable securities have enjoyed rising demand from investors in recent years, amid an ongoing proliferation of funds dedicated to environmental, social, and governance goals.

This is reflected in downward pressure on green bond yields, opening up a yield gap, or spread, between green bonds and equivalent conventional bonds from the same issuer, commonly referred to as a 'greenium.' A negative greenium means that a green bond is trading at a lower yield compared to a conventional bond with similar characteristics. This implies a lower cost of raising capital for issuers of green bonds, but also lower cash flows paid to the debt investors.

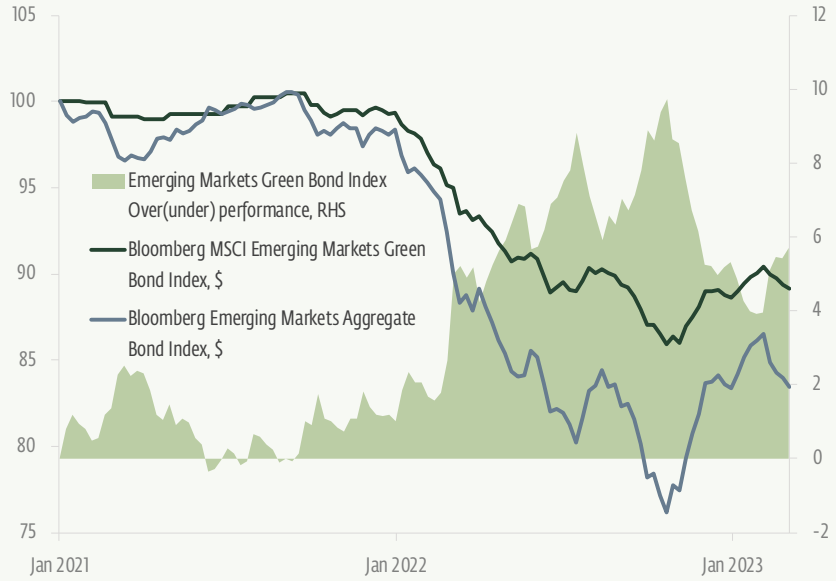
The average greenium represents 6.4 percent of the average spread of bonds in the sample, up from 4.2 percent previously, as shown in the table below (See Table 2.1). Meanwhile, the average greenium widened during 2022 from -4.6 basis points to -7.2 basis points at the end of the year, on a rolling average basis. Compared to the benchmark average, greenium widened, according to Amundi's calculations, to -6.8 basis points in 2022, from -3.4 basis points in 2021.

It is worth noting that this reflects secondary market data, or yields on existing bonds as they are traded, rather than the pricing of newly issued debt. However, secondary market movements act as an indicator of investor sentiment and influence the pricing of new bonds in the primary market. This does not capture, however, other costs faced by issuers, including administrative expenses (See Box 2.1) or even the

EXHIBIT 2-0

Emerging Market Green Bonds Outperformed Conventional Peers

Total return of emerging market green bonds versus the emerging markets aggregates index



Source: Bloomberg, CBI, Environmental Finance, IFC

TABLE 2.1

Emerging Market Green Premium Statistics, 2022

Median premium (basis points)	Average premium (basis points)	Number of observations	Average spread (basis points)	Average premium versus average spread (%)
-3.4	**-6.8**	**37**	**106**	**-6.4**

Source: Amundi calculations based on CBI, IFC, Enivronmental Finance, Amundi, MSCI

capacity-building costs of regulators and supervisors, who may not be familiar with these instruments.

A widening greenium (See Exhibit 2-p) bodes well for issuance across international capital markets as it indicates robust investor demand and incentivizes borrowers, including those in emerging markets, to consider green bonds for future debt issues.

Several economic studies have examined the extent to which investor preference for assets that meet economic, social, and governance criteria drives yields lower on green bonds, in both primary and secondary markets.[15] One analysis, comparing yields on green bonds with those of equivalent conventional debt, finds that demand is higher among euro-area investors for bonds that are credibly green because they are certified, either officially or with a second-party opinion. Euro area green bonds, where the issuers are certifiably committed to environmental programs or are categorized within environmentally sound sectors, trade at a greater and statistically more significant greenium.[16]

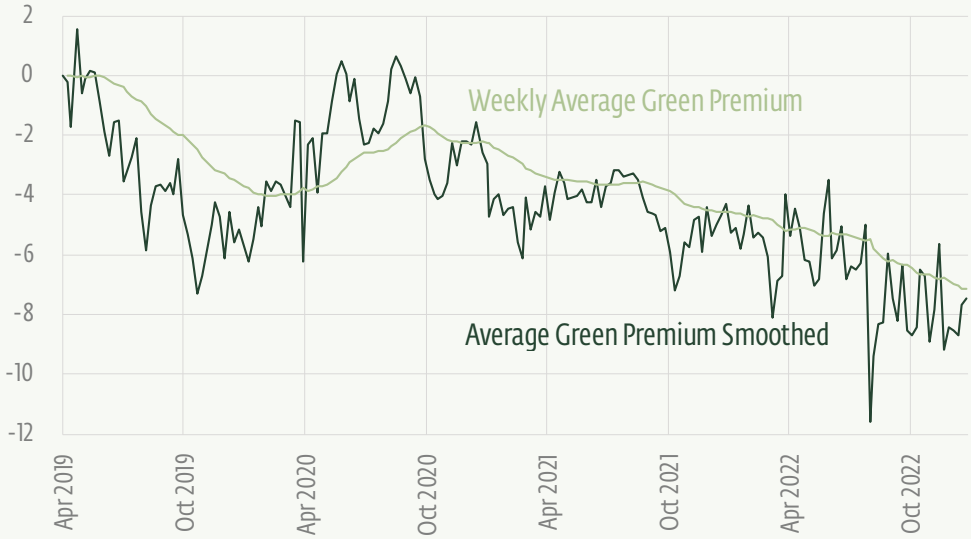
15 See, for example, Zerbib, O., 2019, "The effect of Pro-Environmental Preferences on Bond Prices: Evidence from Green Bonds," Journal of Banking & Finance vol. 98, issue C.

16 Pietsch, A., Salakhova, D., 2022, "Pricing of Green Bonds: Drivers and Dynamics of the Greenium," European Central Bank Working Paper No. 2728.

EXHIBIT 2-p

The Emerging Market Greenium Continues to Widen (i.e. green bonds becoming richer versus conventional)

A widening greenium indicates rising investor demand and incentivizes borrowers



Source: Amundi calculations based on CBI, IFC, Environmental Finance, Amundi, MSCI

In developing countries, the "longer-holding" behavior of green bond investors compared to non-green bondholders may provide an important financial advantage to issuers during financial shocks. Similarly, from an investor perspective, green bonds may help to preserve the portfolio value by being resilient to market sentiment shifts.[17] Issuers from developing countries may face more challenging market terms from investors. This highlights the importance, discussed later in this report, of implementing credible global standards for green bonds and considering synthetic securitizations in the context of public-private partnerships.

In general, without standardized guidelines and a global quality control system, potential buyers of emerging market green bonds are forced to carry out additional due diligence to safeguard against exposure to greenwashing, thereby raising the transaction costs of buying green bonds. Establishing unified regulatory standards is key to channeling more investor capital into emerging market green bonds.

17 See Ramos, E., 2022, "Green Bond Behavior and Greenium During a shock," December 13, 2022.

BOX 2.2

Green Bond Issuance Costs: The Case of Municipalities in Latin America

The uptake of green and sustainable bonds at a municipal level has been limited in emerging markets, with only $4 billion in cumulative issuance since 2014. In Latin America in particular, the use of green bonds has been constrained by shallow capital markets and regulatory frameworks addressed at controlling subnational debt. Mexico City is one of the few subnational governments to have issued green bonds, selling three between 2016 and 2019. However, despite high demand, the green bond market is yet to scale. While local authorities would like to tap this market as early as 2023, they find that the costs outweigh the benefits.

The rates on green bonds have not proven significantly lower than those of regular bonds. Meanwhile, transaction costs related to external verification and reporting are significantly greater. Data is not available on the average greenium in the emerging primary bond markets. In the secondary market, however, the average greenium among developing country green bond issues in 2022 was 6.8 basis points (See Table 2.1). Meanwhile, additional costs associated with structuring and registering green bonds can vary considerably, with some estimates ranging from $10,000 to $500,000.

In the case of Mexico City, subnational debt is regulated by the Financial Discipline Law, which forces governments to always choose the least expensive financing alternative. It has been increasingly difficult for green bonds to pass this test, particularly when compared to loans which offer more competitive terms. In this context, municipalities would need to be allowed to pay a premium, in the short term, to develop the green bond market, in order to benefit from any greenium in the long run. However, given municipalities' current fiscal constraints, this seems unlikely.

Additional challenges for the Mexican municipal bond market include the fact that investors in municipal bonds prefer short-term issuances (3–5 years), which are not a good fit for financing needs, as the government requires longer maturities, which is why it has relied on loans since 2019.

In addition to greater transaction costs and a lengthier process, bonds include a no-prepayment clause, limiting the government's debt management capacity and its ability to reduce the cost of debt. Therefore, despite an investment pipeline that could potentially meet the requirements to be financed with green bonds, the Mexico City government has stayed away from the bond market since 2019.

Colombia's case is similar, as subnational authorities have also shied away from green bonds. The city of Bogota issued a social bond in 2021 , but the experience was mixed. Despite high demand (presenting a bid-to-cover ratio of 1.97), the fact that resources were earmarked for specific uses led to financial management challenges. The disbursement of resources didn't necessarily coincide with project pace of execution, leading to resources being parked for prolonged periods of time. Regular bonds or debt represent a more efficient option. Particularly, because the national government only allows regional authorities to issue debt to cover cashflow imbalances. An alternative is to link the issuance with a portfolio of projects, rather than a single project, following the national government's example with its green bond issuance in 2021. This, however, requires greater structuring and execution capacity.

Higher transaction costs, the inflexibility in the use of green bond proceeds, and more attractive local debt financing terms have led the city of Bogota to rely mostly on loans, although more recently it has increased its issuance of regular bonds.

Although there is appetite for green bonds from investors, and certain large municipalities seem to have eligible projects and interest in financing through green bonds, these are still not competitive in comparison with local debt markets. This is particularly the case given regulatory frameworks that limit municipalities' financial management capacity. Given subnational governments' limited fiscal capacity and lack of incentives to pay the price of developing the green bond market, blended finance could represent a way to unlock the green bond market and allow it to achieve the required scale for it to be a competitive source of financing at the municipal level in the medium term.

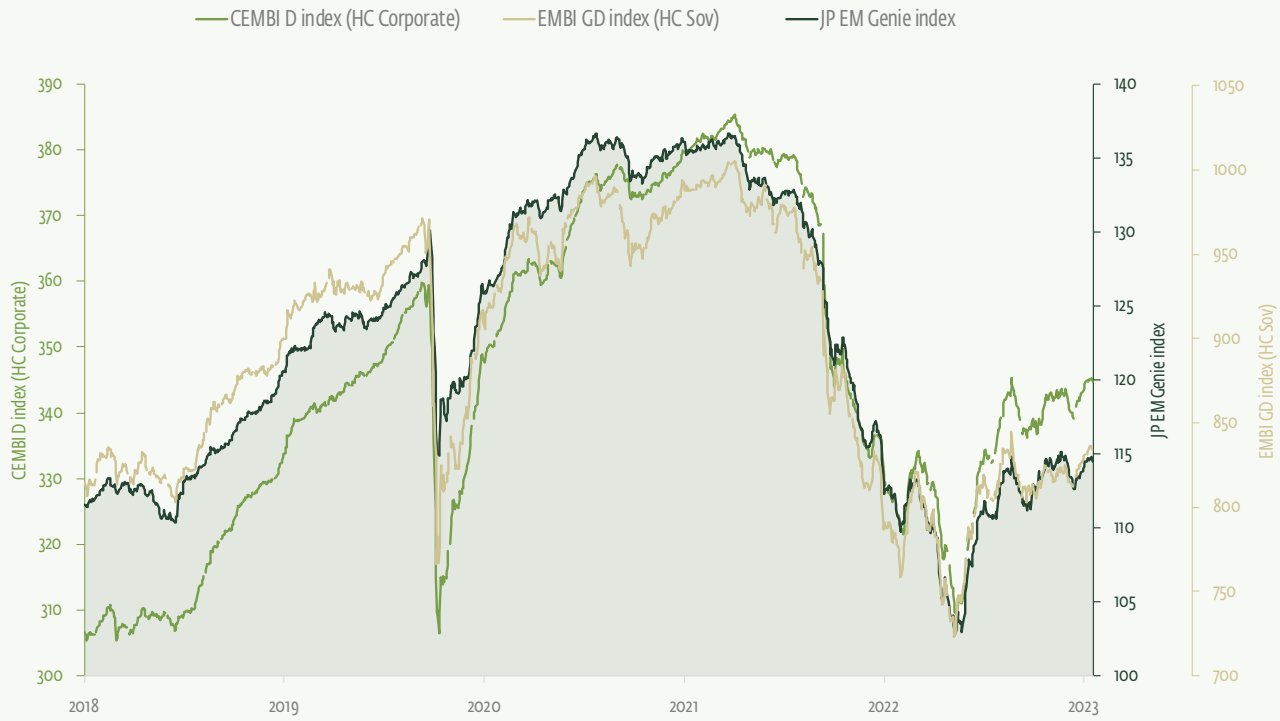
Emerging Market Green Bond Holder Profile and their Relative Volatility

Detailed data on the holders of green bonds is scarce. Bloomberg does provide information on bond holders, though it only captures around 20 percent of outstanding emerging market green bonds. Nevertheless, it shows that institutional investors hold the bulk of emerging market green bonds. Within that broad category, investment managers account for 78 percent, banks represent 16 percent, and insurance companies 6 percent. We believe, however, that governments (including sovereign wealth funds) and pension funds are also likely to be major holders of emerging market green bonds, despite not being accounted for in the Bloomberg data set. By region, Bloomberg's data suggest the bulk of emerging market green bond holders reside in the United States and Europe (Ireland, Luxemburg, United Kingdom), with China in fifth place.

EXHIBIT 2-9

Emerging Market Green Bonds Frequently Fare Better Than Conventional Securities During Risk-off Episodes

Performance of JPM Green bond index vs EMBI and CEMBI



Note: CEMBI D refers to the Corporate Emerging Markets Bond Index Diversified while EMBI GD is the Emerging Markets Bond Index Global Diversified

Source: Bloomberg and authors' calculations

While emerging market green bonds are still subject to underlying country and global risks, they also tend to have longer-term holders, as opposed to speculative investors who trade more tactically in response to market conditions. This means that emerging market green bonds often display lower volatility than conventional debt during times of market stress. This was evident during the 2020 pandemic year when a number of emerging market debt indices outperformed conventional bond gauges.

Another reason emerging market green bonds frequently fare better than conventional securities during risk-off episodes is that they are often issued by borrowers located in developing countries that have high credit ratings such as Chile, Hungary, Poland, and South Korea. A case in point was the relative performance of emerging market green bonds in the context of the COVID-19 outbreak in 2020 (See Exhibit 2-q).

One more variable to consider when looking at emerging market green bond performance is duration. As it takes time to complete a green project, green bonds tend to have longer-dated maturities compared to both emerging market corporates and high-yield sovereigns. Therefore, at times of duration sell-offs like in 2022, green bond performance is negatively impacted as core yields increase. With the Fed approaching the end of its hiking cycle, we expect pressure from duration should ease, which is supportive for fixed income in general, but green bonds in particular.

Finally, a very important driver of allocations toward green bonds over the last few years has been regulatory requirements. This has been especially true for European investors since the implementation of Sustainable Finance Disclosure Regulation. This means that investors will continue to demand high quality and reliable information on how green bond proceeds are used.

Market Outlook

Although 2022 witnessed a fall in GSSS bond issuance compared to 2021, this was mainly due to ongoing market fallout from Russia's invasion of Ukraine and rising interest rates globally. This decline in emerging market debt issuance was also evident in conventional emerging market debt with a drop in sovereign debt sales from $182.5 billion in 2021 to $97 billion the following year, according to J.P. Morgan data. Country authorities in emerging markets face difficult choices between sustaining financial stability and supporting growth in an environment of tighter global liquidity, increased geopolitical frictions, and slower global growth. Notwithstanding the continuing headwinds affecting the broader bond market, GSSS bonds will likely continue to increase their market share amid rising demand for sustainable investment. China will remain the most significant contributor to green debt issuance in emerging markets, but at lower volumes.

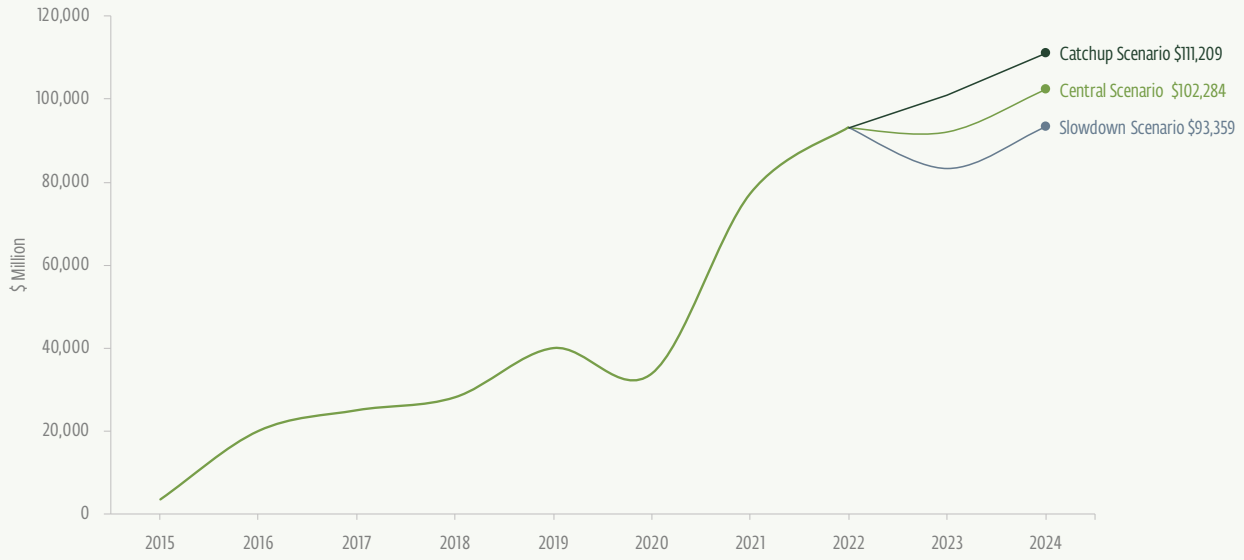
In our central scenario, we expect an easing of global inflationary pressures driven by a global slowdown and weaker credit growth. This, despite China's widely expected economic rebound, may hinder emerging market fixed income in 2023 in absolute terms, as risk aversion increases. Still, emerging market bonds could outperform local equities as the cumulative rate hikes implemented so far feed through to the real economy, translating into downward earnings-per-share revisions. In this central scenario, GSSS bonds as a proportion of total issuance will continue to increase. In a context of slow growth, sovereign issuers, including sub-sovereigns and agencies, will dominate the market.

When it comes to the fundamentals, we expect emerging markets excluding China to benefit from being more advanced in the tightening cycle and the fight against inflation relative to developed markets (with Brazil being a good example in this regard). More modest stimulus programs during the COVID-19 shock and Europe's recent energy crisis will also translate into lighter fiscal headwinds for emerging economies compared with their developed counterparts. This should translate into growth as high

EXHIBIT 2-r

Emerging Market Green Bond Issuance Under Three Global Economic Scenarios

Emerging market and developing economies green bond issuance forecasts for 2023



Source: Amundi calculations based on CBI, IFC, Environmental Finance, Amundi

as 27 percent in green bond issuance cumulatively over 2023–2024.

At the same time, we expect green bond issuance to fall around 7 percent in China during 2023, mostly due to the relatively unattractive yields of Chinese local bonds versus the United States and Europe, and the strength of the country's post-COVID-19 recovery falling short of expectations last year. In fact, a relatively high U.S. dollar funding rate is the main driver of the observed decline in dollar-denominated green bonds in China, as onshore companies can finance themselves at much lower rates in local currency. Also, weaker-than-expected growth in China in 2023 will be due to a combination of COVID-19 restrictions and a potentially severe correction in the domestic real estate sector. As a result, China will reduce its contribution to overall green bond issuance in emerging markets from 73 percent in 2022 to 68 percent in 2023–2024.

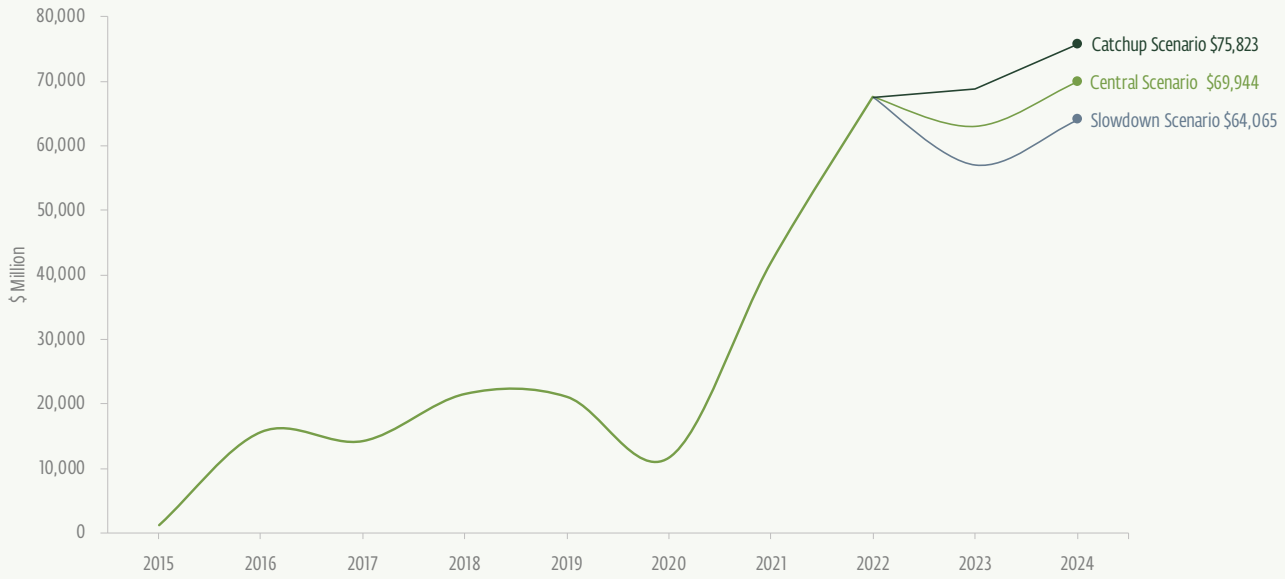
Importantly, our expectations for the full year are consistent with recent trends. While fixed-income issuance had a very strong start to the year (driven by higher yields), it has since stalled due to uncertainty around a number of factors, including the U.S. Federal Reserve's terminal rate, ongoing financial stability concerns in developed markets, and concerns around the strength of China's post-COVID-19 recovery.

As in previous editions of the report, however, we also run two alternative scenarios. The first of these is a more optimistic outlook, where a faster-than-expected decline in inflation is accompanied by an earlier completion of the tightening cycle at a lower terminal rate. In parallel, an

EXHIBIT 2-5

Chinese Green Bond Issuance Under Three Global Economic Scenarios

China green bond growth forecast



Source: Amundi calculations based on CBI, IFC, Environmental Finance, Amundi

earlier-than-expected resolution of Russia's invasion of Ukraine reduces uncertainty, eases supply-side pressures, and boosts global trade. In this case, recession is avoided and growth returns to its pre-pandemic trend. Financial stability concerns ease, bond prices recover on the expectation of lower rates, and credit quality stops deteriorating. The combination of higher risk appetite and rates peaking in the United States would translate into higher capital flows into emerging markets, which offer higher growth rates (roughly 3 percentage points on average, according the Amundi Institute) relative to developed markets. Higher asset prices and stronger emerging market currencies would result in higher foreign exchange-adjusted returns. Under these conditions, we would expect green bond issuance to grow by close to 40 percent cumulatively in 2023–2024 in emerging markets excluding China. Including China, we see a smaller increase of close to 20 percent, partly due to the relatively unattractive yields of Chinese local bonds.

Our pessimistic scenario is defined by a global economic slump driven primarily by tighter-than-expected financial conditions. Two potential paths could take us there. On the one hand, this could be the result of persistent inflationary pressures keeping interest rates high. On the other, this could also be the result of a credit crunch, with banks rapidly reducing exposures to assets that will underperform in a high-rate environment such as commercial real estate and leveraged loans. Recent events in the financial sector such as the stresses experienced by U.S. regional banks and the rescue of Credit Suisse could also contribute to this scenario. Either way, tighter financial conditions would weigh negatively on both private consumption and investment,

ultimately leading to weaker economic growth and a broad-based deterioration in credit quality. This alternative scenario could be compounded by higher geopolitical tensions around Ukraine (but also Taiwan) and a further fragmentation of global trade. Higher risk aversion would put additional upward pressure on borrowing costs as well as downward pressure on emerging market currencies. Overall, this would translate into lower capital inflows (or even net outflows) and lower asset values, particularly when measured in foreign currency. In this scenario, we would expect green bond issuance in emerging markets (including China) to be flat cumulatively over the next two years, with an 11 percent decline in 2023 followed by a 12 percent rebound in 2024.

Opportunities for Green Bond Market Growth

Issuance patterns reflect the prevailing economic, environmental and structural issues in individual markets. As mentioned earlier in this section, uncertainty around geopolitics and the interest rate outlook feed into demand for green bonds. Political factors shaping sustainable finance policies and frameworks also play a part, as does the institutional makeup of individual countries. For many developing economies, limited capital market depth and underdeveloped financial infrastructure contribute to keeping green bond issuance below potential. Later sections of this report (See Chapters 3 and 4 in particular) highlight the importance of sound governance and consistent regulation for healthy financial markets. These, in turn, depend on political stability.

Table 2.2 illustrates how individual countries perform across these factors and indicates whether there has been a notable change from 2021 to 2022. Some members of the IFC-initiated Sustainable Banking and Finance Network have not yet issued green bonds. Nevertheless, they demonstrate potential based on their commitment to national sustainable finance initiatives. Market prospects for each region are discussed in the remainder of this section.

Asia and the Pacific

China is expected to remain the largest single contributor to overall green bond issuance in emerging markets over the next two years. Its weight, however, is expected to fall from 73 percent in 2022 to 68 percent in 2023–2024 on the back of weaker-than-expected growth in 2023 and disappointing yields on China's onshore bonds.

The China Green Bond Principles released in July 2022 now require that 100 percent of the money raised through green bonds is directed toward green projects rather than the 50 to 70 percent requirement under the previous guidelines. Not all issuers are currently applying these principles, however, because of fragmentation in the governance of China's green bond market. In a context of growing concerns around potential greenwashing, uncertainty over the proportion of funds effectively allocated to green projects may further reduce the attractiveness of green bonds issued in China.

Outside China, the pickup in green and sustainability markets in Asian countries is likely to be further strengthened by recent policy efforts. Following the publication of a taxonomy for the region, several countries are in advanced stages of developing their own guidelines or classification systems detailing which economic activities qualify for environmental or sustainable investment. Indonesia and Malaysia published taxonomies in 2022, while both Thailand and Vietnam have produced draft frameworks which are closely aligned with those of regional peers. Efforts to improve data and information disclosure and reporting frameworks will be key to ensuring these voluntary taxonomies support the development of GSSS markets in the region. Additionally, Malaysia and Indonesia have opportunities to grow Islamic sustainable finance markets through the use of green and social sukuks.

In South Asia, Indian policymakers are spurring further development of the green bond market, which has mostly been concentrated in issuance by renewable firms. The government published its sovereign green framework in October 2022 as well as additional criteria for green bond

TABLE 2.2

Determinants of Green Bond Market Potential

	Volume of Green Bonds Issued in 2022, $Million	Cumulative Volume of Green Bonds Issued in 2012-22, $Billion	Sustainable Banking and Network Score	Green Bond Momentum		Capital Market Development			Governance	
			Overall	Green Bond Issuance in 2022	Green Bonds Issuance Relative to Total Debt Issuance in 2018-22, %	Domestic Credit to Private Sector as a % of GDP	Market Capitalization as a % of GDP	EMBI Spreads, March 2023	Regulatory Quality	Rule of Law Index
China	67.56	163.9								
Fiji										
Indonesia	2.58	8.0								
Lao PDR										
Malaysia	0.25	1.3								
Mongolia										
Philippines	0.23	2.8								
Samoa										
Thailand		3.6								
Vietnam	0.04	0.2								
Armenia		0.1								
Czech Republic		7.9								
Estonia	0.17	0.2								
Georgia		0.8								
Hungary	3.31	6.7								
Kazakhstan										
Kyrgyz Republic										
Latvia	0.11	0.3								
Lithuania	0.02	0.5								
Poland		7.0								
Romania		2.8								
Russia		2.5								
Serbia		1.2								
Slovenia		0.1								
Slovakia		1.3								
Türkiye	0.11									
Ukraine		1.2								
Argentina	0.35	1.0								
Barbados		0.0								
Brazil	3.27	9.4								
Chile	1.36	14.1								
Colombia	0.03	0.8								
Costa Rica										
Dominican Republic		0.0								
Ecuador	0.09	0.2								
Guatemala		0.7								
Honduras										
Mexico		2.9								
Panama		0.3								
Paraguay										
Peru	0.03	1.5								
Uruguay		0.4								
Egypt		0.9								
Iraq										
Jordan										
Lebanon		0.1								
Morocco	0.09	0.1								
Tunisia										
Saudi Arabia	3.06	4.4								
United Arab Emirates	3.18	5.1								
Bangladesh										
India	2.17	12.9								
Nepal										
Pakistan		0.5								
Sri Lanka										
Cote d'Ivoire		0.0								
Ghana		-								
Kenya		0.1								
Maldives										
Namibia										
Nigeria	0.05	0.2								
Seychelles										
South Africa		2.0								

Notes: Countries included are those that are Sustainable Banking and Finance Network (SBFN) members or green bond issuers. Countries are scored from 0 to 5 on each of the components, with 5 being the highest on a relative basis, according to available data. The SBFN Score is based on the Sustainable Banking and Finance Network measurement framework assessing national sustainable finance policies. Countries that are not SBFN members are indicated in gray. Sovereign Green Bond Issuance is based on whether the sovereign has already issued green bonds and whether it has announced plans to do so. Relative Green Bond Issuance measures the share of green bond issuance relative to total bond issuance from 2017–21. Domestic Credit to Private Sector is based on the percent of gross domestic product and refers to financial resources provided to the private sector by financial institutions. The data source is the World Bank. Market Capitalization data is based on the percent of GDP and are sourced from the World Bank and World Federation of Exchanges. J.P. Morgan Emerging Market Bond Index spreads are measured in basis points and are from May 2022. Lower spreads are scored as a 5, while higher spreads are scored as a 1. The Regulatory Quality and Rule of Law Index indicators are sourced from the World Bank.

issuers. The landmark issuance of two sovereign green bonds in early 2023 raised 160 billion Indian rupees, nearly $2 billion, which is likely to foster momentum in the broader domestic bond market. Elsewhere, Bangladesh's central bank recently published its taxonomy, setting out guidelines for eight sectors with a particular focus on solar facilities, while Sri Lanka launched its green framework in May 2022.

Europe and Central Asia

While the rollout and implementation of EU-level standards and policies related to GSSS bonds have implications for global markets, they are particularly significant for issuers and investors in EU member and accession countries.

Hungary plans to update its green bond framework to align with the EU Taxonomy, and Romania is working to finalize its green bond rules. Issuances in 2022 such as Hungary's repeat sovereign panda green bond, as well as an expansion of product offerings to include covered green bond issuance in Poland, demonstrated the region's potential to tap a broader investor base by using alternative currencies and structures. The region has strong prospects for further sovereign issuance in 2023, with Slovenia having already issued its second sustainability bond early in the year, Türkiye issuing a $2.5 billion green sovereign bond in April, and Romania indicating it plans to issue a sovereign green bond.

Latin America and the Caribbean

Issuance of sustainability and sustainability-linked bonds continues to be a strong thematic focus in Latin America and the Caribbean. The landmark issuances of sovereign sustainability-linked bonds in Chile and Uruguay provided a significant boost to the broader markets in these countries which are likely to see further growth. Green bond markets, however, still have significant potential, as demonstrated by a deal from a renewable energy firm in Argentina early in 2023. Brazil plans to issue a sovereign bond in either a green or sustainable format later this year. Efforts toward strengthening market infrastructure continue, with the development of national taxonomies underway in Brazil and Chile. Mexico and Peru are also developing frameworks of their own though they have made less progress than some regional peers.

Middle East and North Africa

Led by Saudi Arabia and the UAE, the momentum generated in 2022 for green bond issuance in the Middle East and North Africa has carried over into the early part of 2023. The Saudi sovereign wealth fund placed its second bond in February 2023, raising $5.5 billion and generating considerable interest from institutional investors, including from Asia. Financial institutions in the UAE have been regular issuers, with Dubai Islamic Bank selling a second sustainable sukuk in early 2023. Egypt has announced plans to issue $500 million in green bonds within the year to finance water, renewable energy, and electric mobility.

Sub-Saharan Africa

Although GSSS markets are nascent in Sub-Saharan Africa, developments in 2022 have been encouraging. Signs of progress include Kenya's draft green fiscal incentives policy framework which is intended to encourage private sector investment in green projects. At the COP27 summit, Namibia and the EU announced a partnership to develop renewable hydrogen supply, which included plans to mobilize funding to support infrastructure needs. Identifying a pipeline of green assets is essential to the growth of markets in Sub-Saharan Africa, as is strengthening market infrastructure. Financial regulators in Ghana unveiled new guidelines for listing and trading green and sustainable bonds, while Nigeria's stock exchange aims to deepen the country's market for sustainable products.

3

Recent Global Initiatives and Implications for Emerging Markets

The following section starts by examining the issue of "greenwashing" whereby an issuer makes misleading claims about a project's environmental credentials to qualify for sustainable funds. This is an important problem that is drawing the attention from regulators and investors alike. Failure to tackle this challenge could make investors increasingly reluctant to deploy funds in emerging markets because of the heightened reputational and compliance risk that comes with greenwashing.

A related obstacle that international investors face when deciding how to allocate resources to green investments in emerging markets, addressed throughout this report, is underdeveloped regulatory structures. In particular, multiple jurisdictions are embarking on initiatives to develop green finance taxonomies to enshrine best practice and set up parameters for investment. Another issue is the application of developed markets standards to emerging market countries, which could put emerging market countries in a disadvantageous position as they start from a lower base than their developed market peers. However, a lack of coordination between countries risks exacerbating the fragmentation of international capital markets. Different rules in different markets make it difficult to compare them, which acts as a major hindrance to cross-border investors. Furthermore, it also raises the risk of greenwashing by enabling issuers to choose the least onerous rules when seeking to issue debt that is eligible for sustainable investment.

Here we outline efforts to achieve better coordination between markets, such as a joint initiative between the EU and China, which should unlock greater potential in GSSS markets. We also include a box outlining a project by a group of international investors to assess sovereign issuers from a climate perspective.

Greenwashing, addressing a legitimate concern

Growing demand for sustainability-related assets, expanding product offerings, and rapidly changing regulations raise the risk of unscrupulous issuers misstating the extent to which bond proceeds fund environmentally or socially sound

projects, a practice commonly referred to as greenwashing.[18] False or misleading sustainability claims include exaggerating or obfuscating elements of issuers' sustainability profile as well as vague, immaterial, or unambitious sustainability commitments.

Greenwashing can occur at different phases of the green bond life cycle due to weak monitoring and enforcement as well as failures in reporting the intended use of proceeds. This brings an additional element of risk to the GSSS bond market that threatens to dissuade ESG investors from deploying funds in emerging markets. Solutions to address these challenges include robust third-party certifications and monitoring, mandatory disclosures, the development and adoption of voluntary guidelines, and harmonized taxonomies (as detailed in Chapter 4). Improvements in instrument design could also alleviate greenwashing concerns by ensuring financial penalties are sufficiently large to motivate issuers, embedding sustainability targets that are both material and ambitious, and eliminating loopholes that minimize penalty pay-outs.[19] Nevertheless, regulatory and other reforms aimed at improving transparency and countering greenwashing must be balanced against the need for flexibility while containing costs. Failure to achieve that balance could be counterproductive and dissuade smaller issuers.

Regulators are focusing on greenwashing claims

Financial authorities are taking some steps to address this. At the end of 2022, three European supervisory authorities—the European Banking Authority, European Insurance and Occupational Pensions Authority, and the European Securities and Markets Authority—launched a public consultation, seeking insights on analyzing greenwashing claims.[20] They outlined market participants' roles in greenwashing, including acting as trigger, spreader, and receiver of a sustainability-related claim. They also spelled out areas on which sustainability-related claims can be made. These include an entity's governance, sustainability strategy, objectives, qualifications in relation to a bond's issuer, the project it finances or the controls in place, and claims about metrics based on historical data or future targets.

Another area the regulators identified concerns the misleading qualities of a sustainability-related claim. This can include selective disclosure (cherry-picking positive information), omissions, or vagueness and ambiguity. Finally, the regulators highlighted the channels through which sustainability-related claims are communicated to other participants, including regulatory documents, ratings and benchmarks, project information, and marketing materials. They also outlined the various stages of the green bond's life cycle where these issues can arise.

These areas offer guidance on minimizing the risk of greenwashing and maintaining the integrity of sustainable finance. There are encouraging signs of progress in addressing greenwashing across the green finance market. For example, mandatory disclosure practices related to sustainability are becoming more common in different regions, while entities are using voluntary guidelines more. There have also been advances in developing global guidelines on common definitions and methods.

Calls for mandatory sustainability disclosure are getting louder.

Data disclosure requirements enable investors to price risks appropriately and develop a sustainable finance sector in emerging markets. Some countries like India have launched

18 See for example, Curtis, Q., Weidemaier, M., and Gulati, M., 2023, "Green Bonds, Empty Promises," Virginia Public Law and Legal Theory Research Paper, No. 2023-14, February 2023.

19 See Ul Haq, I., and Doumbia, D., 2022, "Structural Loopholes in Sustainability-Linked Bonds," Policy Research Working Paper, No. 10200, October 2022.

20 European Securities and Markets Authority, 2022, "ESAs Launch Joint Call for Evidence on Greenwashing," Press Release, November 15, 2022.

new guidelines to make these disclosures mandatory.[21] Company disclosures will also lead to an expansion of policy and research analysis. In the EU, the Corporate Sustainability Reporting Directive entered into force at the start of 2023 and was set up to ensure that companies report reliable and comparable sustainability information. In Singapore, climate disclosures are mandatory for financial companies.[22] Meanwhile, climate disclosure rules proposed by the Securities and Exchange Commission in the United States are still under development.[23]

A shift is underway from voluntary to more formal guidelines on green principles.

Adherence to the ICMA's green bond principles can help strengthen investor confidence in green bond instruments and support establishing local green bond markets. While voluntary market principles have proven effective in many areas, formal measures enshrined within regulation could further support and incite green bond issuers to define clear objectives and performance indicators while producing clear impact reporting.

Developing global sustainability disclosure standards will foster integrity in sustainable markets and avoid fragmentation in global capital markets and regulatory approaches.

The International Sustainability Standards Board at the IFRS Foundation—a public body overseeing financial reporting standards—has recently outlined the steps required to establish a comprehensive global baseline of sustainability disclosures.[24] It intends to serve as a global baseline to reduce further fragmentation of sustainability disclosure requirements.

Efforts on sustainable regulatory disclosures and common guidelines or taxonomies on best practices for green definitions are indications that the global market is mobilizing to minimize the risk of greenwashing into the future. The importance of this cannot be overstated. The prevention and identification of greenwashing must be clearly defined to ensure issuers and investors redress this issue. This would be a major step in preventing the green bond market from suffering reputational damage that chokes off flows of much-needed investment in sustainable projects across emerging markets.

Toward Standardization of Taxonomies

To achieve goals set out in the Paris Agreements, significant resources must be deployed globally to build resilient economies in light of the challenges posed by climate change. For renewable energy alone, investments amounting to $1 trillion per year are necessary between now and 2030 to reach net zero objectives by 2050, according to the International Energy Agency.[25]

In emerging markets, adapting to a carbon-neutral global economy will be especially challenging, given a relative scarcity of capital compared with developed countries. Plugging this financing gap will become harder still amid multiple challenges and economic distortions associated with climate change. Governments will face simultaneous demands to contain energy prices, maintain economic growth and create jobs, amid ever rising costs from more frequent extreme weather events associated with climate

21 SEBI has prescribed additional disclosures in offer documents for issuance of green debt securities (including the environmental objectives of the issuance and details of the project where proceeds are to be deployed), as well as post-listing continuous disclosures in relation to the utilization of the proceeds, details of unallocated proceeds and performance of the project. Source: https://www.lexology.com/library/detail.aspx?g=954cd74b-bf66-4ec6-a2c3-45cd2fa5c547

22 See https://www.sgx.com/sustainable-finance/sustainability-knowledge-hub

23 Federal Register, 2022. "The Enhancement and Standardization of Climate-Related Disclosures for Investors," Proposed Rule by the SEC.

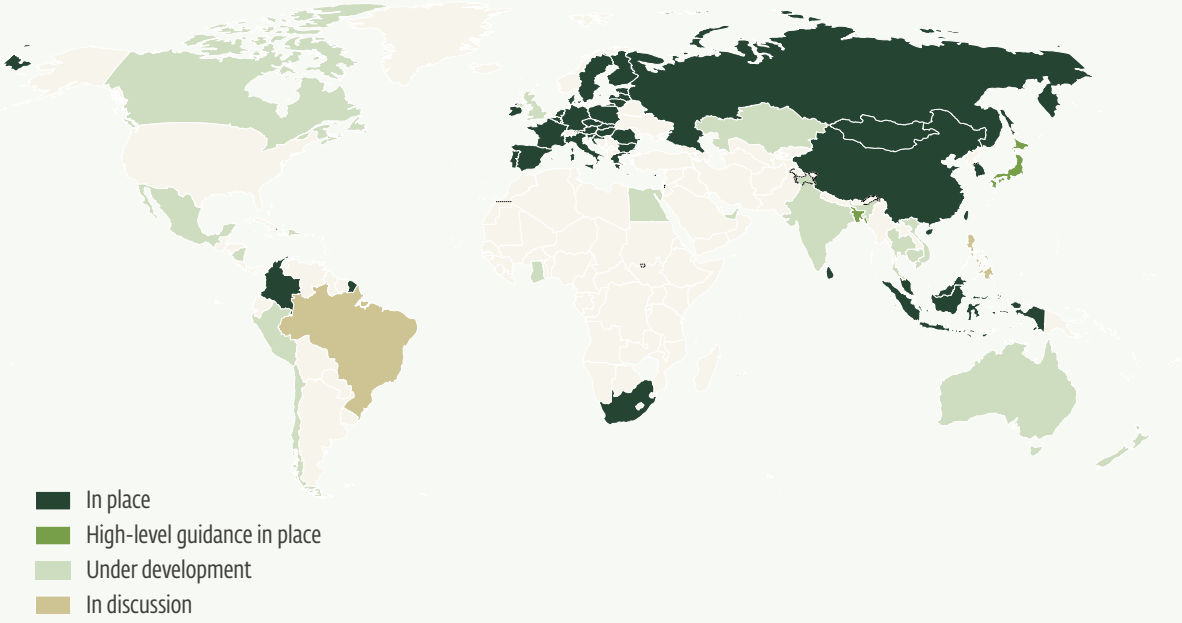
24 IFRS, 2022, "ISSB Delivers Proposals That Create Comprehensive Global Baseline of Sustainability Disclosures," Press Release, March 31, 2022.

25 International Energy Agency, 2021, "Financing Clean Energy Transitions in Emerging and Developing Economies Report."

EXHIBIT 3-a

An International Overview

Progress toward sustainable finance taxonomies varies internationally



Source: FoSDA Workstream on Taxonomies

change. Therefore, ensuring that policy and regulatory frameworks on sustainable finance are robust will be critical for mobilizing financial resources and attracting the investment needed to close financing shortfalls.

Progress in closing financing gaps in emerging markets has been slow thus far, in large part due to the absence or deficiency of public policy on funding economic and energy transitions. A lack of standardized regulatory frameworks for sustainable finance is keeping flows of investment capital below their potential. To address this deficiency, a number of developing country governments have taken steps since 2022 to introduce green classification frameworks, including Indonesia, South Africa, and Georgia.

These green taxonomies define environmentally sustainable economic activities or investments that can help countries progress toward meeting targets related to priority environmental objectives.[26] They seek to address the risk of greenwashing around corporate and sovereign borrowing while promoting the development of green finance by helping companies, investors, and policy makers to make better-informed decisions.

The number of emerging market countries considering setting up green taxonomies is rising around the world. Regulatory frameworks are already under development in

26 World Bank, 2020, "Developing a National Green Taxonomy."

BOX 3.1

Indonesian and South African Taxonomies

Launched on January 20, 2022 by President Joko Widodo, the Indonesian taxonomy is based on the evaluation of sectors and sub-sectors of the economy in terms of their impact on the environment and society. It introduces a classification system which divides sectors into three categories. These are:

- **Green:** The activity has a positive impact on the environment and is aligned with national environmental objectives.
- **Yellow:** The activity does not have a significantly negative impact on the environment but needs to adapt for transitional purposes to align with national environmental objectives.
- **Red:** The activity has a negative impact on the environment.

Similarly, South Africa published a Green Finance Taxonomy in April 2022. This encompasses a classification system that maps the sectors and activities that need to contribute to tackling climate change and informs companies of areas for improvement and their associated screening criteria. The South African taxonomy initially focuses on climate change but is expected to be extended to other areas such as biodiversity and land use.

the Dominican Republic, Kazakhstan, India, Thailand, and the UAE, while other jurisdictions including Costa Rica, Egypt, and Mexico, are preparing similar steps.[27]

However, this expansion of taxonomies around the world raises issues of comparability, interoperability, and credibility, a significant problem for potential investors seeking to allocate funds in multiple jurisdictions.

For example, Indonesia relies on qualitative assessments to evaluate economic activities, whereas the EU uses quantitative measures, making the two systems incompatible from international investors' perspective.

Another notable example is the EU's system for rating green buildings based on its Energy Performance Certificate and Near Zero Energy Building definition. Neither of these are applicable outside Europe, though the EU has recently communicated its intention to standardize these two measures globally.

Part of the problem of comparability relates to the existence of two alternative approaches to establishing national taxonomies. The first of these, a whitelist-based approach, relies on the identification of projects or economic activities that have an environmental or social impact in each sector of an economy. China, Mongolia, and Russia are among the countries with taxonomies modeled around this system.

The second method focuses on technical screening criteria and thresholds which are specific to each economic activity, without assessing them at the level of technologies or sub-sectoral activities. Chile, Colombia, the EU, South Africa, and South Korea have opted for this approach.

But the existence of more than one model makes comparisons between markets difficult for international investors, undermining the appeal of green finance as an asset class and contributing to market fragmentation.

Harmonizing taxonomies would help reduce greenwashing.

Standardization would make it possible to provide a common definition of the procedures for assessing economic

27 Future of Sustainable Finance Alliance, 2022, "Taxomania! International Overview Update 2022," accessed on February 26, 2023.

activities. This would prevent issuers referring to the least onerous standard available to them, thereby undermining the effectiveness of climate finance instruments in channeling capital to areas where it can have a meaningful impact on sustainability.

In emerging markets, in addition to data gaps and statistical challenges, the lack of clarity about which activities and assets can be defined as green has hindered the scaling up of green finance. The development of harmonized classification definitions and methodological standards would help ensure the availability, comparability, and reliability of climate-related data (See Exhibit 3-b). To support environmentally sustainable investments, there is a need to set up a widely accepted global taxonomy and sustainable finance classifications.

The convergence of different taxonomies over time will be important in ensuring consistency in climate-related disclosures but will also improve the comparability of credit ratings across markets. It is in this spirit that the International Platform on Sustainable Finance was developed. Co-developed by the People's Bank of China and the European Commission, a comparison between the Chinese and European taxonomies was established in 2021 and revised in 2022 under the "Common Ground Taxonomy" (CGT).

Other taxonomy standardization processes are currently being planned or are already under development. The first version of the ASEAN Taxonomy was published in November 2021. July 2022 saw the launch of the Working Group on Sustainable Finance Taxonomies in Latin America and the Caribbean. More emerging market authorities may be tempted to turn to the EU Taxonomy as a standard. However, the European model does have its limitations as an example for developing countries amid significant differences in production methods and levels of economic development.

EXHIBIT 3-b

Building Blocks for Bridging Climate Data Gaps

Source: NGFS

For example, the EU taxonomy includes nuclear energy and natural gas in its "sustainable investment" category, which may not be applicable in other countries or regions.

Another issue limiting the applicability of the European system to emerging markets is its binary assessment of which economic activities are sustainable and which ones are not. It does not consider efforts made by companies toward embarking on a transition. If these initial steps are not taken into account by local taxonomies, companies cannot access funding from private firms to finance their transition efforts.

BOX 3.2

The Common Ground Taxonomy

The CGT aims to help reduce transaction costs and facilitate international green capital flows by strengthening market confidence and reducing fragmentation. Based on the International Standard Industrial Classification guidelines for the categorization of sectors, the CGT is designed to promote cross-border economic activity while taking into consideration national and regional specificities. To harmonize the two taxonomies, when they diverge on a particular issue, the CGT adopts whichever criteria are more stringent.

The CGT covers 72 activities and six sectors including:

- Agriculture, forestry, and fishing
- Manufacturing
- Electricity, gas, steam, and air conditioning supply
- Water supply, sewage, waste management, and remediation activities
- Construction
- Transportation and storage

The CGT was greeted with enthusiasm by market participants as well as policy makers. Indeed, Chinese financial institutions welcomed the ability to label bonds as CGT-aligned. Internationally, the Bank of China branch in Frankfurt issued the first-ever green bond aligned with the CGT, a $500 million three-year senior unsecured fixed -rate offering. In addition, Deutsche Bank signed in June 2022 the first transaction aligned with the CGT, earmarking proceeds to finance Huaneng Leasing's direct leasing for two wind power development projects in China.

There are signs that the CGT is being examined in other emerging market jurisdictions as a potential model for international alignment of their own taxonomies. Indeed, Sri Lanka drew on the CGT as an example when developing its system.

On top of this, local economic and social realities in developing countries require transitions to be more gradual for emerging market companies than for their European counterparts. Taxonomies should, therefore, take local conditions into account, adapting sustainable activity thresholds and granting more flexibility to transitional activities. To this end, the EU Platform on Sustainable Finance has recommended mapping EU Taxonomy activities, comparing them to well-known industry classifications, in order to facilitate the alignment of non-EU entities.[28]

To conclude, the challenges faced by various emerging market jurisdictions in establishing their taxonomies are considerable. Comparability, the categorization of activities, and the subjectivity of classifications are just some of the problems faced by authorities seeking to make their markets more attractive to investors. However, addressing these challenges is crucial for strengthening the role of private capital in emerging market climate finance and ensuring the green bond market maintains momentum in these vulnerable economies. Harmonization of classification systems around the world will be key. But local conditions will also need to be considered in order to encourage effective transitions in emerging markets.

28 https://finance.ec.europa.eu/system/files/2022-03/sustainable-finance-taxonomy-nace-alternate-classification-mapping_en.xlsx

BOX 3.3

The ASCOR Project–the first public investor framework to assess sovereign risks[1]

The Assessing Sovereign Climate-Related Opportunities and Risks (ASCOR) Project, an initiative set up by a coalition of international investors, seeks to establish a coherent framework for assessing sovereign bond issuers from the perspective of climate change. The aim is to provide an independent and publicly available tool to help investors engage with issuers while giving governments the opportunity to showcase their progress in addressing climate change.

ASCOR has the principle of fairness at the core of its framework with the aim of encouraging financial flows to support a just and resilient low-carbon transition, especially in countries that are least able to finance it themselves.

It sets out a common basis to analyze individual country approaches and will reinforce public disclosures to help investors understand sovereign actions and progress. It builds on existing data but will also further enable issuers to detail material information, so that investors can more effectively support country transition plans. The framework will enable scrutiny of country climate policies both in terms of their contribution to mitigating climate change as well as building resilience to its impact.

1 The framework is still to be finalized and subject to changes. An updated framework will be published in autumn 2023 based on the feedback received during ASCOR's consultation process in Q1 2023.

The Three Pillars of the ASCOR Framework:

PERFORMANCE OF COUNTRY ON MANAGING CLIMATE CHANGE		**LANDSCAPE OF COUNTRY'S RISKS AND OPPORTUNITIES**
PILLAR 1: ***Emissions pathways***	***PILLAR 2:*** ***Climate policies***	***PILLAR 3:*** ***Opportunities to finance the transition***
• Emissions trends • 2030 targets • Net zero targets	• Mitigation • Adaptation • Just transition	• Financing to mitigate • Financing to adapt • Financing to harness opportunities

4

Central Banks, Financial Technology, and the Public Sector

The following section outlines three areas that will play a crucial role in deepening capital markets in emerging markets so that more funding can be channeled toward financing green transitions at a lower cost. The first of these relates to central banks. Debt markets are shaped by monetary policy as this has a direct impact on how bonds and loans are priced. Therefore, central banks will play an important role in energy transitions on account of their influence on international financial markets.

The second segment focuses on how financial technology companies, commonly known as "fintech," and blockchain-based solutions can aid domestic resource mobilization for sustainable investments.

Next, we examine what role public sector actors can play in reducing the cost of capital in emerging markets while increasing the availability of funds for the energy transition. In particular, we address how energy transitions in emerging markets would benefit from using synthetic securitizations—repackaging risky debt into new securities with the backing of government or multilateral agencies— to attract more private investment into emerging market green bonds.

Monetary Policy Implications of Climate Change

Climate change and the transition toward cleaner energies entail significant risks for economic and financial systems. They also represent a sizeable challenge for central banks because of their direct impact on macroeconomic and financial stability.

Rising prices associated with the cost of green transitions, known as "greenflation," and the risk of de-anchoring inflation expectations could result in some central banks rethinking their monetary policy strategies. As well as their day-to-day responsibility for ensuring price stability, the critical nexus of climate change and the financial system could make it increasingly necessary to incorporate climate risks into regulatory and supervisory frameworks. These, in turn, could shape the data disclosure and risk management practices required by authorities of the financial institutions that they supervise.

Furthermore, central banks could actively support the greening of economies by potentially adapting their lending operations, collateral frameworks, and asset purchases. This would present some risks, however. In doing so, central

banks would need to monitor whether active involvement in climate policy undermines their independence, leaving them open to accusations of stepping beyond their mandates and thereby weakening their credibility.

Climate-related macroeconomic stabilization challenges for central banks.

The interactions of climate change and monetary policy may significantly influence macroeconomic outcomes and represent sizeable challenges for central banks. Transition policy uncertainty, increased volatility, and damage to production from climate shocks can destabilize economic systems, forcing central banks to step in and stabilize price and output fluctuations.

Extreme weather and other physical risks linked to climate change may result in significant output losses, requiring central bank action to smooth the economic cycle or spur growth. The challenges are particularly acute for emerging markets, especially in Africa, where monetary authorities typically have fewer financial resources than their developed country counterparts, and exposure to extreme weather events such as droughts and floods is greater. Transition policies in advanced economies could also generate undesired spillovers to developing countries and cause serious balance-of-payment challenges. For example, implementing a carbon tax on goods entering the EU would harm the price competitiveness of emerging market exporters to Europe, particularly in neighboring North Africa. After a radical policy shift, such as introducing carbon pricing or a carbon tax, lower demand for emerging market exports and higher export production costs may generate external imbalances in export-oriented economies.

Climate risks could destabilize external liquidity conditions in other ways. The introduction of new regulation in advanced economies, the declining profitability of high-emission activities, higher exposure to physical risks, and a broader preference for greener investments could all cause sharp selloffs of emerging market assets. To counter these external shocks, central banks would need to act by adapting their foreign exchange reserve management, for instance, by shifting to a flexible exchange rate regime to preserve cost-competitiveness.

Greenflation may require central bank action but also rethinking the monetary policy strategy.

The primary mandate of most (orthodox) central banks is to keep inflation low, stable, and predictable. Climate change represents a sizeable challenge to central banks because of its direct impact on inflation and output. The materialization of climate-related risks could significantly increase price volatility over extended periods and potentially de-anchor inflation expectations.

The materialization of physical risks could trigger similar dynamics to negative supply shocks, such as the surging food prices often seen in the wake of floods or droughts. These might be difficult to counter with the traditional monetary policy toolbox, as evidenced by the food and energy price spikes seen after Russia's invasion of Ukraine. Climate-related upheavals will present central bankers with a complex trade-off between inflation stabilization and economic growth.[29] While an interest rate hike would partially contain supply-driven inflation, it may seriously restrain credit expansion and weigh on economic activity.

The potential disruptions associated with adapting economic and energy models to climate change, known as transition risks, also present the possibility of highly persistent negative supply challenges that are inflationary.[30]

29 The IMF finds that the output-inflation trade-off will be larger for the central banks of countries where there is a significant delay in implementing climate policies. The longer the transition to clean energy generation is delayed, the greater the costs of inflation and output losses. See Carton, B. and Natal, J-M., 2022, "Further Delaying Climate Policies Will Hurt Economic Growth," IMF blog, October 5.

30 See: Schnabel, I., 2022, "A New Age of Energy Inflation, Climateflation, Fossilflation, and Greenflation," Speech to ECB panel on monetary policy and climate change, ECB, Frankfurt, March 17, 2022.

The implementation of a carbon tax in advanced economies or a dramatic hike in the global carbon price to align it with the true environmental cost of emissions would incentivize the shift toward clean energies. These transition policies would also raise global fossil fuel prices and increase their short- to medium-term volatility.[31] Central European countries with large and fossil fuel-intensive manufacturing sectors within the EU are highly exposed to this type of inflation risk. The progressive phasing out of fossil fuel subsidies in developing countries is also a potential trigger for energy inflation.

Rising energy prices could also arise from strong demand for materials that are central to the expansion of low-carbon technologies, such as copper, lithium, and nickel, given inelastic supply in the near term.[32] Indeed, an International Monetary Fund (IMF) study finds that copper, nickel, cobalt, and lithium prices could all reach historical peaks and stay at elevated levels for as long as a decade.[33] These price pressures will likely spill over into other material-dependent sectors and impact wage dynamics. The extent to which these transition-specific pressures affect different areas and drive up consumer prices remains uncertain and warrants future research.

Climate change could push central banks to act against the risk of de-anchoring inflation expectations.

Climate-related inflation is most likely to affect food and energy prices in the first instance. Yet, households tend to overestimate the weight of these price rises while forming their inflation expectations. Therefore, this inflation type could amplify the second-round effects and trigger a wage-price spiral. By causing higher and more volatile inflation in the short and medium term, climate change impacts how households and businesses plan for further ahead. Government actions could also directly shift inflation expectations as economic actors respond to announcements of new policies and regulations to reduce greenhouse gas emissions.

Climate risks increase uncertainty around central banks' macroeconomic diagnosis and have significant strategic implications for their monetary policy. Central banks measure price stability by a level or range of inflation targeting that is publicly communicated to anchor inflation expectations. By impacting different aspects of their inflation-targeting framework, climate change may cause central banks to rethink the design of their monetary policy regimes.[34] More precisely, central banks may need to review their strategy relative to the measure chosen as the inflation target, addressing the choice between a target expressed as a level or interval, the horizon over which the inflation target must be reached, and the level of the target itself. Integrating these key implications of climate change into monetary strategy is currently being discussed among major central banks.

The implications of climate change for financial stability and supervision

Climate change may significantly alter financial conditions and endanger the stability of financial systems, a prospect that is attracting increased attention from central banks and supervisory authorities. In 2017, eight financial and monetary authorities launched The Network of Central Banks and Supervisors for Greening the Financial System (NGFS), bringing together 114 central banks, supervisors, and

31 In the long term, fossil fuel inflation is likely to progressively give way to relative price adjustments. But while clean energies are expected to become cheaper with easing supply bottlenecks and scale economies, fossil fuel prices may remain elevated in the long term as a result of environmental taxes and regulations.

32 Miller, H., Dikau, S., Svartzman, R., and Dees, S., 2023, "The Stumbling Block in the Race of Our Lives," Centre for Climate Change Economics and Policy Working Paper 417, London: London School of Economics and Political Science.

33 Boer. L., Pescatori, A., and Stuermer, M., 2021, "Energy Transition Metals," Working Paper No. 2021/243, IMF.

34 Dees, S., Weber, P-F., "Les consequences du changement climatique pour la politique monetaire,", Revue d'Economie Financiere, 2020/2 No.138.

18 observers.[35] Participation is voluntary, and the network's purpose is to strengthen and align responses to the Paris Agreement and to enhance the financial system's ability to manage risks and mobilize capital for green and low-carbon investment.

Central banks and financial supervisors are placing increasing focus on how climate risks could affect the financial soundness of banks, insurers, and other financial institutions.[36] More frequent and severe climate-induced natural disasters are likely to translate into higher losses for insurance companies, trigger sharp drops in property prices, and cause severe deterioration of balance sheets and the creditworthiness of households and companies.

Transitioning to a low-carbon economy may also cause financial losses stemming from stranded capital and lower future profit prospects from non-green investments.[37] Sudden changes in climate policies, technology, or market sentiment could undermine the value of financial assets with a high carbon footprint. Under a late and disorderly transition scenario, the collapse of emission-intensive asset prices would be more severe and cause sizeable damage to financial assets and the balance sheets of energy companies that rely on fossil fuels. These sudden revaluations could inject fragility into the wider financial system, weakening the finances of corporations, households, financial institutions, and central banks. They could also alter risk premia and credit conditions.

Conversely, rapid changes in the price of low-carbon assets may destabilize financial markets if greater demand for such investments incentivizes greenwashing. The rush for green investment could create green asset bubbles while increasing the risk of sudden price corrections.[38]

The materialization of greenwashing risk could trigger a sudden withdrawal by investors from financial products perceived to be green, hence generating significant capital outflows and selling pressures.[39] Any market perception that some green bonds might not meet their green aspirations might cause a cliff-edge effect with abrupt repricing for the asset class that could even endanger financial stability.

The financial sector's exposure to climate risks means data collection, risk management, and regulation must adapt.

Risk management frameworks for banks and supervisors need to adapt to incorporate the economic and financial impacts of climate risks, which are complex and multi-dimensional. Financial institutions are exposed to climate-related financial risks through their relationships with customers and counterparties. A complete assessment of their risk exposures would require the disclosure of comprehensive climate-specific data sets with sufficient historical depth and granularity, accounting for the heterogeneity of their portfolios.[40]

Several central banks and supervisory authorities have recently launched climate stress tests to assess the impact of climate risks on the financial system and the overall economy. Stress testing has been traditionally used to evaluate a financial institution's resilience to economic shocks, often through a capital adequacy target. Unlike standard stress tests, climate assessments pose additional challenges regarding data availability and model uncertainty. Without historical precedent on which to build quantitative

35 The NGFS is chaired by Ravi Menon, Managing Director of the Monetary Authority of Singapore, and the Banque de France provides the secretariat function.

36 Network for Greening the Financial System, 2021, "Progress Report on the Guide for Supervisors, Technical Document."

37 Network for Greening the Financial System, 2019, "A Call for Action: Climate Change as a Source of Financial Risk, Report."

38 Breeden, S., 2022, "Balancing on the Net Zero Tightrope," Speech at TheCityUK International Conference, April 7, 2022.

39 European Central Bank and European Systemic Risk Board, 2022, "The Macroprudential Challenge of Climate Change Report."

40 At the request of the Financial Stability Board, since 2017, the Task Force for Climate-related Financial Disclosures (TCFD), has issued recommendations to companies and other organizations to help them improve transparency on the actual and potential impact of climate change on their activities.

scenarios, climate scenarios rely on forward-looking data and transition reference scenarios published by the NGFS. Long-term climate socio-economic pathways fundamentally differ from the three- to five-year horizons used in standard stress test exercises. Finally, incorporating firm-level heterogeneities to capture the impact of the most disruptive climate shocks is a sizeable challenge. Banks and insurers tend to have limited information at their disposal to understand the current emissions, transition plans, and physical risk exposure of their customers.

Climate stress tests on banks have revealed potential vulnerabilities around capital adequacy and long-term drags on profitability.

In 2021, the Bank of England ran its first climate stress test on the largest U.K. banks and insurers. The exercise revealed that while results vary across firms and scenarios, overall climate-related losses would reach a level equivalent to 10–15 percent of annual profits. This implies that climate risks may persist over time on banks' and insurers' profitability, leaving them more vulnerable to future shocks. Firms' projections suggest that these costs will be lower if early, well-ordered action is taken to lessen their climate-risk exposure. Given data limitations, this stress test exercise will not be used to set capital requirements for banks and insurers. However, it plays a pivotal role in moving forward the discussion among central bankers.

Another example is the Philippines Financial Sector Assessment Program[41] by the IMF and the World Bank, evaluating the impact of extreme weather events on financial stability. The results show that the materialization of physical risk could significantly endanger banks' capital adequacy and asset quality under a compound shock scenario such as, for example, a typhoon that follows a pandemic.

Beyond identifying and measuring climate risks, developing new supervisory tools, and adapting existing frameworks will be pivotal for regulators to mitigate climate-related financial risks. Integrating climate risk into capital adequacy frameworks is a widely discussed avenue among supervisory authorities.[42] Stronger capital rules for climate exposure would increase the banking system's capacity to withstand future climate-related losses. In addition, adjusting capital risk weights in the function of the bank's climate risk exposures would incentivize the banking system to support low-carbon projects.

A lack of reliable data, the absence of common definitions, and partially developed methodologies for running sensitivity analyses and stress tests, are the biggest impediments to fully incorporating climate risks into capital adequacy requirements. Yet, supervisors should also be mindful of the potential unintended consequences of climate-risk capital buffers. Underestimating the risk associated with green assets may lead to under-capitalizing banks and insurers, making them more vulnerable to shocks. On the other hand, excessively punitive capital requirements for carbon-intensive financial activities may prove inefficient. Over-capitalization of financial institutions would reduce their ability to support the economy through the transition. Banks and insurers must continue providing finance to more carbon-intensive sectors in developing countries with high

41 International Monetary Fund, 2022, "Philippines, Financial Sector Assessment Program: Technical Note on Bank Stress Test for Climate Change Risks".

42 The work on incorporating a minimum capital (Pillar 1) and bank-specific additional (Pillar 2) capital treatment for climate-related and environmental risks in the prudential framework is at an early discussion stage. The Bank of England and U.K. banking regulator, the Prudential Regulation Authority, have proposed an "escalating" climate buffer, which is based on a risk assessment on the materiality of future system-wide transition and the physical risks associated with climate change. Canada's financial regulator is also considering a new set of capital buffers to ensure that federally regulated financial institutions can endure an abrupt transition to a green economy.

climate exposure and limited financial resources to allow them to invest in the transition.

How can central banks support the transition to a low-carbon economy?

Including climate change considerations in monetary policy actions will require significant changes in central banks' operations. The European Central Bank (ECB) and the Bank of England have been pioneers in initiating the inclusion of climate-related policies into their operational frameworks. Implementing these policies by a wider selection of central banks would go hand in hand with resolving underlying data gaps and establishing a widely accepted green taxonomy. Green central banking initiatives in developing countries are mostly limited to reporting and disclosure. At the same time, the People's Bank of China stands out by introducing green instruments into its operational framework.

Central banks could put in place green lending initiatives by making the interest rate on lending facilities conditional on commercial banks' contribution to tackling climate change or the decarbonization of their business models. Japan and China's central banks have already introduced various credit incentives to boost green projects. The ECB has announced that it might consider green-targeted lending operations in the future when its policy becomes expansionary again.[43]

Monetary authorities could also adjust their collateral frameworks to align with climate objectives and incentivize asset allocation favoring low-carbon projects.[44] They could apply negative screening, limiting the share of assets issued by entities with a high-carbon footprint that can be pledged as collateral by counterparties when they borrow. They could apply haircuts to corporate and government bonds to better account for climate-related risks faced by the issuers but also to incentivize the issuance of green bonds. Another option is positive screening, expanding eligibility criteria to incentivize banks to lend or capital markets to fund environmentally beneficial projects. In 2018, the People's Bank of China included green loans and green bonds as eligible collateral. The National Bank of Hungary started to incentivize green securities. The ECB has announced that it would include negative screening, climate-related disclosure requirements, and haircuts into its collateral program beginning in 2026.

Central banks could align their balance sheets with Paris Agreement objectives through asset purchase programs. They can implement green quantitative easing policies by targeting asset purchases based on climate-related criteria at the issuer or asset level to support green bond markets and increase the share of clean assets in their balance sheets. The Bank of England has committed to a 25 percent reduction in its corporate bonds portfolio's weighted average carbon intensity by 2025, and complete alignment with net zero by 2050. Since the end of 2022, the ECB has also started to tilt its corporate bond holdings toward issuers with better climate performance through the reinvestment of redemptions.[45]

These green asset purchases have so far been limited to corporate bonds. Greening public sector asset holdings would prove more challenging. In the case of the ECB, purchases of sovereign bonds are guided by the capital key, which limits the scope for tilting strategies based on countries' carbon intensities. Compared to the size of central banks' sovereign bond portfolios, the overall supply of green sovereign bonds remains insufficient. But more importantly, a reliable worldwide taxonomy and sovereign rating framework to assess the alignment of sovereign bonds with Paris Agreement goals is still lacking.

Overall, the aforementioned options for green central bank operations would help incentivize borrowers to improve

43 Schnabel, I., 2023, "Monetary policy tightening and the green transition," Speech to the international Symposium on Central Bank Independence," January 10, 2023.

44 Central bank collateral policy defines the type of assets to be pledged to secure central bank credit operations, as well as the risk control measures that apply to them.

45 For now, the ECB follows only a flow-based tilting approach by adjusting its reinvestments of corporate bonds based on a climate score that reflects issuers' carbon intensity, their decarbonization plans and the quality of their climate-related disclosures.

their disclosures and reduce their carbon emissions. They would also let central banks set a good example to other financial institutions through their lending, collateral, and asset purchase practices. Most importantly, these green operations would benefit central banks by reducing their balance sheet exposure to climate risks. In emerging market economies, central bank green policies will undoubtedly be instrumental in deepening the green bond market by boosting demand for green financial products and lowering their yields.

What are the risks for central banks?

While climate-related economic and financial considerations may require central bank policy action, governments should retain overall control of climate policies. Governments and supranational entities tend to have a broader range of fiscal and regulatory tools to foster the low-carbon transition and mitigate physical risk.

Addressing climate-related challenges may require policy decisions that fall beyond the remit of central banks and financial regulators. There is so far no common agreement among central bankers on how to include climate change in their monetary policy operations and which boundaries to respect. Central banks' mandates generally exclude actions that target specific agents such as firms, households, sectors, and regions or systemically provide direct financing to governments to support climate adaptation or mitigation spending.

Adding the fight against climate change to central banks' mandates so that they actively undertake green monetary policy carries risks. Central banks may endanger their credibility in core activities by making themselves publicly accountable in areas where they have limited capability and risk-assessment accuracy. In developing markets with scarce financial resources, extending central banks' mandates to address climate change may expose them to greater political pressure that may endanger their autonomy and credibility.

Using Technology to Mobilize Domestic Resources

This sub-section focuses on how financial technology companies, often referred to as fintechs, and blockchain-based solutions—decentralized databases—can aid domestic resource mobilization for sustainable investments.

We explore how fintechs could complement traditional capital markets and help mobilize financial resources for sustainable infrastructure investments. We also discuss existing notable blockchain-based solutions for bond development, fintech applications in trading, and cases for mobilizing domestic savings to scale up sustainable investment. The importance of domestic savings in areas such as developing infrastructure was highlighted by the large-scale withdrawal of international capital from emerging economies' bond markets in March 2020.[46] We also highlight a comprehensive framework published by the Asian Development Bank Institute, the Pathfinder Initiative with the Government of Bangladesh, the Bank for International Settlements' Genesis 2.0: Smart Contract-Based Carbon Credits Attached to Green Bonds, and the World Bank's CAD Trust.[47]

There are various potential uses for blockchain technology which can improve the implementation of infrastructure projects by upgrading processes and enhancing transparency around record-keeping and revenues.[48]

However, questions remain around the political pressures that may arise as standards and governance processes are

46 Hofmann, B., Shim, I., & Song Shin, H., 2020, "Emerging Market Economy Exchange Rates and Local Currency Bond Markets Amid the Covid-19 Pandemic," (BIS Bulletin No. 5). Bank for International Settlements.

47 See Chen, Y., & Volz, U., 2022. "Scaling up sustainable investment through blockchain-based project bonds," Development Policy Review, 40.3

48 Smart contracts are simple programs stored in the blockchain that can be used to automatically exchange coins based on certain conditions.

developed. Blockchain-based solutions can certainly address some of the data challenges and increase efficiencies. But they are not a standalone solution and should not work in a vacuum.

How can fintechs be complementary to conventional capital markets?

New technologies are enabling sustainability solutions that can help alleviate the negative implications of climate change.[49] A growing body of research indicates that green fintech has the potential to impact the whole value chain of financial services covering consumer-to-consumer, business-to-consumer, and business-to-business services.[50]

Global investment in green finance, particularly in developing economies, requires immediate actions and climate policies, which must be accompanied by fund flows to address global financing gaps. Reducing risks and constraints through public-private partnerships, with the involvement of entities that leverage blockchain technology, artificial intelligence, and machine learning, can help mobilize domestic and foreign private sector capital in climate finance.

Public-private partnerships with fintechs can aid the development of a sustainable finance framework. To illustrate, Mauritius is one country actively exploring ways to encourage private actors to cooperate with the public sector in creating enabling environments and promoting financing structures such as green bonds. In February 2021, the Bank of Mauritius published its "Guide for the Issue of Sustainable Bonds," which followed the creation of the Mauritius Africa FinTech Hub, launched by the country's government in October 2018.[51]

Fintechs can be used in areas such as renewable energy, harnessing blockchain technology, decentralized electricity markets, carbon credits, and innovation in financial instruments, including green bonds. For example, several fintech investment platforms have emerged that enable consumers to screen assets and invest personal funds exclusively in green initiatives.

Debt financing has readily embraced principles around ESG frameworks.

Emerging fintech lending companies are focusing on sustainability and providing dedicated platforms and products aimed at addressing ESG objectives for their clients.

A separate but related issue is the importance of addressing concerns like data quality, availability and comparability, and asymmetries in information access between investors and other stakeholders. These challenges are especially relevant in emerging markets. Technology-based solutions have the potential to address some of these data challenges. For instance, they can enable a more efficient collection of information, while blockchain platforms can help ensure the provenance of ESG certifications. Natural language processing—using artificial intelligence systems that allow computers to understand written or spoken communications— can help to analyze reports and distill relevant sustainability-related information.[52]

Blockchain-based projects are facilitating the mobilization of domestic resources for sustainable investments.

Distributed ledger technologies that underlie blockchains are being leveraged to support climate action by facilitating transparent and standardized transactions and enabling more efficient monitoring and accreditation. Blockchains are decentralized databases that are effective at storing a registry of money, ownership rights, contracts, goods,

49 Schillebeeck, G., 2021. "Digital Sustainability and its Implications for Finance and Climate Change," MAS Special Feature A, April 2021, Macroeconomic Review.

50 Puschmann, T., Hoffmann, C. H., and Khmarskyi, V., 2020. "How Green FinTech Can Alleviate the Impact of Climate Change—The Case of Switzerland" Sustainability 12, no. 24: 10691.

51 More information can be found at: https://mauritiusfintech.org/about-mafh/

52 Menon, R. 2021. "What We Need to Do to Make Green Finance Work." Keynote speech at the Financial Times Investing for Good Asia Digital Conference, Singapore, September 8, 2021.

personal information, and transactions. They can provide a tamper-proof, encrypted, and transparent system for implementing innovative business solutions. Blockchain-based methods allow for a direct exchange of information without going through a central server or an authorized institution. In the conventional bond market, it is difficult for multiple stakeholders to monitor the flow of money and exchange real-time updates on the development status. In contrast, blockchain-based solutions in the green bond market could enhance traceability and transparency.

Issuers in high-income and emerging economies are leveraging blockchain technology for bond development.

In February 2023, the Hong Kong government sold its first digital green bonds, working with the Bank of China, Credit Agricole, Goldman Sachs, and HSBC. This move will put to the test Hong Kong's legal and regulatory framework amid a broader push into sustainable financing.[53] The initiative also includes a policy component, as Hong Kong will embark on a three-year training program for financial professionals on green and sustainable finance.

Meanwhile, in January 2023, National Australia Bank (NAB) partnered with agritech start-up Geora to help Australian farmers report the impact of their sustainability practices. The project uses blockchain technology to help farmers with NAB's Agri Green Loan reporting covenant.[54] Geora will integrate existing sustainability data into blockchain to create a standard record of environmental impact and emission reduction efforts, adding a layer of transparency to the Agri Green Loan book.

In July 2022, Bolsas y Mercados Españoles, through Iberclear, BBVA, and the Inter-American Development Bank (IDB), completed the first bond issuance in Spain listed in a regulated market and registered using blockchain technology. IDB promoted the initiative to accelerate the use of blockchain technology. It will enable BBVA to roll out its service in Latin America, where access to alternative project finance is limited.[55]

Blockchain technology can make trading green financial assets more efficient in emerging markets.

Trading of carbon credits and other green financial assets has enormous potential to leverage blockchain technology, lowering costs and reducing the involvement of intermediaries.

Examples of global carbon exchanges include Climate Impact X and Aircarbon, both headquartered in Singapore. Climate Impact X is a marketplace for carbon credits established by DBS bank, Standard Chartered Bank, Temasek, and Singapore Exchange Limited. It enables the trading of carbon credits created from projects involved in protecting and restoring natural ecosystems, with portfolios connected to several recognized forest conservation and restoration projects in Africa, Asia, and Central and South America.

Similarly, Aircarbon is built on blockchain technology and bundles carbon credits from various projects into a single instrument that can then be traded on its digital platform. Bundling projects can promote a more standardized carbon credit economy and enable larger-scale trading.

Public sector and non-governmental organizations are exploring the potential of blockchain-based solutions for several applications.

This segment explores ways in which domestic savings could be mobilized through fintech solutions to scale up sustainable investment.

53 Bloomberg News, February 15, 2023. "Hong Kong Hires Banks for Debut Digital Green Bond Sale."

54 National Australia Bank, 2023, "NAB Helps Farmers Report on Sustainability of Agri Green Loans Using Blockchain."

55 Inter-American Development Bank, 2022, "BME, BBVA, and IDB Issue Spain's First Blockchain-Based Regulated Bonds," Press Release, July 26, 2022.

One comprehensive proposal published by the Asian Development Bank Institute[56] proposes a blockchain-based solution that integrates multiple fintech applications to mobilize domestic financing for sustainable infrastructure investment. The approach uses a public-private partnership model enhanced by including local residents and potentially international development agencies. The proposal, which is described below, addresses the three key phases of an infrastructure project's life cycle from inception and fundraising to realization and to its operational phase.

In the inception and fundraising phase, blockchain integrates with the crowdfunding fintech solution to mobilize domestic savings for investment in the domestic local-currency bond market. In this case, the ledger records the ownership structure to ensure customers' rights. Existing fintech applications, such as M-Akiba, a retail infrastructure bond issued by the government of Kenya, which seeks to enhance financial inclusion for economic development,[57] could be used to mobilize local savings for the domestic bond market allowing smaller-sized investments through mobile phones. Additionally, applying smart contracts can help reduce the asymmetry of information.

In the realization phase, stakeholders would be able to trace the use of proceeds and the construction status transparently. One of the main issues in several emerging market economies has been dealing with corruption and the potential misuse of funds. By using blockchain to record information, investors can better understand the project's status and exchange information in real time. Here, smart contracts are once again leveraged to automate the interest rate and return. Finally, in the operational phase, recording operational data through blockchain can allow for transparency on project revenue streams and minimize the risk to investors of being exposed to corruption.

Overall, this framework could be adjusted to fit different projects that mobilize domestic resources for sustainable investments in emerging markets, improving efficiency and transparency. The framework approach has the potential to provide opportunities to purchase local-currency assets to a broad range of investors with varying amounts of money to deploy. It can also help issuers such as municipalities to raise funds for sustainable infrastructure investment.

The Pathfinder Initiative with the government of Bangladesh is exploring how to use this framework to mobilize domestic savings for sustainable infrastructure investment. The initiative has support from the United Nations Development Program, the United Nations Democracy Fund, and the UN Secretary General's Taskforce on Digital Financing of the Sustainable Development Goals. It aims to reduce the need for international borrowing and uses blockchain-based solutions to enforce accountability for the funds, the returns, and the dividends from infrastructure investment.

Project Genesis is a pilot project from the Bank for International Settlements Innovation Hub's Hong Kong Centre, exploring ways to make investing in green bonds more attractive. To this end, it is developing a new framework for green bonds using blockchain and digital tokenization to help investors who purchase climate-related bonds track carbon credits in real time.

The main concept of the product is a mitigation outcome interest, which would take the form of a warrant attached to the green bond that entitles the holder to receive carbon credits generated by the reduction of greenhouse gas emissions achieved by projects financed by the debt. The warrant and green bond would be traced separately, and the mitigation outcome interest warrant holder will receive the credits generated by the green bond. Blockchain would be used to keep track of the warrant ownership and verify the credits generated by the green bond project. Two prototypes

56 Chen, Y. and Volz, U., 2021, "Scaling Up Sustainable Investment Through Blockchain-Based Project Bonds," ADBI Working Paper Series, No. 1247, April 2021.

57 M-Akiba is administered through the Central Bank of Kenya in collaboration with: Nairobi Securities Exchange, Central Depository Settlement Corporation, Mobile Network Operators, and the Kenya Association of Stock Brokers & Investment Banks. The money raised from the bond will be used for funding government infrastructure development projects.

were developed to track, deliver, and transfer digitized mitigation outcome interests using blockchain, smart contracts, and other related technologies.

Climate Action Data Trust is an open-source metadata system that uses distributed ledger technology that "links, aggregates, and harmonizes all major carbon registry data to enhance transparent accounting in line with Article 6 of the Paris Agreement."[58] It was established by a joint initiative between the World Bank Group, the International Emissions Trading Association, and the government of Singapore. It aims to create a decentralized record of carbon market activity to avoid double counting, increase trust in carbon credit data, and build confidence in carbon markets.

The examples discussed in this section show how blockchain-based solutions can improve the implementation of infrastructure and other projects by upgrading processes and enhancing transparency. However, for initiatives to succeed in channeling more capital to sustainable projects, there is also a need for effective public-private partnerships, wider frameworks, and robust standards for governance. Blockchain-based solutions can make a fundamental difference in addressing data challenges, increasing efficiency and promoting transparency. Nevertheless, this type of technology and the involvement of fintechs should be regarded as complements to effective capital markets rather than a standalone solution.

Public-Private Partnerships: Reducing the Cost of Capital

A structural challenge in emerging markets is the high cost of capital for investing in projects compared with developed economies.[59] While this is an issue that is common across all sectors, it is particularly important for climate-related adaptation and mitigation projects, given the amount of capital required to hit targets—as much as $4.55 trillion globally, on average, for the remainder of this decade, under BNEF's Net Zero Scenario. Other factors to consider include the typically long-term nature of the projects, many of which are focused on infrastructure, and the urgency of limiting global warming to the Paris Agreement target of 1.5 degrees Celsius above pre-industrial levels. Furthermore, the need for investment is particularly acute in emerging markets, where public funding is scarcer and capital markets less liquid than in developed economies. While they account for two-thirds of the global population, emerging markets receive just one-fifth of global clean energy investments.[60]

The small number of dedicated emerging market green bond investment funds further illustrates this. From its inception in 2018 until 2021, Amundi's EGO fund, which is targeting $1.5 billion in assets under management, stood alone. More recently, four other dedicated funds have emerged. Amundi set up a second vehicle, BEST, seeking to raise $1 billion, in partnership with IFC. Meanwhile, HSBC launched the REGIO fund, which raised $538 million in assets in March 2021, with IFC as an anchor investor alongside HSBC. Additionally, BlackRock set up the BGF fund, with a more modest $56 million, while and Germany's KfW launched LAGreen, aiming to raise $500 million from investors by 2024. This is the first fund dedicated to green bonds in Latin America and is supported by the EU, the German government, Finance in Motion, and Santander Asset Management.[61]

A commonly used measure of funding costs for a project is the weighted average cost of capital (WACC). This comprises the average cost of equity (COE) and the cost of debt (COD) for a project, weighted according to the proportion of each in a project's capital structure.

58 See https://climateactiondata.org/

59 See International Energy Agency, 2021, "The Cost of Capital in Clean Energy Transitions Report."

60 International Energy Agency, 2022, "World Energy Investment 2022."

61 See Environmental Finance, 2021, "Green Bond Funds: Impact Reporting Practices."

The higher WACC of projects in emerging markets is explained by a higher risk-free rate and a higher country risk premium compared with investments in developed countries.[62] In practice, however, the actual WACC of an emerging market project is even higher, as the lower capacity to tap the debt market in developing economies skews the capital structure of projects toward equity. A higher equity weight in the project's capital structure pushes the WACC higher.

Synthetic Securitizations

Synthetic securitizations involving some public-sector protection have been widely used for making high-risk assets attractive to institutional investors. They were at the core of successful programs, such as Italy's GACS and Greece's HAPS, to sell on non-performing loans that were weighing down the balance sheets of southern European banks in the wake of a regional financial crisis that emerged as an aftershock from the global storm of 2008 to 2009.[63]

The Italian GACS (Garanzia Sulla Cartolarizzazione delle Sofferenze or Non-Performing Loan Securitization Guarantee) program involved government guarantees, issued for a fee, on a securitization transaction where non-performing loans comprised the underlying asset. Operationally, local banks transferred their bad loans to a Special Purpose Vehicle that then issued notes (i.e., asset-backed securities) across three tranches—junior, mezzanine, and senior— each carrying distinct levels of risk.

GACS served to protect the senior tranche, enabling an investment-grade rating that put the securities on a par with Italy's sovereign rating at the time. Senior notes were retained by the banks themselves, while the junior and mezzanine tranches were sold to private—generally private equity—investors, though the banks did hold on to a 5 percent vertical slice in both tranches to comply with risk retention "skin in the game" rules. Because of selling a controlling stake in the equity tranche, participating banks could deconsolidate their non-performing loans.

Some of the key investors in the junior and mezzanine tranches were granted servicing rights over the overall non-performing loan portfolio, with a performance-based remuneration structure. This helped align the interests of these investors with those of all other stakeholders, including the banks themselves, their shareholders, and the Italian government. It also provided them with a potential upside that improved the risk-reward profile of their investment.

Crucially, apart from the seeing their ratios of non-performing loans as a proportion of total loans fall, the key advantage for Italian banks was that they were effectively swapping bad debt with high risk-weighted assets, for senior notes with no risk-weighted assets attached. This allowed them to free some capital to strengthen their capital ratios while increasing the appeal of their non-performing loans, thereby making it possible to sell the junior and mezzanine tranches to private investors.

The HAPS (Hercules Asset Protection Scheme), introduced by the Greek government in 2019, was similar to the GACS scheme. The key difference was that with HAPS, the senior notes could not qualify for an investment-grade rating due to the sub-investment-grade score of their guarantor, the Greek government. However, an exception was made under Europe's Single Supervisory Mechanism so that the notes also carried a zero-risk weight.

These two programs, which would not have been possible without government backing, enabled banks to offload large portfolios of risky assets. In practice, they reduced the effective WACC of non-performing loan portfolios by letting the government absorb part of the risk while optimizing risk allocation for investors.

62 For an illustrative breakdown of risks that explain country-by-country variations in the levelized cost of electricityfor a given clean energy project, see: International Energy Agency (IEA), 2022, "Cost of Capital Observatory: Tools and Analysis."

63 For a review of NPL securitizations and related governmental guarantee programs in Europe, see: Deloitte, 2020, "NPL Securitizations and Related Governmental Guarantee Schemes in Europe Report."

Beyond non-performing loans, synthetic securitizations are also beginning to be used to manage other types of risk, including that associated with emerging market assets. Amundi's EGO fund, the first-ever dedicated emerging market green bond fund, offers a relevant example. EGO invests in green bonds issued by emerging market banks and then pools the debt before dividing it into three tranches. The junior and mezzanine tranches, amounting to 10 percent of the total debt, are sold to international financial institutions, while the senior tranche goes to private investors. This implies a multiplier effect of up to 10 times.

Placing the riskiest portion among development finance institutions improves the risk-reward profile of the senior tranche via credit enhancement. Indeed, because of this, the tranche's credit rating is elevated by two notches, from a from BB+ "junk" rating to an investment grade BBB+.

The result is that, out of the five existing emerging market green bond funds, EGO is not just the largest, with $1.4 billion in assets at the end of 2022, but also sets an example of partnering with international financial institutions in ways that attract more private finance into emerging market projects.[64]

Gaining scale to support the transition in emerging markets

The last United Nations COP27 climate summit saw an agreement on the setting up of a "loss and damage" fund for developing economies. The next meeting, COP28 which is scheduled for late 2023, is expected to yield details around its size—potentially up to $100 billion per year, as agreed in 2009 at COP15—how it will be funded, and its functioning.

In the context of such negotiations, it is worth exploring the virtues of synthetic securitization on a large scale to improve the risk-reward profile of projects in emerging markets, replicating how these structures were used to address the problem of non-performing loans in southern Europe.

From a financial viewpoint, there are similarities between both cases. They both involve a need to improve the risk-reward profile of a risky underlying asset to a level that unlocks significant private-sector investment inflows, while minimizing public-sector involvement because of limited fiscal resources.

The energy transition in emerging markets and the associated potential for green bond issuance would benefit from using synthetic securitizations to mobilize developed market investors.

We suggest five conditions are necessary to maximize the chances of success for large-scale synthetic securitizations. The first is increased involvement by international financial institutions, either as guarantors for the senior tranche or as anchor investors in the junior and/or mezzanine tranches.

Backstops by local governments are, at least in theory, a potentially effective tool to reduce a project's WACC. But government guarantees may not work as well in emerging markets as in the Italian case due to lower sovereign credit ratings and higher risk perceptions among investors. Also, just as the market prices for the higher riskiness of emerging versus developed markets, via both a higher risk-free rate and a higher, non-zero country risk premium, the market will also assign a lower value to guarantees granted by a developing country government. That is, the mitigation potential of an emerging market government will be lower than that of a developed country government. For this reason, more involvement by multilateral development finance institutions may be necessary, sponsoring more funds and increasing their stakes in those vehicles.

These institutions' participation can be either remunerated guarantees on senior tranches—as with the GACS and HAPS programs—or direct investments in the junior or mezzanine tranches, similar to the EGO Fund. This seems feasible, as the use of equity by international institutions remains extremely limited, at about 1.8 percent of their total commitments to

64 Bolton, P., Musca, X., and Damama, F., 2020, "Global Public-Private Investment Partnerships: A Financing Innovation with Positive Social Impact," Journal of Applied Corporate Finance, Volume 32, Issue 2.

private climate finance in emerging markets at the end of 2020.[65]

Second, anchor investors in the junior or mezzanine tranches, whether they are multilateral institutions or specialized asset managers, should be allowed to participate in managing the Special Purpose Vehicle containing the risky assets for a claim against all or part of the management fees. This would improve the risk-reward profile of their investment while aligning their incentives with those of all other stakeholders, as was the case with the GACS and HAPS programs, where a key investor in the junior or mezzanine tranche was also the servicer of the non-performing loan portfolio.

Third, securitization should be conducted at the bank, rather than at the investor level, to increase emerging market banks' capacity for further green debt origination. In other words, it would allow local lenders to finance more green projects and then sell them via the issuance of green notes, or asset-based securities, to private investors in the capital markets.

Fourth, deals should allow for local currency-denominated assets. Denominating a project's revenues in hard currency may make sense from a risk management perspective, but it has major implications from a policy viewpoint. In particular, it may limit the size of the overall market being addressed. Around 70 percent of all green bonds issued in 2022 were denominated in local currency. It may also incentivize local issuance denominated in hard currency, potentially increasing the risk of currency mismatches for sponsors in case of sharp foreign exchange market moves, raising the potential for financial instability. At the same time, however, local currency-denominated projects will carry a higher WACC, due to foreign exchange risk, which will impact the calibration of the size of the junior and mezzanine tranches of a synthetic securitization.

Fifth, in order to ensure synthetic securitizations serve the purpose discussed in the report and do not create any systemic risks, there should be restrictions on the originate-to-distribute business model via adequate bank supervision and credible reporting standards.

65 International Monetary Fund, 2022, "Scaling Up Private Climate Finance in Emerging Market and Developing Economies: Challenges and Opportunities," Chapter 2 of the Global Financial Stability Report (GFSR), October 2022.

5

Case Studies on Specific Emerging Market Countries

BRAZIL:
The new government is planning to return to the international capital markets with a bond offering to help address environmental concerns.

The victory of Luiz Inácio Lula da Silva in Brazil's presidential election in October 2022 is expected to give a boost to the country's environmental agenda. Lula's plans include granting a new protected status to half a million square kilometers (193,000 square miles) of Amazon rainforest, subsidies for sustainable farming, and introducing fiscal incentives–via a reform of Brazil's tax code–for the energy transition.

The new government has set a goal of halting deforestation by 2030 and stated a willingness to use the power of the state to prevent further invasions of protected lands and biomes. Farmers have also been told they must revitalize degraded land if they want to plant more crops. This balance will have to be weighed against the microeconomic challenges that local people will face as second-round effects of any newly enacted policies.

The rate of deforestation in the Amazon region surged 59 percent from an average of 7,500 square kilometers per year between 2015 and 2018, to 11,400 square kilometers per year from 2019 to 2022 (See Exhibit 5-a). This was a significant setback to global efforts to promote sustainability. Brazil is influential on the global environmental stage, on account of the fact that more than 46 percent of its territory is covered in rainforest. The country also claims some of the world's highest levels of biodiversity.[66]

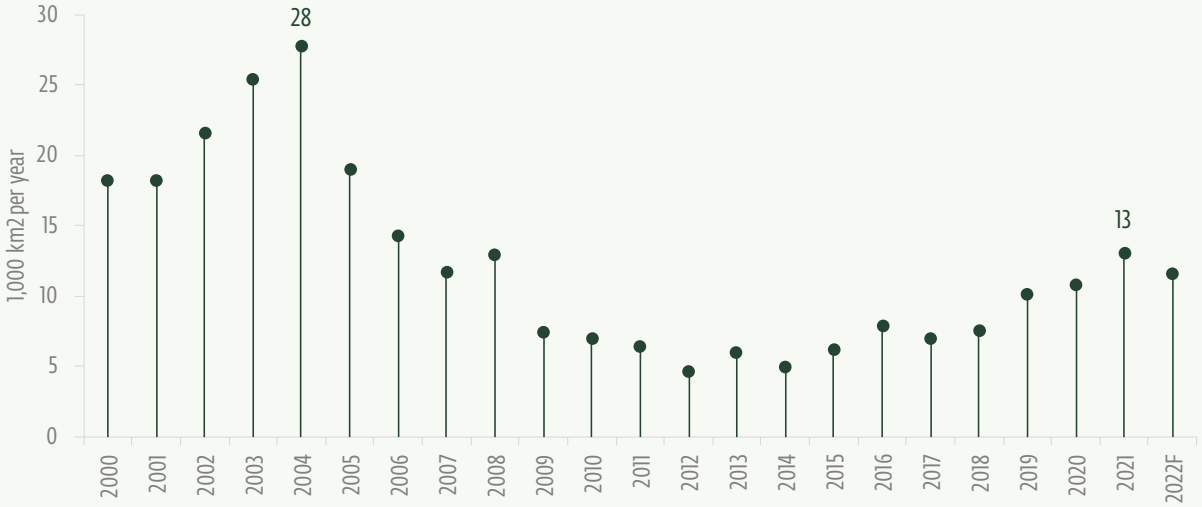
The Amazon rainforest plays an important role in absorbing carbon dioxide from the atmosphere. Indeed, if all the CO_2 stored in the region were released, it would equate to roughly 730 billion tons, equivalent to 20 years of global

66 Rainforest Foundation US, 2022, Brazil, Viewed January 31, 2023, https://rainforestfoundation.org/our-work/where-we-work/brazil

EXHIBIT 5-a

Brazil's New Government Aims to Halt Deforestation After Recent Increases

Deforested area in the Amazon rainforest in Brazil



Source: Instituto Nacional de Pesquisas Espaciais, IFC

emissions at current rates.[67]

Conservation in the Amazon and other environmental goals will require funds, a major challenge given Brazil's fiscal rules leave it little room for maneuver in terms of securing bigger environmental budgets. Germany and Norway have both signaled that they will restart donations to the Amazon Fund, an essential tool in combating deforestation. Further options under discussion to ease the burden on public budgets include the exclusion of certain expenses, including foreign donations destined for the environmental agenda, from a constitutionally mandated spending cap. Importantly, the country's Public Debt Operations office is planning to return to the international capital markets with a bond offering to help address environmental concerns.[68]

One option for Brazil's government is to sell a sustainability-linked bond, where the interest it pays creditors hinges on whether the country protects the rainforest. As mentioned elsewhere in this report, two of Brazil's Latin American peers,

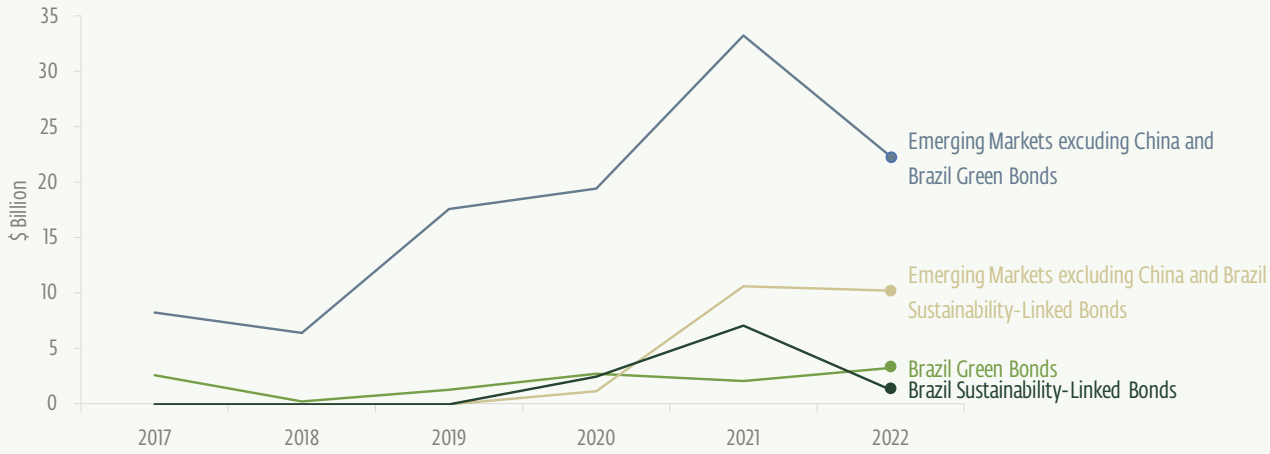
67 Nobre, C., Sampiao, G., and Borna, L., 2015, "Land Use and Climate Change Risks in the Amazon and the Need of a Novel Sustainable Development Paradigm," PNAS, https://www.pnas.org/doi/10.1073/pnas.1605516113

68 Reuters, 2023, "Brazil Says Plans Green Bond Sale This Year," January 25, 2023, Viewed January 26, 2023, https://www.reuters.com/business/environment/brazil-looks-forward-environmental-bond-sale-debt-head-2023-01-26/

EXHIBIT 5-b

A Sovereign GSSS Bond Issue Could Prompt Brazil's Corporates to Follow

Brazilian green and sustainability-linked bond issuance versus other emerging markets



Source: CBI, Bloomberg, IFC

Chile and Uruguay, have already made use of this type of instrument. Market participants led by NatWest Bank, have proposed the idea of a $10 billion sustainability-linked bond to help Brazil reclaim leadership on the climate front.[69]

Challenges Brazil will face include ensuring a strong governance framework to align with investors and to set targets and a baseline that complement existing efforts to reduce deforestation. Additional areas for consideration will be around social safeguarding and ensuring that the rights of indigenous peoples are respected, a key concern for the new government.

A sovereign sustainability-linked or green bond from Brazil would also help revive the broader Brazilian GSSS market. Brazilian corporations only accounted for 11 percent of total emerging market issuance of sustainability-linked bonds, down from 40 percent. Meanwhile, Brazil's share of emerging market green debt issuance increased from 5 percent to 12 percent (See Exhibit 5-b).

69 Reuters, December 19, 2022, "Bank Floats $10 bln Brazilian Bond Plan to Halt Amazon Deforestation," Accessed December 19, 2022, https://www.reuters.com/markets/rates-bonds/bank-floats-10-bln-brazilian-bond-plan-halt-amazon-deforestation-2022-12-19/

URUGUAY:
A two-way coupon structure for a sustainability-linked bond

In September 2022, Uruguay published its first sovereign sustainability-linked bond framework ahead of a planned issuance of new debt. This makes the bond's interest payment conditional on the country meeting environmental objectives and the achievement of climate and nature-based goals aligned with the Paris Agreements. The Inter-American Development Bank and the United Nations Development Programme provided technical support for the issuance.

The most differentiating feature of the 10-year dollar-denominated bond is that there are two key performance indicators: reduction of greenhouse gas emissions intensity as a share of GDP and the maintenance of native forest area.

The coupon will step up by 15 basis points if either of the targets is not met. For the coupon to step down 15 basis points, however, the country will need to exceed the targets by twice as much as the levels set for the penalty.

Meanwhile, Uruguay exceeded United Nations reporting requirements on providing greenhouse gas emissions data under the Paris Agreement. For the second performance target, Uruguay will commit to carrying out satellite mapping of its native forest area every four years up to 2033.

From the investors' perspective, the step-down risked lessening the bond's appeal to so-called buy-and-hold investors if they perceive the coupon as likely to revise lower during the debt's duration.

In the event, however, the bond met considerable demand and led to many investors allocating capital to Uruguay for the first time. This suggests that ambitious, but credible, sustainability targets are appealing to global investors seeking to deploy funds in assets that meet environmental or social criteria. Furthermore, the success of the deal may encourage subsequent use of the structure by other issuers both within Uruguay as well as across the broader region, boosting the liquidity of sustainability-linked bonds as an emerging market asset class.

EXHIBIT 5-c

The Terms of Uruguay's Sustainability-Linked Bond

KEY PERFORMANCE INDICATOR 1	
Reduction of aggregate gross GHG emissions (in CO_2 equivalent) per real GDP unit with respect to reference year 1990 (in %)	
SPT1.1	***Nationally Determined Contributions (NDCs) commitment:*** Achieve at least 50 percent reduction in GHG emissions intensity by 2025 from 1990 reference year.
SPTI 1.2	***Outperformance compared to NDC commitment:*** Achieve more than 52 percent reduction in GHG emissions intensity by 2025 from 1990 reference year.
KEY PERFORMANCE INDICATOR 2	
Maintenance of native forest area (in hectares) with respect to reference year 2012 (in %)	
SPT2.1	***NDC commitment:*** Maintain at least 100 percent of the native forest area compared to reference year 2012.
SPTI 2.2	***Outperformance compared to NDC commitment:*** Achieve an increase higher than 3 percent of the native forest area compared to reference year 2012.

Source: FoSDA Workstream on Taxonomies

INDONESIA:
Leader in Green Sukuk issuance and Climate Budget Tagging

Since 2018 when Indonesia issued the world's first sovereign green sukuk, a bond-like instrument that adheres to Islamic law, the country's government has continued to develop the market. Proceeds from the sukuk have been allocated toward projects in renewable energy, energy efficiency, sustainable transport, waste management, and resilience to climate change.

What makes Indonesia's climate finance initiatives ambitious is its Climate Budget Tagging mechanism, which enables the tracking and evaluation of climate-related expenditure from the national budget system. Indonesia is the first country in the world to have adopted this new climate finance tracking system which is based on recommendations from the United Nations Development Programme and United Nations Environment Programme.

Budget Tagging has proved an effective mechanism for preventing greenwashing and ensures financing is directed to areas of the economy where it is needed. It should also help with the government's commitment to climate finance even at times of regime change.

Annex

Annual Emerging Market Green Bond Issuance by Market Segment

This analysis uses data consolidated from Bloomberg, the Climate Bonds Initiative, and Environmental Finance, according to the bond definitions in Box 1.1 (Section 1) of the report. A complete data set showing issuance volumes per region, in billions of U.S. dollars from 2012 to 2022 can be found in the table below. According to Bloomberg's methodology, bonds are associated with the issuer's country of risk, which comprises four factors: management location, the security's country of primary listing, the country of revenue, and the issuer's reporting currency. Categorizing a country as an emerging market aligns with criteria used by the Amundi Planet Emerging Green One fund. This list is made up of IFC members, including countries eligible to receive International Development Association resources and official development assistance, as defined by the Organization for Economic Cooperation and Development's Development Assistance Committee. Although Russia is not included in the fund's investment universe, it is included in this data set. Bonds issued in China that do not meet international norms or standards as defined by the Climate Bonds Initiative are excluded from the data set. Unlike previous editions, this report only includes bonds with a maturity of over one year to capture better bonds issued to fund medium- to long-term projects. It also includes eligible bonds, as per the definitions of Box 1.1., issued by supranational entities.

Finally, we acknowledge there is only a brief mention of "transition bonds" in the report (in Box 1.1). While we do take them into account, when calculating GSSS issuance, we also flag their small scale, with their contribution to overall GSSS issuance being under 0.5 percent of the total in 2022. This does not negate the fact that these instruments may have an important role to play in financing transitions to greener practices in hard-to-change sectors, as well as in aligning heavy industry with global net-zero efforts. Specifically, we highlight increasing issuance of transition bonds in Japan, where the Ministry of Economy, Trade, and Industry published Basic Guidelines on Climate Transition Finance, leading to a significant uptake of transition bonds in 2022. In this regard, we also emphasize the importance of other nations adopting similar frameworks to endorse credible transition financing and drive market transformation.

GSSS Issuance Volumes per Region, in Billions of U.S. Dollars, 2012–2022

Green	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change between 2021 and 2022	Total Issuance 2012-22 in US$bn
East Asia and the Pacific (excluding China)	0.0	0.0	0.0	1.2	1.8	5.2	3.4	6.6	4.3	9.1	6.1	-33%	37.7
Europe and Central Asia	0.0	0.0	0.0	0.1	0.8	0.5	1.7	4.4	6.6	14.8	6.5	-56%	35.4
Latin America and the Caribbean	0.0	0.0	0.2	1.1	1.6	4.2	1.3	5.8	9.0	10.1	5.1	-49%	38.4
Middle East and North Africa	0.0	0.0	0.0	0.0	0.2	0.7	0.1	1.3	2.1	0.7	7.2	932%	12.4
Sub-Saharan Africa	0.0	0.0	0.0	1.3	15.7	14.3	21.6	21.1	11.7	41.9	67.6	61%	195.2
China	0.0	0.0	0.0	1.3	15.7	14.3	21.6	21.1	11.7	41.9	67.6	61%	195.2
Developed Markets	1.4	5.1	25.8	32.0	47.4	114.5	121.7	197.7	237.9	414.4	353.1	-15%	1,551.0
Supranational	1.7	5.8	9.6	8.3	10.5	10.0	11.7	15.3	15.8	28.5	41.6	46%	158.6
Total	3.1	10.9	35.5	45.2	93.7	163.8	183.1	273.3	299.2	561.3	554.7	-1%	2,223.9

Social	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change between 2021 and 2022	Total Issuance 2012-22 in US$bn
East Asia and the Pacific (excluding China)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.2	1.0	0.6	-40%	3.1
Europe and Central Asia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	-100%	0.6
Latin America and the Caribbean	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	3.4	17.5	1.4	-92%	22.8
Middle East and North Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		-
Sub-Saharan Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.3	14%	0.9
China	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0		0.6
Developed Markets	0.2	0.8	0.5	3.2	2.9	8.2	11.3	16.5	94.4	125.1	144.4	15%	407.4
Supranational	0.0	0.0	0.5	0.1	0.0	2.8	2.9	1.3	68.9	67.7	17.8	-74%	162.0
Total	0.2	0.8	1.0	3.3	2.9	11.3	14.4	18.4	168.8	211.9	164.4	-22%	597.5

Sustainability	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change between 2021 and 2022	Total Issuance 2012-22 in US$bn
East Asia and the Pacific (excluding China)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.0	2.2	8.9	8.2	-9%	21.5
Europe and Central Asia	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.8	4.2	0.4	-91%	5.9
Latin America and the Caribbean	0.0	0.0	0.0	0.0	0.0	0.9	0.3	1.6	1.2	10.4	17.0	64%	31.4
Middle East and North Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	2.3		2.4
Sub-Saharan Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1	-86%	1.1
China	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.5	1.4	0.0	-100%	3.2
Developed Markets	0.0	0.5	0.6	2.1	4.2	9.8	13.9	34.8	49.4	89.4	77.4	-13%	282.2
Supranational	0.0	0.0	0.0	0.0	0.1	0.3	2.7	11.1	79.6	70.6	44.7	-37%	209.0
Total	0.0	0.5	0.6	2.1	4.5	11.4	18.5	49.5	133.8	185.8	150.0	-19%	556.7

Sustainability-Linked Bonds	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change between 2021 and 2022	Total Issuance 2012-22 in US$bn
East Asia and the Pacific (excluding China)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	1.3	-39%	3.5
Europe and Central Asia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	2.2	126%	3.7
Latin America and the Caribbean	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	14.3	7.9	-44%	24.7
Middle East and North Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0		0.6
Sub-Saharan Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-100%	0.3
China	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.1	-39%	2.8
Developed Markets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	6.7	72.4	59.2	-18%	142.4
Supranational													-
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	10.3	91.8	71.7	-22%	178.1

Transition	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change between 2021 and 2022	Total Issuance 2012-22 in US$bn
East Asia and the Pacific (excluding China)													-
Europe and Central Asia													-
Latin America and the Caribbean													-
Middle East and North Africa													-
Sub-Saharan Africa													-
China													-
Developed Markets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	3.2	3.5	10%	8.5
Supranational	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0		0.8
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.1	3.2	3.5	10%	9.3

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