IWMI
International Water Management Institute

Policy Brief

# Green bonds to facilitate circular bioeconomy in urban centers

## Key messages

- Green bonds are increasingly used to raise capital for projects that have environmental benefits, such as renewable energy and sustainable water and waste management. They represent a loan given by an investor to a borrower, making them a key tool in financing a more sustainable, low-carbon economy. Green bonds are attractive instruments for investors interested in supporting environmentally friendly projects while maintaining a low risk and steady return on their investment. This helps lower financing costs for fund managers.
- Green bonds play an important role in financing projects by promoting sustainable practices and circular waste management, resulting in resource-recovered products and services. Large corporations can channel funds from their corporate social responsibility (CSR) initiatives to support innovations by small and medium enterprises (SMEs) through green bonds.
- The main challenge in implementing green bonds lies in the need to quantify the environmental benefits of each investment. This requires transparency in reporting and monitoring (without greenwashing) and proper quantification of positive impacts on net carbon savings, labor, health and environment, and sustainable resource use.

## Context

About 56% of the world's population (4.4 billion inhabitants) live in cities (UNICEF 2022). It is estimated that this will swell to 5 billion by 2030 with much of the urbanization unfolding in Africa and Asia. Urbanization brings forth huge social, economic and environmental transformations. This demands a shift toward sustainable production and consumption to overcome one-way material flows from rural to urban areas. Transitioning to a circular economy (bioeconomy)[1] approach entails urban areas realizing the potential resources hidden within waste, circulating products and materials and regenerating nature.

The promotion of a circular bioeconomy requires regulations, finances, market development and private participation (*photo*: Chayanuphol/ Shutterstock).

[1] Circular bioeconomy (CBE) is a subset within the circular economy (CE) that targets minimizing organic waste from different sources to recover products, rejuvenating natural capital and replacing non-renewable fossil-based products.

The circular economy (CE) has the potential to unlock USD 4.5 trillion worth of economic opportunities (van Houten and Naoko 2020), generating multiple jobs, enhancing supply chain resilience and causing major reductions in greenhouse gas emissions (Ellen MacArthur Foundation 2021). Achieving this transition requires substantial financial resources and new business models to create and maintain adequate infrastructure, provide essential services and cater to the diverse needs of urban citizens.

There are, in fact, multiple financial instruments for public and private investments to support a sustainable transition. To transition, private companies generally raise capital through public and private equity, direct or co-investments, issuing corporate bonds (green or climate-aligned bonds) and hybrid finance.

Governments, on the other hand, raise most of their capital through bonds (municipal, sovereign and project bonds), receive grants from multinational organizations and provide fiscal relief (tax concessions, subsidies, tax holidays, etc.) in public-private partnerships (Basu et al. 2020). Among these instruments, debt instruments such as green and transition bonds are particularly prominent. Debt instruments are less risky and well-suited for circular bioeconomy since they can be uniquely structured for projects and businesses with higher risk and, if used with other instruments, can help leverage or subsidize private sector participation (Lazurko et al. 2018).

The sustainable bond market offers a perspective to explore how the growing sustainable finance market can be tapped to support the capital needs of a circular transition.

## What are green bonds?

The growing interest in the environmental, social and governance (ESG) framework—aimed at aligning financial systems with environmental, social and governance considerations—has spurred the development of sustainable bonds that have different impact criteria and areas of focus. As a result, various sustainable bond instruments have emerged, such as green bonds (including climate bonds), social bonds and sustainability bonds (shown in Figure 1).

Green bonds, similar to any other bond, are fixed-income financial instruments (loans) where the issuer owes the holder a debt and promises to pay back a fixed sum based on an agreed interest rate. The proceeds from these bonds are used to finance projects that have positive environmental and/or climate benefits. Similar to traditional bonds, green bonds can be issued by governments, multinational banks or corporations. The issuing organization repays the bond principal and the interest. This allows investors to pursue their environmental and social goals by investing in a lower-risk instrument with a reliable return.

By the end of the third quarter of 2023, the Climate Bonds Initiative recorded a cumulative volume of USD 4.2 trillion targeting green, social, sustainability and sustainability-linked (GSS+) projects. Within the emerging economies the market volume is estimated to be USD 0.4 trillion from 2014–23 (Figure 2).

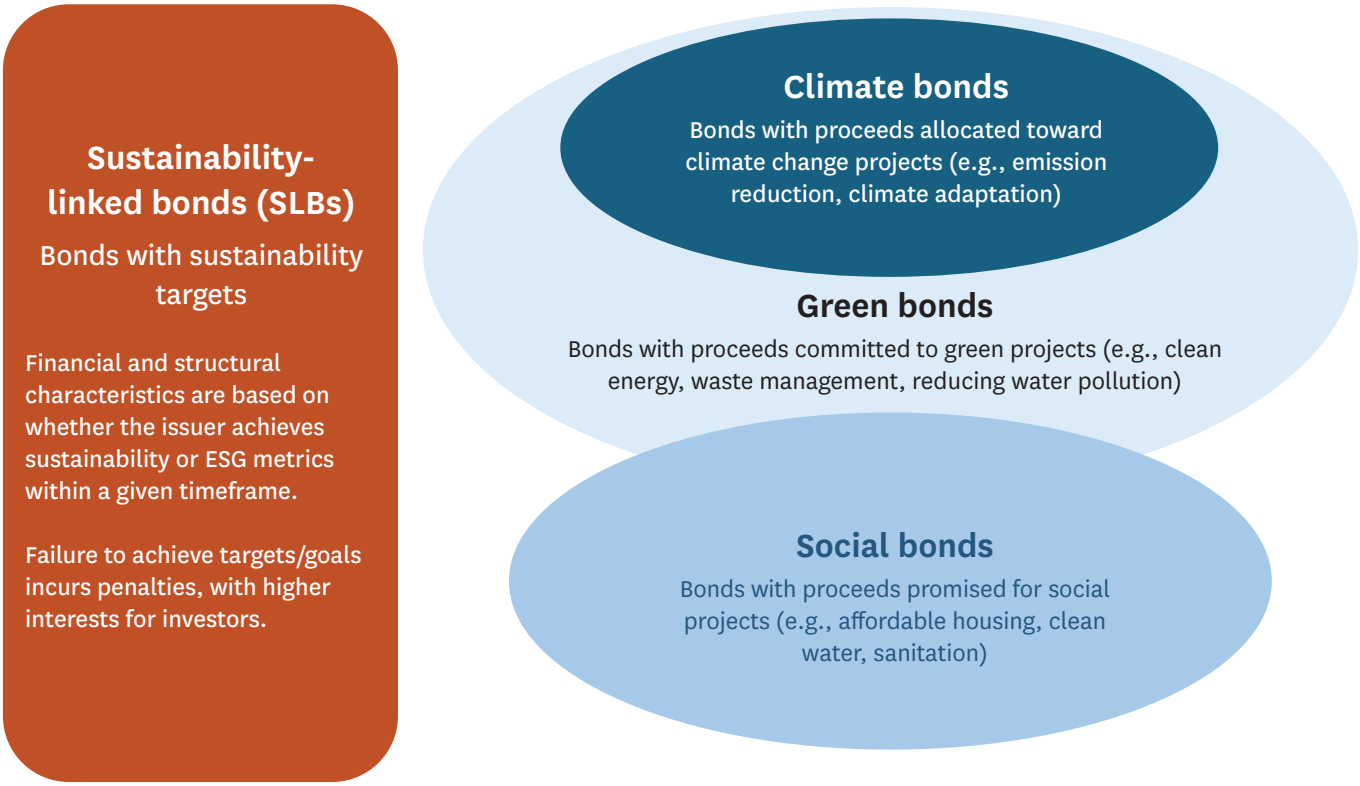


**Figure 1.** Sustainable bond types.

*Source*: Weick and Ray (2023)

*Note*: ESG – Environmental, social and governance

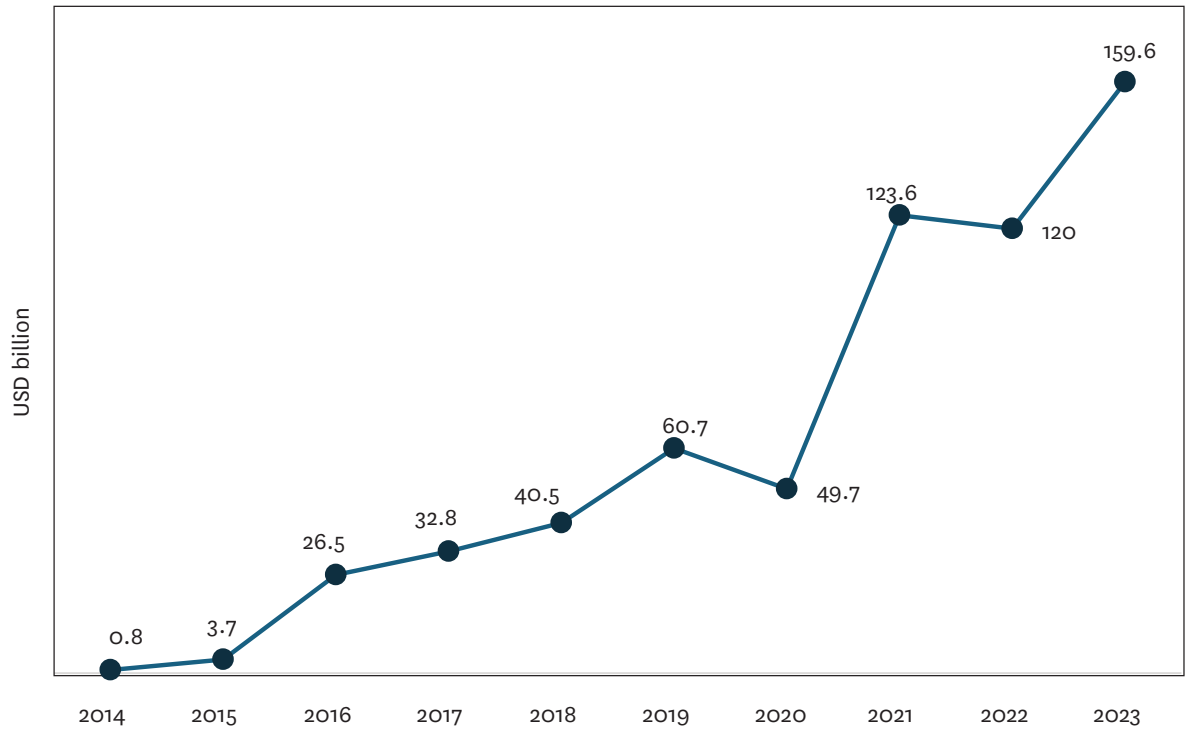


**Figure 2**. Growth of green bonds in emerging economies.
*Source*: Climate Bonds Initiative (2023)

## Trends in green bond issuance

The total share of the bond market issued by emerging economies[2] in the Global South is valued at USD 577.8 billion (Climate Bonds Initiative 2023). Asia-Pacific is the largest regional contributor, with a market value of USD 527.2 billion, driven primarily by issuances from China and India. In contrast, green bonds in Latin America and Sub-Saharan Africa are valued at USD 45.2 billion and USD 5.4 billion, respectively (Figure 3). Meanwhile, the total value of green bonds from developed countries has reached USD 1972.2 billion, with significant contributions from the United States (USD 513.9 billion) and European Union countries (USD 1265.7 billion) (Climate Bonds Initiative 2023).

In emerging economies, approximately 54% of these issuances come from national financial corporations, followed by non-financial corporations. Government entities and development banks contribute about 20% of these green bond issuances. In developed economies, private bonds (financial and nonfinancial corporations) dominate issuance, accounting for 56% of the market. Government bonds—in the form of government-backed entities and sovereign bonds—also significantly contribute to the green bond market (33%).

A substantial portion of the green bond proceeds in both emerging and developed countries is mainly allocated to the renewable energy sector, i.e., the generation of electricity and biofuel from solar and wind power, waste-to-energy, green buildings and the transport industry. Only about 9% and 6% of the green bond proceeds in emerging economies are allocated for wastewater treatment and waste management. The allocation in developed countries is 8% and 4%, respectively.

Four major differences exist in green bond investments between developed and emerging economies (Bokhari 2023; S&P Global 2023):

- **Scale and maturity of the markets** - Green bonds in developed countries have a more extended history and robust regulatory frameworks supporting green finance.
- **Projects financed by green bonds** - While renewable energy (solar and wind) is a priority for both, developed countries focus on large-scale projects and emerging economies put more emphasis on small-scale projects.
- **Regulatory environment** - Developed countries have more incentives, including tax incentives and subsidies, and regulatory requirements for disclosure and reporting.
- **Investor base** - In developed countries, institutional investors (such as pension funds, insurance companies and asset managers) play a significant role, whereas emerging economies are more reliant on development finance institutions (DFIs) and multilateral development banks (MDBs) to catalyze green bond markets.

[2] The present study does not include emerging economies from Europe.

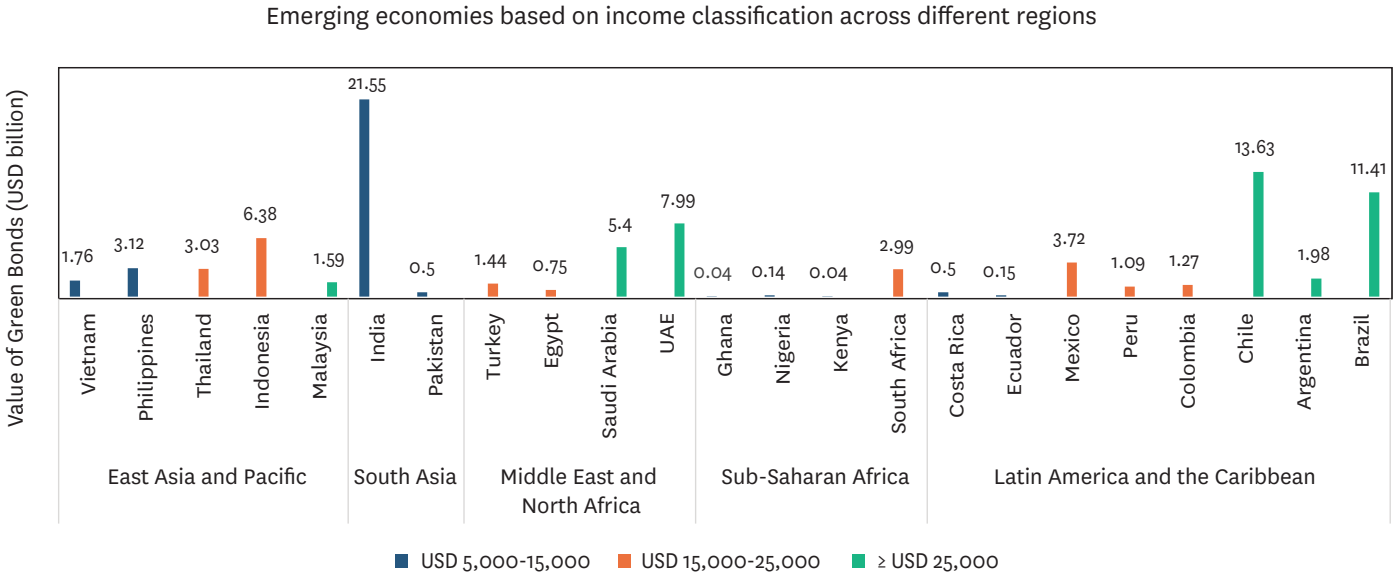


**Figure 3**. Green bond issuance across different countries represented regionally (in USD billion).

*Source*: Climate Bonds Initiative (2023)

## Green bonds in emerging markets: Potential for circular bioeconomy

The development and contributions of bond markets to circular economy (CE) vary across regions. Bond markets in Southeast Asia and the Pacific have made significant progress compared to those in other regions. Since 2017, the Association of Southeast Asian Nations (ASEAN) sustainable bond market has grown considerably (ADB 2021). The value of the green bond market increased at a compound annual growth rate (CAGR) of 33%, from USD 216 billion to USD 509 billion between 2020 and 2023. Two significant regulations by ASEAN have further driven market growth in the region: (i) the development of green bond standards in 2017 by the ASEAN Capital Markets Forum (ACMF) and (ii) the introduction of the Green, Social, Sustainable and Other Labeled (GSS+) Bonds Initiative for Southeast Asia in 2022 by the ASEAN Catalytic Green Finance Facility (ACGF). A recent survey by ADB and GGGI (2022) shows that waste management and CE are promising sectors for green bonds in Thailand, Singapore, the Philippines and Malaysia.

India has developed a robust green bond market through a Green Bond Framework, with technical assistance from the World Bank's Sustainable Finance and ESG Advisory Services (Hussain and Dill 2023). This framework sets forth the obligations of the Government of India as a green bond issuer and applies to all sovereign bonds issued by the government. Further, India adopted an ambitious Nationally Determined Contribution (NDC) under the Paris Agreement on a 'best effort basis', keeping its developmental imperatives in mind. The impetus provided by the NDC is on waste management and CE, thereby driving the issuance of green bonds targeting CE (and bioeconomy) in India.

Bangladesh and Sri Lanka have recently embarked on the journey toward issuing green bonds. In April 2023, Sri Lanka devised a framework (CSE 2023) with support from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and the Global Green Growth Institute (GGGI) to sell green bonds. In 2022, the Bangladesh Bank promulgated the policy on green bond financing for banks and financial institutions in Bangladesh.

Green bond issuances in Latin America and the Caribbean (LAC) are mainly concentrated in Brazil, Chile, Mexico and Colombia. Large companies have issued these bonds to finance adaptations to CE-aligned technologies and processes (UNEP 2023). However, green bonds in LAC are increasingly recognized as significant sources of long-term funding for companies and financial institutions, such as commercial banks, which in turn can provide credit for financing companies and projects that incorporate CE principles. Success in this area depends on macroeconomic stability to maximize growth opportunities, clear CE criteria for using proceeds and the establishment of CE-focused key performance indicators (KPIs).

While green bonds in Africa have yet to gain momentum, the Middle East and North Africa (MENA) markets are gathering pace. Green Bonds in Africa (cumulatively USD 2.7 billion) are limited to Nigeria, Ghana, Kenya, South Africa and Namibia. Although there have been initiatives to define green bond proceeds for projects and investments related to CE, the sector has yet to fully take off. For example, FSD Africa, UKaid and the Climate Bonds Initiative developed an Africa Green Bond Toolkit (FSD Africa and Climate Bonds Initiative 2020), which outlines proceeds directed toward CE[3]. Moreover, Box 1 highlights a few

[3] Green bond proceeds for CE as defined under the toolkit: Products, production technologies and processes adapted to the ecological economy and/or CE (such as the development and introduction of products that respect the environment with an ecological label or environmental certification, efficient packaging and distribution in terms of resources, etc.).

successful case studies identified related to the issuance of green bonds and debt instruments in different countries of the respective regions.

In emerging markets, green bonds for CE and bioeconomy are typically classified under low or partial focus,[4] as defined by the United Nations Environment Programme (UNEP). However, there is immense potential in using financial instruments to promote the CE sector. A recent survey of 135 company-specific bond frameworks and impact reports for green and sustainability bonds issued in the United States between 2015 and 2022 shows that 5% of these bonds are fully aligned with CE and 80% indirectly contribute to CE (Weick and Ray 2023). Therefore, defining standards for the use of proceeds, project selection criteria and reporting systems can gain investor trust for the bond market.

**Box 1. Case studies of different types of successful green bonds and debt instruments for the circular economy.**

***Donor-based bonds***: The World Bank issued a USD 28.6 million green bond to fund a waste management project in Mexico City. The project aimed to reduce greenhouse gas emissions by promoting recycling and composting, ultimately diverting 1.2 million tons of waste from landfills over 20 years. The bond was oversubscribed by 1.7 times, demonstrating strong investor demand for sustainable projects (FasterCapital 2024).

***Sovereign bonds***: One example of a municipal green bond in India is the Ghaziabad Municipal Corporation in Uttar Pradesh raising INR 150 crore (USD 18 million) to construct a tertiary sewage treatment plant (Khandelwal 2022). Another major project by the government of India is the allocation of INR 40,700 crore (USD 5 billion) to help support solid and liquid waste management across over 200,000 villages under the Swachh Bharat Mission. Such projects and commitments show that the country has an emerging domain for a green economy.

Substantiating ***bonds with government guarantees*** is a way to support infrastructure for a circular bioeconomy (CBE). For instance, Bancolombia was the first bank in Latin America and the Caribbean (LAC) to issue green bonds in 2016 through its sustainable credit line, raising USD 115 million to address climate change. The bank has recently developed a credit line that has promised approximately USD 150 million for the circular economy (CE), specifically mentioning projects focused on waste recycling, recirculated water, water from alternative sources and reduction in consumption. The bank launched a tool called 'Circular Diagnosis', based on international CE standards and evaluations, that helps small and medium enterprises (SMEs) and corporations assess their current level of circularity. Through their results, the tool identifies opportunities across different dimensions that can be embraced by organizations in their transition towards a circular business model. Another prominent example is the Philippines Local Government Unit Guarantee Corporation providing credit guarantees to municipalities that seek to finance infrastructure projects through bonds (GFL 2024).

***Private sector***: Klabin SA is a publicly listed pulp, paper and packaging company with 22 industrial units in Brazil and one in Argentina. In line with its commitment, Klabin is issuing green bonds (Klabin Green Bonds) to advance environmental sustainability across the company's global business divisions and operations. This includes improvements in solid waste management (USD 383,000) with a 19% increase in the volume of solid waste recovered; waste and wastewater (USD 394,000); and renewable energy from biomass for pulp manufacturing (USD 1,987,000) (Klabin 2022).

## Challenges in implementing green bonds

A primary criticism of the green bond market is that it has yet to mature enough to fully support the circular bioeconomy. This limitation arises because the current market is too focused on single-issue projects. For example, even though the proceeds may cater to projects related to renewable energy initiatives, they may not support a broader circular bioeconomy. They could be restricted to solar and wind without considering reduction of waste through options such as waste-to-energy projects or wastewater treatment with energy recovery systems, which entails renewable energy. It has often been argued that the certification of green bonds is not rigorous enough to ensure that projects funded through such bonds truly promote circular bioeconomy principles.

Existing certification frameworks, such as the Climate Bonds Standard and Green Bond Principles, have a narrow scope and do not include circular bioeconomy principles. For example, while the Climate Bonds Standard primarily focuses on reducing greenhouse gas emissions, it does not necessarily require projects to incorporate CE principles. Additionally, some circular bioeconomy projects require longer-term financing with lower revenue streams. In these cases, alternative financing mechanisms may be required to provide returns for the investors.

The three main challenges in implementing green bonds with proceeds directed toward circular bioeconomy are: (i) the lack of a standardized definition of green investing; (ii) the complexity of quantifying the impacts of circular bioeconomy;

[4] Financial instruments directed towards CE are classified by UNEP (2023) as low, partial, high and advanced, based on the level to which CE concepts and principles are integrated and the degree to which each financial instrument is CE-focused. A 'low' classification applies if the term "circular economy" is mentioned as an area of interest, without a clear definition or dedicated financing line for circular businesses or projects. The instrument has 'partial' focus when a definition of CE is provided, but a committed financing line for such businesses or projects is absent. Financial instruments with a 'high' focus include both a definition of CE and a financing channel, while 'advanced' instruments go further, featuring a transparent selection process based on circularity criteria.

and (iii) limited transparency in reporting and monitoring. These challenges are interrelated, as a lack of standard definitions and characterizations can lead to poor monitoring and reporting. This issue is compounded by the complexities involved in quantifying health and environmental benefits, as causal pathways can sometimes be unidentified, making reporting even more challenging. Emerging countries face the challenge of underdeveloped capital markets with high market concentration, which restricts opportunities for new firms to raise capital.

## Recommendations

Implementing green bonds effectively requires a comprehensive approach that can integrate standardizing definitions of green investing, measuring environmental impacts, and monitoring and reporting (Figure 4). Some recent progress by different public agencies, private organizations and supranational alliances has begun to circumvent the challenges related to green bonds. For example, the ***European Union's Finance Taxonomy*** is a comprehensive attempt to create a common definition of sustainable finance. This taxonomy is worked upon and updated periodically, with international banks and agencies helping to define six environmental objectives: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to CE, pollution prevention and control, and protection and restoration of biodiversity and ecosystems. Another significant development is the ***Common Ground Taxonomy (CGT)***, generated by comparing the green classifications of China and the European Union. The exercise mapped the commonalities and differences between the two taxonomies, creating a taxonomy framework. The market has increasingly seen use cases of the CGT being incorporated into onshore and offshore green products. Since the first mention by the Construction Bank of China Macau Branch in its December 2021 green bond, 219 green bonds meeting CGT standards have been issued, with a combined volume of CNY 297.4 billion (USD 41.9 billion) (Climate Bonds Initiative 2024).

Similarly, the Climate Bonds Initiative provides ***certification for green bonds*** that meet the standards of transparency, environmental integrity and verification. Such certification allows issuers to demonstrate to the market that their bond aligns with industry best practices for climate change mitigation, resilience, management of proceeds and transparency. Transparent reporting on the use of the green bond proceeds helps gain investor trust, as it can assure them that their funds are used for the intended purpose. In 2019, the Climate Bonds Initiative launched Green Criteria (under Climate Bonds Standards) for waste management. These standards were developed with potential green bond issuers and investors in mind, and they help to evaluate low-carbon and climate-resilient waste management projects. The criteria apply to assets and projects relating to different aspects of treating municipal solid waste and similar waste, such as collection, sorting, reuse and recycling, composting and anaerobic digestion, thermal treatment and landfill gas recovery.

Governments in emerging economies need to facilitate and develop the bond market. Governments should (i) introduce suitable policies, including ***tax breaks or subsidies*** for green bond issuers and regulations for companies to disclose environmental parameters for monitoring the impacts of financing; and (ii) provide ***guarantees and support***. Government guarantees or support for green bond issuers can make bonds more attractive to investors, and it reduces the risks and costs associated with issuing bonds. Government guarantees are, therefore, essential for circular bioeconomy projects with longer payback periods, since this instrument can support bonds to cover the debt. For example, the Philippines Local Government Unit Guarantee Corporation provides credit guarantees to municipalities that seek to finance infrastructure projects through bonds (Di Mario et al. 2018).

As stakeholder interest and scrutiny around ESG issues continue to rise, sustainable financing has become mainstream. Frameworks and institutions such as the Climate Bonds Initiative, the Green Bond Principles and the International Capital Market Association play a crucial role in shaping circular economy key performance indicators (CEKPIs).


**Figure 4.** Overview of toolkits for greening the financial system.

*Source*: Pesme (2021)

*Notes*: FI - Financial institution; NDB - National Development Bank.

## References


ADB (Asian Development Bank). 2021. *Detailed guidance for issuing green bonds in developing countries*. Manila, Philippines: Asian Development Bank. 50p. http://dx.doi.org/10.22617/TIM210521-2

ADB; Global Green Growth Institute (GGGI). 2022. *Survey on green bonds and sustainable finance in ASEAN: Insights on the perspectives of institutional investors and underwriters*. Manila, Philippines: Asian Development Bank; Seoul, Republic of Korea: Global Green Growth Institute. 74p. https://dx.doi.org/10.22617/TCS220535-2

Basu, K.; Taron, A.; Nikiema, J. 2020. *Financial compendium and feasibility analysis of wastewater reuse for industry and agriculture in Solapur and Vijayawada*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). https://doi.org/10.13140/RG.2.2.10158.93766

Bokhari, S. 2023. *Can record global green bond issuance drive U.S. market?* VanEck website. Available at https://www.vaneck.com/us/en/blogs/sustainable-investing/can-record-global-green-bond-issuance-drive-us-market/#:~:text=U.S.%20Green%20Bond%20Market%3A%20Key%20Players%20and%20Trends&text=Asset%2Dbacked%20securities%20issuance%20stood,of%20the%20U.S.%20total%20issuance (accessed on March 20, 2024).

Climate Bonds Initiative. 2023. *Interactive Data Platform*. Climate Bonds Initiative website. Available at https://www.climatebonds.net/market/data/ (accessed on January 25, 2024).

Climate Bonds Initiative. 2024. *China solidifies leadership in green finance for 2023*. Media Release. May 17, 2024. Climate Bonds Initiative website. Available at https://www.climatebonds.net/files/releases/chinasotm_mediarelease_16052024_0.pdf (accessed on February 5, 2024).

CSE (Colombo Stock Exchange). 2023. *CSE enables issue of green bonds by Sri Lankan companies*. Media Release. April 25, 2023. Colombo, Sri Lanka: Colombo Stock Exchange. Available at https://cdn.cse.lk/cms-internal/news/jpCwsV3taSrLrBPm_25Apr2023160233GMT_1682438553143.pdf (accessed on January 15, 2024).

Di Mario, L.; Rao, K.C.; Drechsel, P. 2018. The enabling environment and finance of resource recovery and reuse. In: Otoo, M.; Drechsel, P. (eds.) *Resource recovery from waste: Business models for energy, nutrient, and water reuse in low- and middle-income countries*. Oxon, UK: Routledge - Earthscan. pp.778–800. https://hdl.handle.net/10568/93269

Ellen MacArthur Foundation. 2021. *Unlocking the value of the circular economy*. Ellen MacArthur Foundation website. Available at https://www.ellenmacarthurfoundation.org/articles/unlocking-the-value-of-the-circular-economy (accessed on January 10, 2024).

FasterCapital. 2024. *Circular economy: Green bonds and the circular economy revolution*. FasterCapital website. Available at https://fastercapital.com/content/Circular-economy--Green-Bonds-and-the-Circular-Economy-Revolution.html#Case-Studies-of-Successful-Green-Bond-Projects-in-Circular-Economy.html (accessed on June 25, 2024).

FSD Africa; Climate Bonds Initiative. 2020. *Africa green bond toolkit: A practical guide to issuing green bonds for Africa*. Nairobi, Kenya: FSD Africa; London, UK: Climate Bonds Initiative. 28p. Available at https://www.fsdafrica.org/wp-content/uploads/2020/08/Africa_GBToolKit_Eng_FINAL.pdf (accessed on January 30, 2024).

GFL (Green Finance for Latin America and the Caribbean). 2024. *Bancolombia promotes the circular economy*. Green Finance for Latin America and the Caribbean website. Available at https://greenfinancelac.org/resources/news/bancolombia-promotes-the-circular-economy/ (accessed on July 2, 2024).

Hussain, F.I.; Dill, H. 2023. India incorporates green bonds into its climate finance strategy. Development and a Changing Climate blog series. *World Bank Blogs*, June 12, 2023. Available at https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy (accessed on January 23, 2024).

Khandelwal, P. 2022. Tertiary sewage treatment plant in Ghaziabad to supply 40 MLD water to industrial units. *Hindustan Times*, May 18, 2022. Available at https://www.hindustantimes.com/cities/noida-news/tertiary-sewage-treatment-plant-in-ghaziabad-to-supply-40mld-water-to-industrial-units-101652812662742.html (accessed on January 25, 2024).

Klabin. 2022. *Green bonds report: Resource use disclosure*. São Paulo, Brazil: Klabin. 63p. Available at https://esg.klabin.com.br/documents/946986917/952244768/klabin_greenbond_2022_en_11.04+1.pdf/917711b6-b24a-3751-7e3f-2f4535d56a2d?t=1696251391376 (accessed on June 3, 2024).

Lazurko, A.; Drechsel, P.; Hanjra, M.A. 2018. *Financing resource recovery and reuse in developing and emerging economies: Enabling environment, financing sources and cost recovery*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). 39p. (Resource Recovery and Reuse Series 11). https://doi.org/10.5337/2018.220

Pesme, J. 2021. Moving from ambition to action toward a greener financial system. Private Sector Development blog series. *World Bank Blogs*, June 2, 2021. Available at https://blogs.worldbank.org/en/psd/moving-ambition-action-toward-greener-financial-system (accessed on January 12, 2024).

S&P Global. 2023. *Sustainability insights: Research: Global sustainable bonds 2023 issuance to exceed $900 billion*. S&P Global website. Available at https://www.spglobal.com/ratings/en/research/pdf-articles/230905-sustainability-insights-research-global-sustainable-bonds-2023-issuance-to-exceed-900-billion-101585823 (accessed on March 10, 2024).

UNEP (United Nations Environment Programme). 2023. *Unlocking circular economy finance in Latin America and the Caribbean: The catalyst for a positive change – findings and recommendations for policymakers and the financial sector*. Nairobi, Kenya: United Nations Environment Programme. Available at https://financeincommon.org/sites/default/files/2023-09/Unlocking-Circular-Economy-Finance-in-LAC.pdf (accessed on November 7, 2024).

UNICEF. 2022. *Strategic note on UNICEF's work for children in urban settings*. 2nd edition. New York, USA: UNICEF. Available at https://www.unicef.org/media/133771/file/Strategic%20note%20on%20UNICEF's%20work%20for%20children%20in%20urban%20settings.pdf (accessed on June 21, 2024).

van Houten, F.; Naoko, I. 2020. *The world needs a circular economy. Help us make it happen*. World Economic Forum website. Available at https://www.weforum.org/agenda/2020/01/the-world-needs-a-circular-economy-lets-make-it-happen/ (accessed on January 12, 2024).

Weick, M.; Ray, N. 2023. *Rethinking bonds: How bond financing can advance circularity.* Ernst & Young website. Available at https://www.ey.com/en_us/insights/climate-change-sustainability-services/rethinking-bonds-financing-circularity (accessed on January 10, 2024).

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## Project

The CGIAR Initiative on Resilient Cities (https://www.cgiar.org/initiative/resilient-cities/) generates evidence, technologies and capacities that help improve urban food systems and secure equitable job and business opportunities, healthy diets for all, human and environment health, and a reduced carbon footprint.

The CGIAR Initiative on Nature-Positive Solutions (https://www.cgiar.org/initiative/nature-positive-solutions/) aims to re-imagine, co-create and implement nature-positive solutions-based agri-food systems that equitably support food and livelihoods while ensuring that agriculture is a net positive contributor to biodiversity and nature.

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