

RENEWABLE ENERGY FINANCE

GREEN BONDS





*Reallocating global capital into sustainable solutions
requires a greater supply of effective
and desirable capital market instruments*

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RENEWABLE ENERGY FINANCE

GREEN BONDS

The world's transition to a low-carbon economy necessitates a massive shift in the allocation of financial capital. Green bonds are fixed-income securities whose proceeds are meant to be allocated to sustainable assets. The green bond market can serve as an important bridge between providers of capital, such as institutional investors, and sustainable assets, like renewable energy.

From a slow start in 2007, and a market driven primarily by multilateral development banks, green bonds have experienced impressive growth over the past decade. With annual issuances approaching USD 190 billion in 2019, the growth has also been marked by a greater diversification of issuer types. Although corporations and financial institutions are becoming dominant, sovereign issuances used to finance climate-aligned assets are also increasing. European issuers have been joined by issuers from North America and, increasingly, from Asia-Pacific. Renewable energy is the leading recipient of green bond proceeds, but most green bonds finance multiple sustainable solutions.

While progress to date has been impressive, there is still opportunity for further growth and improvement. Cumulative issuances of green bonds are still below 1% of cumulative global bond issuances. To achieve further market growth, particularly as it relates to the renewable sector, co-ordinated actions among many stakeholders are needed.

Policy makers can help increase both the supply of green bonds (through the adoption of leading climate-aligned green bond standards) and the provision of enabling policies that grow the renewable energy sector. Public capital providers can do their part to help de-risk renewable assets and can support green bonds through provision of the seed capital, demonstration issuances and capacity building. Institutional investors can assist by aligning their internal capacities and investment targets with long-term sustainability mandates.

Other stakeholders, such as rating agencies, financial institutions and retail investors, also play a role in strengthening the green bond market and advancing the global energy transformation.

RENEWABLE ENERGY INVESTMENT TRENDS

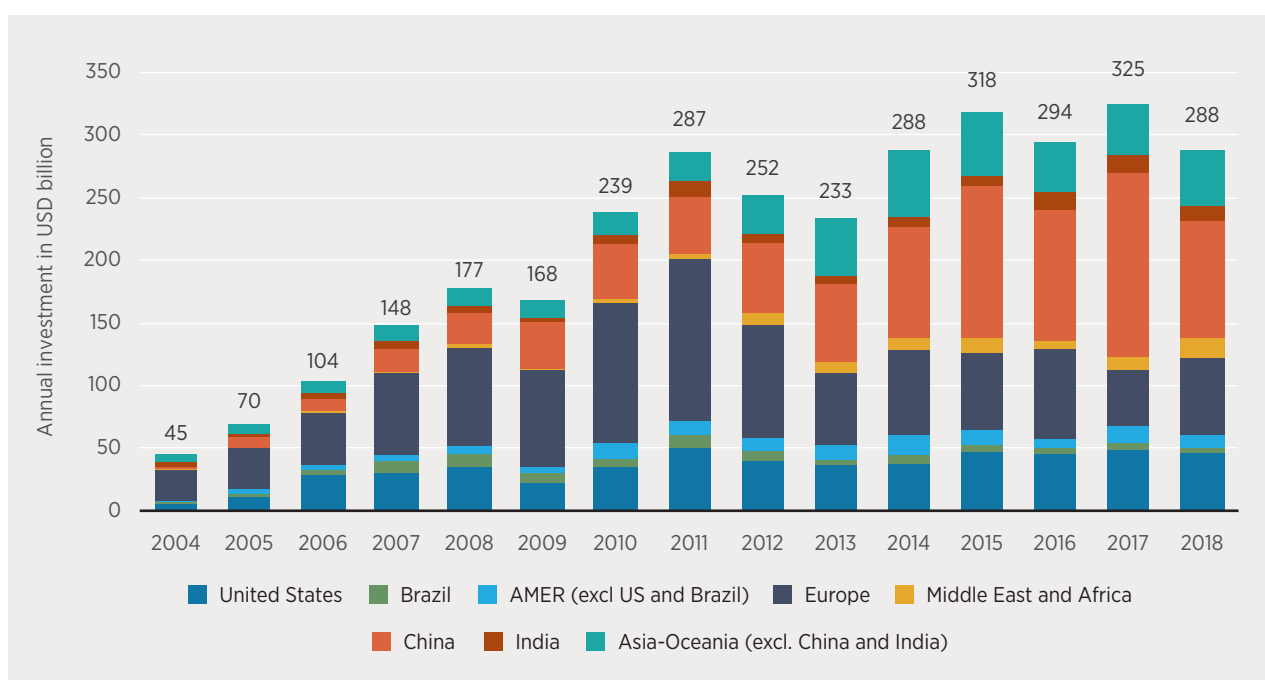
As renewables have become a compelling investment proposition, global investments in new renewable power have grown from less than USD 50 billion per year in 2004 to **around USD 300 billion** per year in recent years (Frankfurt School-UNEP Centre/BNEF, 2019), exceeding investments in new fossil fuel power by a factor of three in 2018 (REN21, 2019).

While hydropower still accounts for the largest share of the total renewable power capacity (50% of the 2018 total), solar and wind power have accounted for the largest shares of both annual capacity installations and annual investments in recent years (IRENA, 2018). **Solar photovoltaics (PV) and wind** power accounted for 90% of total renewable power investments in 2018 (Frankfurt School-UNEP Centre/BNEF, 2019). A forthcoming report from IRENA and the

Climate Policy Initiative (CPI) further examines the breakdown of capital flows, first between private and public sources, and then by institution type.

Another defining trend of renewable energy investments has been a **geographic shift towards emerging and developing markets**, which have been attracting most of the renewable investments each year since 2015, accounting for 63% of 2018 renewable power investments (Figure 1). Besides China, which attracted 33% of total global renewable energy investments in 2018, other top emerging markets over the past decade include India, Brazil, Mexico, South Africa and Chile (Frankfurt School-UNEP Centre/BNEF, 2019). Nevertheless, many developing and emerging countries in Africa, the Middle East, South-East Asia and South-East Europe still have a largely untapped renewables investment potential.

Figure 1 Global renewable energy investment (excl. large hydropower), in USD billion, by region, 2004-2018



Source: Frankfurt School-UNEP Centre/BNEF, 2019

Note: The figure shows investment in renewable power excluding end-use and large-scale hydropower (since data are from the BloombergNEF database, which does not include large-scale hydropower as "new energy"), which amounted to USD 273 billion, plus renewable energy investments through public markets, venture capital/private equity, and research and development. These investments together totalled USD 288 billion in 2018. Separately, large-scale hydropower investment in 2018 was around USD 16 billion, bringing the renewable energy power investment total to USD 289 billion and renewable energy investment (excluding end-use) to USD 304 billion.

In addition to the growing technological and geographical diversity, the renewable energy investment landscape is also witnessing a proliferation of **new business models and investment vehicles**, which can activate different investors and finance all stages of a renewable asset's life. Examples include the rise of the green bond market, growing interest in corporate procurement of renewable power and new business models for small-scale renewables such as the pay-as-you-go model.

Despite generally positive investment trends, however, far more needs to be invested in renewables in order to meet sustainable development and climate goals and to realise the many benefits of the energy transformation.

IRENA has estimated that investment in the energy system that puts the world on the path to limit global temperature increase to below 1.5 degrees Celsius (the “Energy Transformation” path) would focus on renewables, energy efficiency and associated energy infrastructure, and needs to reach a cumulative **USD 110 trillion for the 2016-2050 period**.

Of this amount, around 20%, or USD 22.5 trillion, will be needed for new renewable power capacity generation alone in the 2016-2050 period (IRENA, 2019a). This implies an annual renewable power investment of around USD 662 billion, *i.e.*, at least a doubling of annual renewable power investment compared to the current annual level.

Innovative instruments like green bonds can channel substantial global capital into renewable energy



WHY GREEN BONDS MATTER

Green bonds help bridge the gap between providers of capital and green assets, helping governments raise finance for projects to meet climate targets and enabling investors to achieve sustainability objectives. Along with other innovative capital market instruments, green bonds can support new or existing green projects through access to long-term capital.

A green bond is like a conventional bond in the sense that they both help the bond issuer to raise funds for specific projects or ongoing business needs in return for a fixed periodic interest payment and a full repayment of the principal at maturity.

A green bond differs in the “green” label, which tells investors that the funds raised will be used to finance environmentally beneficial projects. The green bond market started about a decade ago and has undergone rapid growth in the past five years (2014-2018), as global efforts to scale up finance for environmentally beneficial assets intensified. From a market dominated by development banks, green bonds have experienced not only growth in the total amount issued, but also a diversification of issuer types and sectors financed, and a widening geographic spread.

The green bond market continues to offer enormous growth potential. The cumulative issuances of green bonds are below USD 1 trillion, while the global bond market is valued at around USD 100 trillion. On an annual basis, green bonds raised USD 167 billion in 2018, while the total bond market raised around USD 21 trillion (CBI, 2019a; SIFMA, 2019), as seen in Figure 2.

The need for further growth is equally large and urgent. The International Renewable Energy Agency (IRENA) has estimated the energy transition investments needed to meet international goals for a climate-safe future amount to USD 110 trillion

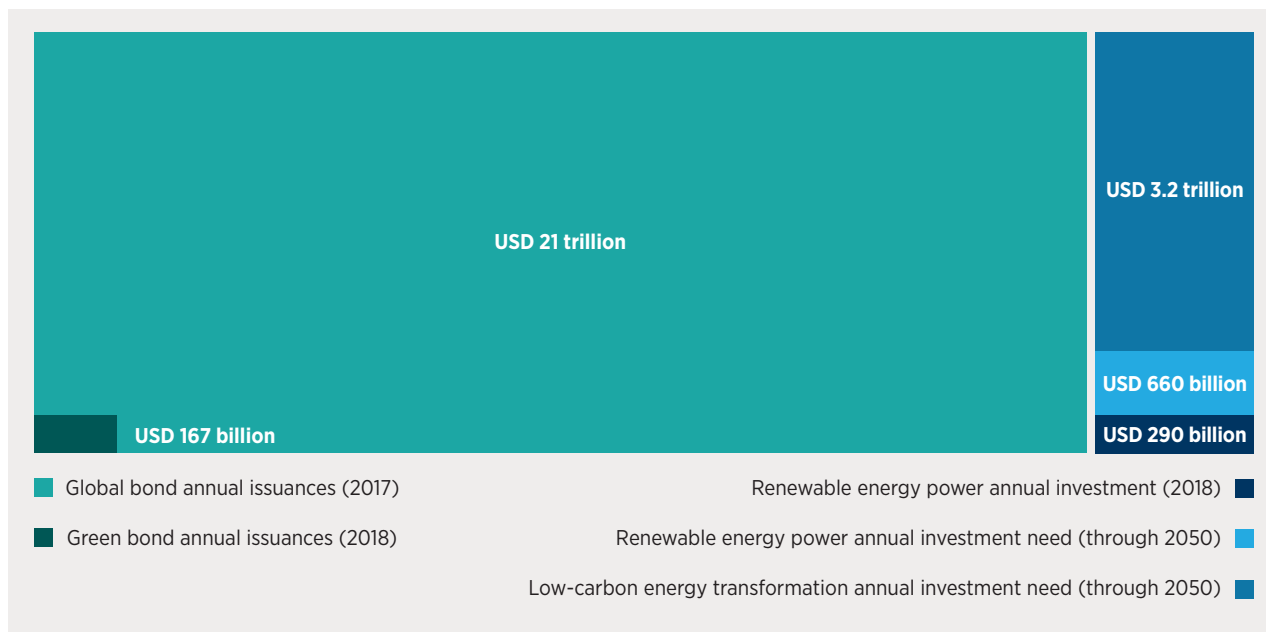
over 2016-2050, or USD 3.2 trillion per year (IRENA, 2019a). For renewable power alone, this implies a more than doubling of the current annual investment of USD 290 billion in 2018 to USD 660 billion through 2050 (Frankfurt School-UNEP/BNEF, 2019; IRENA, 2019a). **Green bonds can help bridge some of this financing gap.**

Who defines “green” and attests to the appropriate use of green bond proceeds? There is no simple answer to this crucial question, although there is a convergence of market guidelines and standards. Some green bonds are self-labelled by the issuers, but multiple standards also exist at the international level (e.g., Green Bond Principles, Climate Bonds Standard), regional level (e.g., Association of Southeast Asian Nations (ASEAN), upcoming European Union Green Bond Standard) and national level (e.g., Brazil, China, India, Japan, Morocco). Complementing these are third-party entities attesting to a bond’s green credentials via a pre-issuance review, post-issuance review or green bond certification. Such entities include rating agencies, specialised consultancies and non-governmental organisations (NGOs), such as Moody’s, Sustainalytics, CICERO and the Climate Bonds Initiative.

Two international standards have become dominant: the Green Bond Principles and the Climate Bonds Standard. While the Green Bond Principles set out *voluntary guidelines* on potentially eligible categories of green projects, the process for project evaluation/selection, the management of proceeds and reporting, the Climate Bonds Standard has more *detailed criteria and requirements* on what is green based on a category’s alignment with the Paris Agreement climate target, as well as on management of proceeds and reporting. These key standards are described at the back of this brief.

Green bonds remain well below their potential and too small to drive the global shift to renewables

Figure 2 Green bond issuances, renewable energy power investment, renewable energy power investment need, low-carbon energy transformation investment need and global bond issuances (USD, annual)



Sources: Frankfurt School-UNEP Centre/BNEF (2019), IRENA (2019a), SIFMA (2019), along with IRENA analysis based on CBI (2019a)



MARKET OVERVIEW

The green bond market has taken off in the past five years, with 2019 issuances expected to reach USD 190 billion. Along with the growing amount of capital raised, the market also expanded in its geographic reach, diversification of issuers and currencies in which green bonds are offered. Renewable energy leads the use-of-proceeds categories and is present in around half of all green bonds issued.

The green bond market started a little over a decade ago with the European Investment Bank's first issuance of a Climate Awareness Bond in July 2007, which allocated EUR 600 million to 14 renewable energy and energy efficiency projects (EIB, 2017).

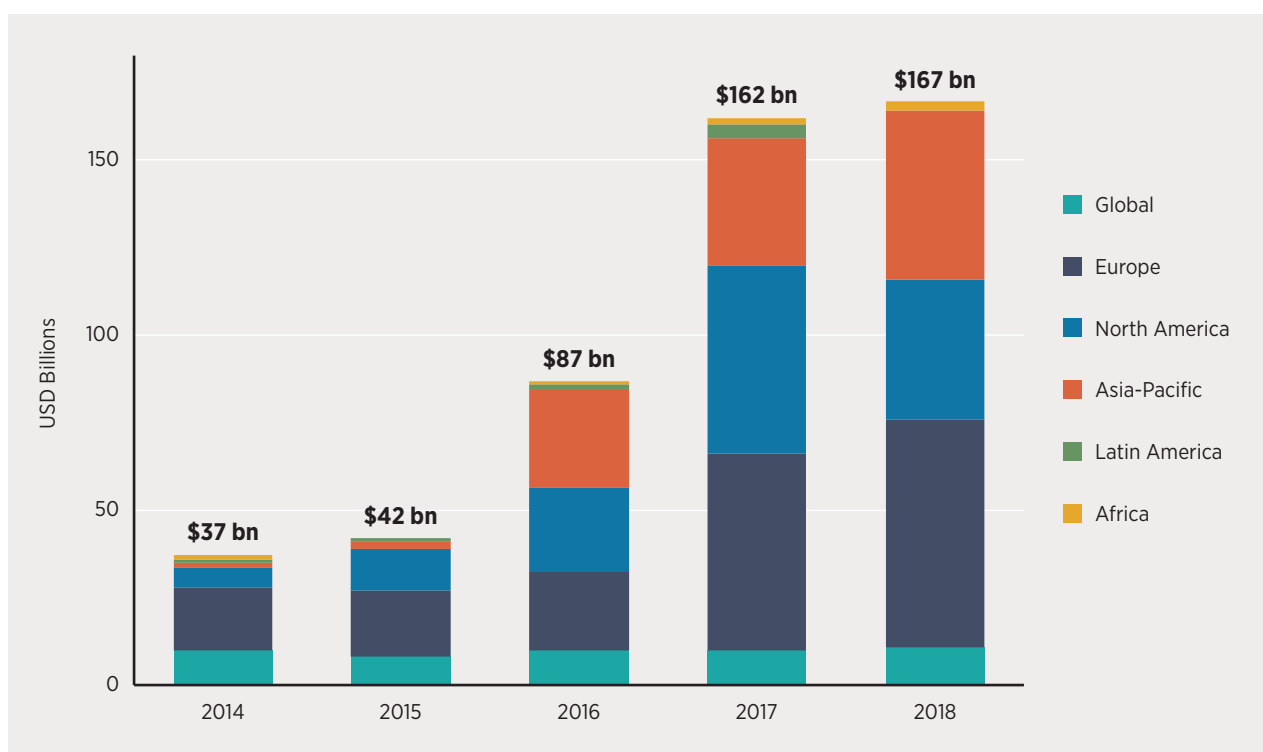
Over the past decade, such supranational institutions have taken a back seat to a growing variety of issuers from different regions – firstly from Europe, then North America, and increasingly from Asia-Pacific and to a smaller extent from Latin America and Africa.

The top three countries to issue green bonds in 2018 were the United States (USD 34.2 billion), China (USD 31 billion) and France (USD 14.2 billion) (CBI, 2019a).

Overall, annual global green bond issuances rose from EUR 600 million in 2007 to USD 37 billion in 2014 and USD 167 billion in 2018 (Figure 3) (CBI, 2019a). For 2019, a new high of USD 190 billion is expected (CBI, 2019b).

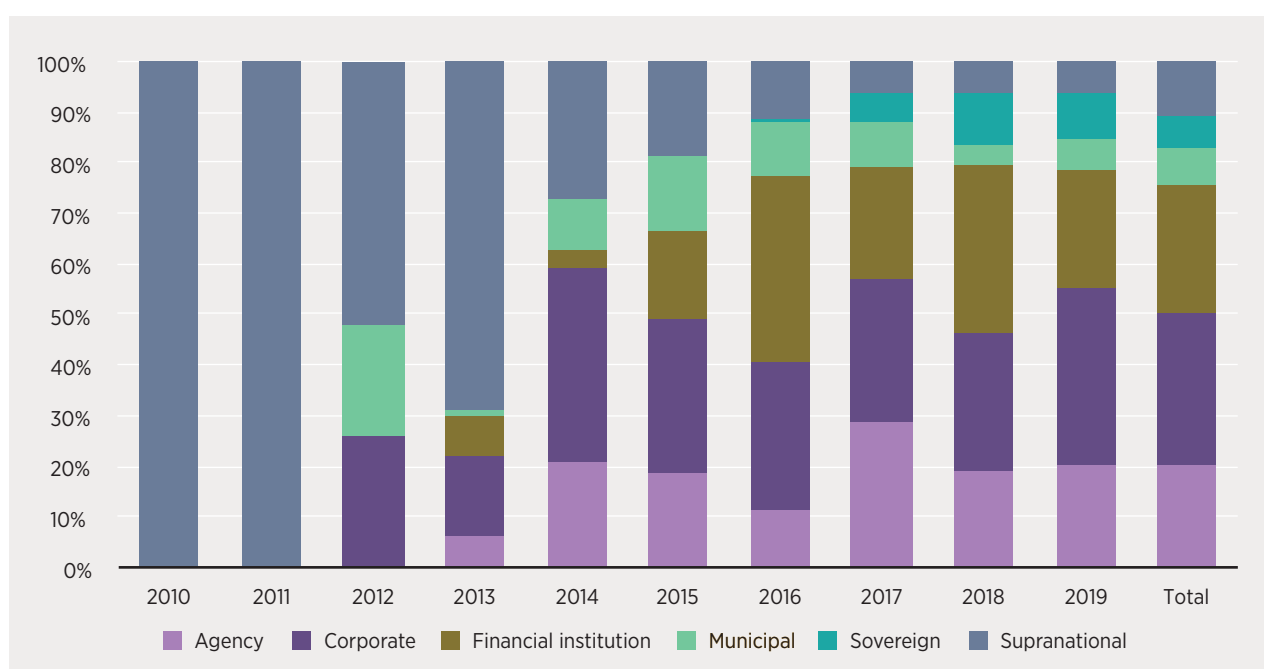
From a market driven primarily by multilateral development banks, green bonds are now issued by public and private institutions, including governments (local, state and national), government agencies, and companies (e.g., big corporations, financial institutions) (Figure 4). For markets that are new to green bonds, however, multilateral banks remain important, as in the case of the African Development Bank, which has issued around 80% of the outstanding green bonds in Africa (Tiyou, 2019).

Figure 3 Annual green bond issuances, per region, 2014-2018, USD billion



Source: CBI, 2019a

"Global" refers to issuances from supranational institutions such as the European Investment Bank, World Bank, Asian Development Bank and others.

Figure 4 Breakdown of green bond issuances by issuer type, 2010-2019*, and total

IRENA analysis based on data from the Environmental Finance Bond Database (subscription required)

*2019 includes data up to and including November 2019.

Green bonds are also issued in more currencies than ever before. While the US dollar and the euro are the top two currencies of issuances (accounting for 83% of issuances, by number, in 2018, followed by the Chinese renminbi), green bonds were issued in a record 30 currencies in 2018 (CBI, 2019a).

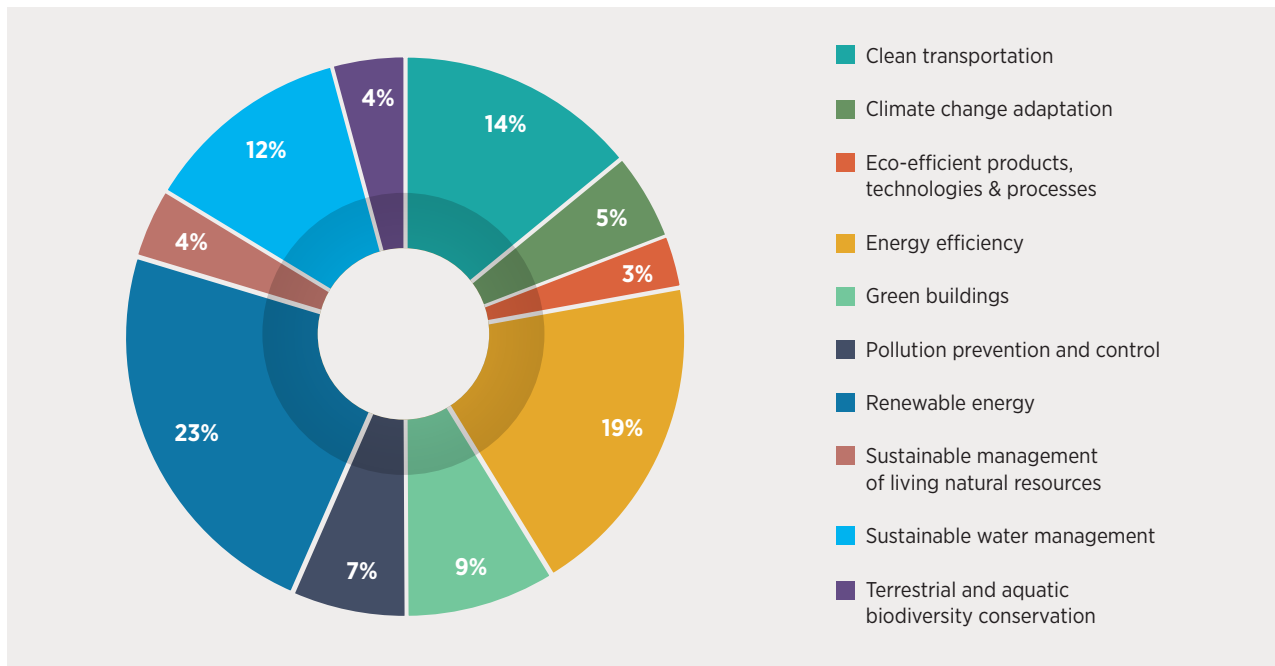
Renewable energy dominates green bond issuances, followed by energy efficiency projects and clean transport. Most green bonds finance multiple “green” categories (Figure 5). Out of the sample of over 4 300 green bonds analysed by IRENA, 50% of the bonds (by volume, in USD) had renewable energy as one of the use-of-proceeds categories, while 16% were solely earmarked for renewable energy assets. On a regional basis, 21% of green bonds in Europe were dedicated only to renewables (by volume, in USD), 19% in Africa, 16% in the Americas and 14% of green bonds in Asia-Pacific (IRENA, forthcoming (a)).

Green bonds solely designated for renewable energy are mostly issued by corporations (67% of the cumulative volume from 2010 to November 2019), followed by government agencies (18%) and financial institutions (14%). The top five countries that issued such bonds over the same period (2010 to November 2019) are the United States (26% of the total, by volume), Germany (20%), Spain (12%), China (11%) and the Netherlands (9%).

In terms of issuance sizes, green bonds designated for renewables tend to be larger than other green bonds, with the average issuance size in the USD 100 million to USD 500 million range (for the period 2010 to November 2019), compared to all green bonds’ average issuance size of below USD 100 million (IRENA, forthcoming (a)).

Growing the green bond market demands co-operation between policy makers, standard setters, capital providers and investors

Figure 5 Breakdown of green bond issuances by use of proceeds, by cumulative volume (USD), 2010-2019*



IRENA analysis based on data from the Environmental Finance Bond Database (subscription required)

*2019 includes data up to and including November 2019.

Green bonds are well suited for a variety of different investors, ranging from retail clients and financial and other companies to governments and institutional investors (pension plans, insurance companies, sovereign wealth funds, foundations and endowments). The latter group is particularly important in the energy transition discussion as institutional investors hold well over USD 100 trillion of assets. Yet so far, they remain largely on the side lines in the shift towards sustainable finance.

IRENA's analysis has found that while institutional investments in renewables have increased over time, such investors funded only 2% of renewable energy projects directly in 2018 (for total direct investment of around USD 6 billion) (IRENA, forthcoming (b)). Their investment activity indicates a strong preference for indirect investments in renewable energy assets through funds or bonds. Such instruments can allow investors to avoid early-stage project risks and can also offer desirable transaction size, liquidity and credit assurance if such instruments are rated and listed on an exchange. Green bonds therefore enable such investors to enter the renewable space, helping them build internal capacities for later-stage direct financing trades.



OPPORTUNITIES FOR ENGAGEMENT

While the promise and potential of the green bond market is large, scaling up current issuance levels will require co-ordinated actions from multiple stakeholders to reduce market barriers.

Those barriers include lack of awareness of the benefits of green bonds and hence a lack of local investor demand, lack of clarity regarding green bond guidelines and standards, a shortage of green projects and high transaction costs for green bonds compared to traditional bonds. Some of the recommended actions include:

Policy makers and regulators:

- Adoption of long-term energy transition plans and of enabling policies that support the overall growth and integration of renewable energy. Multiple IRENA publications provide the analysis, know-how and examples (IRENA (2016, 2017, 2019a, 2019b, 2019c; IRENA, IEA and REN21, 2018, among others).
- Review of investment restrictions faced by institutional investors, and addition of clear sustainability mandates with ideally a minimum allocation to green assets like renewables;
- Development of green bond standards that are aligned with leading climate-aligned standards;
- Support of innovative green instruments like green bonds through economic incentives such as funding of demonstration issuances, grants to offset issuance and reporting costs

Investors (including institutional investors):

- Internal awareness raising and capacity building regarding climate impacts, financing of climate-aligned assets like renewables, and new instruments like green bonds;
- Review and revision of investment targets, internal incentives and overall management practices, to be in line with new long-term sustainability mandates adopted by institutional investors;

- Co-operation with other institutional investors (e.g., via the Institutional Investors Group on Climate Change (IIGCC)) to learn about best practices regarding climate-aligned assets and financial instruments.

Public finance providers (multilateral development banks, development finance institutions):

- Capacity building and technical assistance provided to investors and policy makers regarding green bond standards, climate-aligned assets and instruments;
- Economic support for new green bond issues via funding or co-funding of demonstration issuances, subsidies to cover green bonds issuance and reporting costs;
- Renewable energy project de-risking through the provision of risk mitigation instruments, structuring project aggregation vehicles that can be offered to investors via green bonds.

Other stakeholders:

- **Ratings agencies:** Provision of green bond ratings that is aligned with leading standards and climate targets set in the Paris Agreement;
- **International organisations, think tanks and NGOs:** Awareness raising and capacity building regarding climate impacts on financial assets, leading green bond standards, climate-aligned assets such as renewable energy, and new instruments like green bonds;
- **Investors:** Demand for better disclosure regarding climate-related financial impacts and greater supply of financial instruments that support sustainable sectors like renewable energy.

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KEY GREEN BOND STANDARDS

Green Bond Principles (GBP): Core components

- 1 Use of proceeds:** Bond proceeds should be described in the bond offering documentation, with projects' environmental benefits described and, if possible, quantified. Share of financing versus re-financing amounts should also be provided by the issuer. The GBP list the most commonly used types of projects supported by or expected to be supported by the green bond market. These are:

 1. Renewable energy (production, transmission, appliances and products);
 2. Energy efficiency (e.g., new/refurbished buildings, energy storage, district heating, smart grids and products);
 3. Pollution prevention and control (e.g., reduction of emissions, waste prevention/reduction);
 4. Environmentally sustainable management of living natural resources and land use (e.g., sustainable agriculture, fishery, aquaculture and forestry, natural resources preservation or restoration);
 5. Terrestrial and aquatic biodiversity conservation (protection of coastal, marine and watershed environment);
 6. Clean transport (e.g., electric, hybrid, public, rail transport or infrastructure, reduction of emissions);
 7. Sustainable water and wastewater management (e.g., sustainable water infrastructure, wastewater treatment, drainage systems, flood mitigation);
 8. Eco-efficient and/or circular economy adapted products/technologies (e.g., sustainable products, resource-efficient packaging and distribution);
 9. Green buildings meeting applicable standards or certifications.
- 2 Process for project evaluation and selection:** The bond issuer should clearly communicate every project's environmental sustainability objectives, the process for selecting a project and the related eligibility criteria, and any green standards or certifications used. The GBP recommend that the issuer's project evaluation and selection process is supplemented by an external review.
- 3 Management of proceeds:** Bond proceeds should be segregated or tracked and managed with a high level of transparency. The GBP recommend that such internal processes are attested by an auditor.
- 4 Reporting:** Bond issuers should keep and provide on a timely (at least annual) basis information regarding projects, including project descriptions, amount allocated and expected impacts in quantitative and qualitative terms. Green bond programme summaries and guidance on impact reports are provided on the GBP website.

Source: ICMA, 2018

Climate Bonds Standard (CBS): Categories of eligible projects

ENERGY	TRANSPORT	WATER	BUILDINGS	LAND USE & MARINE RESOURCES	INDUSTRY	WASTE	ICT
Solar ●	Private transport ●	Water monitoring ●	Residential ●	Agriculture ●	Cement production ●	Preparation ●	Broadband networks
Wind ●	Public passenger transport ●	Water storage ●	Commercial ●	Commercial Forestry ●	Steel, iron & aluminium production ●	Reuse ●	Telecommuting software and service
Geothermal ●	Freight rail ●	Water treatment ●	Products & systems for efficiency ●	Ecosystem conservation & restoration ●	Glass production ●	Recycling ●	Data hubs
Bioenergy ●	Aviation ●	Water distribution ●	Urban development ●	Fisheries & aquaculture ●	Chemical production ●	Biological treatment ●	Power management
Hydropower ●	Water-borne ●	Flood defence ●		Supply chain management ●	Fuel production ●	Waste to energy ●	
Marine Renewables ●		Nature-based solutions ●				Landfill ●	
Transmission & distribution ●						Radioactive waste management	
Storage							

● Certification Criteria approved ● Criteria under development ● Due to commence

Source: CBI, 2019a



Bonds could facilitate vast global capital flows into low-carbon assets. Through co-ordinated action between policy makers and the financial sector, green bonds can mobilise the large capital pools owned by institutional investors

RENEWABLE ENERGY FINANCE

GREEN BONDS

About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that serves as the principal platform for international co-operation, a centre of excellence and a repository of policy, technology, resource and financial knowledge, and a driver of action on the ground to advance the transformation of the global energy system. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. www.irena.org

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