Goldman Sachs | Asset Management

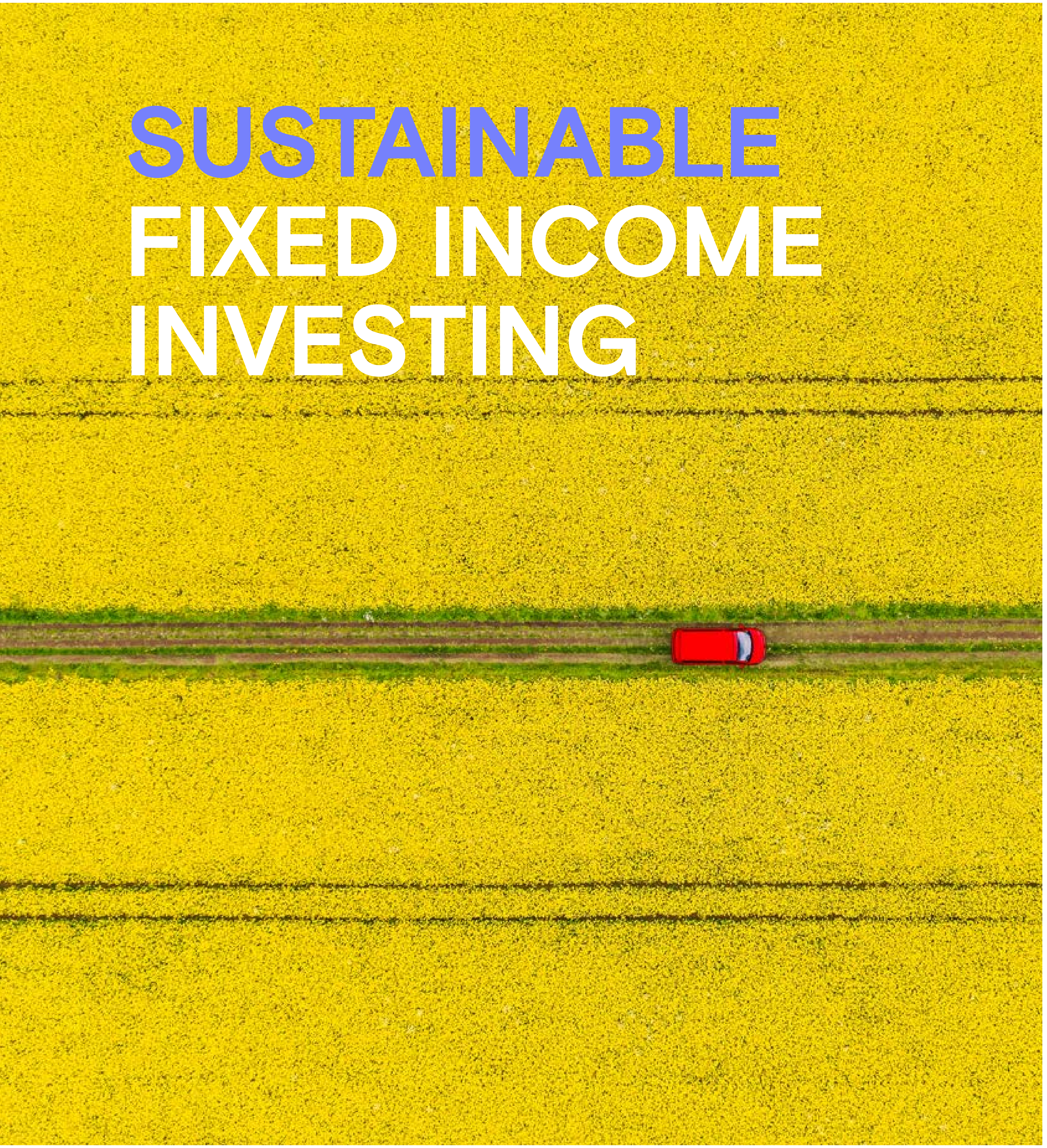
Green Bond Market Guide

FINANCING THE CLIMATE TRANSITION

Contents

This publication was finalized on September 11, 2023.

SUSTAINABLE FIXED INCOME INVESTING



The clean-energy transition and the drive to create a more inclusive society are transforming the global economy. With climate change continuing to affect economies, companies and communities around the world, a successful transition to a low-carbon economy is more important than ever. This decarbonization push will require changes across the economy, especially in high-emitting sectors such as agriculture, construction, heavy industry and transport.

Financing this sustainable transformation will require vast amounts of investment. Goldman Sachs Global Investment Research estimates that the price tag for achieving 75% decarbonization of the global economy now stands at $3.1 trillion per year.[1] In response, public and private investors are channeling capital toward innovative solutions in areas such as renewable energy, green infrastructure and energy efficiency.

The global bond market will be an important source of investment to drive the climate transition. Yet until recently, investors seeking to reduce the carbon footprint of their fixed income portfolios had few options.

The rapid growth of the green bond market – averaging 90% per year from 2016 to 2021[2] – has changed that. Once a niche product, these bonds that finance environmentally beneficial projects and programs have entered the fixed income mainstream. Market expansion and the widening range of investment funds offering exposure to green bonds have made them a viable complement to existing fixed income allocations that offers a potentially positive contribution to the global push to mitigate the impact of climate change.

This Green Bond Market Guide is divided into three sections. The first, **Standard Bonds With Green Goals**, explains the characteristics that green bonds share with conventional bonds and the features that set them apart. We explore the voluntary standards that set out best practices for green bond issuers and look at the critical roles played by impact reporting and investor engagement with issuers to ensure the credibility and transparency of the green bond market.

The second section of the guide, **From Niche to Mainstream**, traces the development of green bonds from the first issuance in 2007 to the current broad and diversified market. We examine the global climate initiatives that are spurring the mobilization of capital to fund the climate response. This section also compares the green bond market with the broader market in terms of performance and composition, providing a detailed view of green bonds' rapid development.

The guide's third section, **A Green Complement to your Fixed Income Allocation**, lays out the fixed income investment opportunity in green bonds, whose financial characteristics are similar to those of traditional bonds. We look at how similar financial characteristics allow investors to replace a portion of their fixed income portfolios with green bonds without sacrificing liquidity or returns. This section examines the issue of "greenwashing" – making overstated or misleading claims about the environmental ambition of a project, asset or activity – and the much-debated question of whether green bonds trade at a premium to conventional peers.

Bram Bos
Global Head of Green, Social and Impact Bonds

1 "Carbonomics: The Economics of Net Zero," Goldman Sachs Global Investment Research. As of November 29, 2022.
2 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2021.

STANDARD BONDS WITH GREEN GOALS

WHAT ARE GREEN BONDS?

Green bonds are standard fixed income securities with a green goal. Their financial characteristics such as structure, risk and return are similar to those of traditional bonds from the same issuer. They range from investment grade to non-investment grade, though most corporate green bonds are investment grade. Like traditional bonds, green bonds come in short- or long-dated maturities and have various coupons and yields.

The main difference is that the goal for green bonds is to finance only projects or activities with a specific environmental purpose such as renewable energy, clean transportation, sustainable water and energy efficiency. This commitment to advancing the climate transition goes back to the first green bond, issued in 2007 by the European Investment Bank (EIB), the lending arm of the European Union (EU).[3]

Green bond issuers self-label their bonds as green based on guidance from regulators, stock exchanges and market associations. A number of organizations have developed sustainability standards and labels to give additional transparency on the environmental quality and performance of a product, process or service.

Since that inaugural EIB issue, green bonds have expanded into a $2 trillion market.[4] Dominated in the early years by multilateral development banks such as the EIB and the World Bank, which issued its first green bond in 2008,[5] the market has seen the range of issuers expand to include companies and governments across the globe seeking investment to drive their plans to reduce greenhouse gas (GHG) emissions and guard against physical climate risks. The investor base has also expanded to include a growing number of traditional fixed income investors, not just those focused primarily on impact and environmental, social and governance (ESG) criteria.

3 "EPOS II - The 'Climate Awareness Bond': EIB Promotes Climate Protection Via Pan-EU Public Offering," EIB press release. As of May 22, 2007.
4 Goldman Sachs Asset Management, Bloomberg. As of April 30, 2023.
5 "World Bank and SEB Partner With Scandinavian Institutional Investors to Finance 'Green' Projects," World Bank press release. As of November 6, 2008.

CASE STUDY[6]

EUROPEAN INVESTMENT BANK

The European Investment Bank (EIB), which is owned by the EU's member states, issued the world's first green bond to support the bloc's climate change strategy. The five-year security, branded a "climate awareness bond," raised €600 million[7] that was earmarked for lending projects related to renewable energy and energy efficiency, two areas that the EIB deemed critical for international climate protection.[8]

The EIB issued that first green bond in 2007 in response to EU climate policy as set out in documents such as the Energy Action Plan for 2007-2009, which included initiatives to promote renewable energy.[9] The bank also sought to tap into growing interest among retail and ethical investors in opportunities created by climate action that did not carry the risks associated with equity or project investments.[10]

Since that inaugural green bond, the EIB has expanded its issuance significantly: climate awareness bonds accounted for 10% of the bank's total bond issuance in 2020, up from just 1% in 2007.[11] Over the years, the EIB has been the first issuer of green bonds denominated in a number of currencies, starting with the euro and including the Brazilian real (2010), Swiss franc (2014) and Danish krone (2019).

In addition, the EIB set a strategic objective in 2015 to support the expansion of the green bond market by supplying benchmark-size transactions[12] and helping develop market governance and standards. As part of this commitment, the bank has chaired the steering committee of the Green Bond Principles, a set of voluntary best-practice guidelines that will be discussed in the following section of this guide.

6 For illustrative purposes only.
7 "European Investment Bank Celebrates Green Bonds' 10th Anniversary," UniCredit Credit View. As of June 28, 2017.
8 "EPOS II - The 'Climate Awareness Bond': EIB Promotes Climate Protection Via Pan-EU Public Offering," EIB press release. As of May 22, 2007.
9 "Evaluation of the EIB's Climate Awareness Bonds," EIB. As of April 2021. The EIB also cited the importance of the so-called Berlin Declaration which set out the EU's ambition "to lead the way in energy policy and climate protection and make our contribution to averting the global threat of climate change." See "Declaration on the Occasion of the 50th Anniversary of the Signature of the Treaties of Rome," EU website. As of March 25, 2007.
10 Ibid.
11 Ibid.
12 Benchmark bond issues provide a standard for measuring the performance of other bonds of similar maturity. The EIB issues euro benchmark bonds under its Euro Area Reference Notes (EARNs) program in a variety of maturities. The size of these benchmark bonds is typically in the range of €3 billion to €5 billion. See "Euro Benchmark Programme," EIB website. As of July 28, 2023.

PROMOTING BEST PRACTICES

Voluntary industry standards have been a key factor supporting expansion of the green bond market. By setting out best-practice guidelines for issuers to promote greater transparency and accurate disclosure of key information, they have helped the market become more standardized, enhancing tradability and facilitating the development of green bonds into a full-fledged segment of the fixed income market.

The **Green Bond Principles** were developed by a group of global banks with input from issuers, investors and environmental groups to provide a recommended process for developing and issuing green bonds.[13] The International Capital Market Association (ICMA) serves as the initiative's secretariat, providing administrative support and guidance and gathering input that feeds into updates of the Green Bond Principles,[14] which have become the industry's most widely adopted standard.

Four components are required for alignment with the Green Bond Principles, starting with the "cornerstone" of a green bond: the use of proceeds to finance eligible green projects. (A more detailed discussion of use of proceeds follows on page 10.) The second component is the process for evaluating and selecting the projects that will be financed using a green bond. The guidelines recommend that issuers clearly communicate to investors the environmental objectives of these projects and the process for determining how they correspond to the categories set out in the Green Bond Principles. Issuers should also disclose how they identify and manage any social and environmental risks associated with these projects.

The third component covers the management of green bond proceeds, which should be tracked by the issuer in a sub-account or sub-portfolio and attested to in a formal internal process linked to its lending and investment operations for eligible projects. Finally, the Green Bond Principles recommend that issuers have current information on the use of proceeds readily available for investors. This information should be renewed annually until full allocation, and this annual report should include the amount allocated to each project and its expected impact. (For more on green bond reporting, see page 12.)

In addition to these four core components, the Green Bond Principles recommend that issuers create a green bond framework that summarizes their issuance program in the context of their overarching sustainability strategy. The guidelines also set out recommendations for obtaining outside input on an issuer's green bond processes through external reviews. (See the discussion on page 12.)

13 "Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds," ICMA. As of June 2021.
14 "Green Bond Principles Governance Established, ICMA Appointed Secretariat," ICMA press release. As of April 14, 2014. Goldman Sachs was among nine initial supporters of the Green Bond Principles.

A second set of voluntary guidelines, the **Climate Bonds Standard and Certification Scheme**, was launched in 2010 by the nonprofit Climate Bonds Initiative with the goal of promoting market growth by building confidence in the environmental credentials of green bonds.[15] To facilitate this, the Standard – a labeling scheme for bonds and loans – has sector-specific eligibility criteria including performance metrics for each green bond category.

Climate Bonds INITIATIVE

The Climate Bonds Standard and Certification Scheme attests to a bond's alignment with the broad guidelines set out in the Green Bond Principles as well as a variety of regional standards. It sets mandatory requirements for use and management of proceeds, selection of projects, and reporting, covering the four components of the Green Bond Principles.

The certification awarded by the Climate Bonds Standard Board aims to provide investors with a tool for screening green bonds. For issuers, the certification is intended to demonstrate that a bond meets science-based climate-integrity standards and industry best practices on proceeds and transparency.

Other guidelines in the green bond market include **ISO 14030**, developed by the Geneva-based International Organization for Standardization (ISO).[16] ISO 14030 builds on the Green Bond Principles to provide specific requirements for issuers that are designed to ensure the integrity of the green designation of bonds and loans. It also set out a taxonomy of eligible projects, assets and expenditures.

15 "Climate Bonds Standard Version 3.0," Climate Bonds Initiative. As of December 2019.
16 "ISO 14030-1:2021 Environmental Performance Evaluation — Green Debt Instruments — Part 1: Process for Green Bonds," ISO website. As of September 2021.

USE OF PROCEEDS

The core of a green bond is the commitment to use the proceeds to finance eligible projects that aim to make a positive impact on the environment. This "use of proceeds" feature, initially worked out by pioneer issuers such as the EIB and the World Bank, has become standard market practice.

A green bond's use of proceeds is set out in its legal documentation. All eligible projects financed by a green bond provide "clear environmental benefits" that the issuer should assess as well as quantify, where this is feasible, according to the Green Bond Principles.

The Green Bond Principles provide broad categories of eligible projects that cover the types most commonly financed with green bonds. Issuers should spell out the environmental sustainability objectives of a bond's projects as well as the process used to determine how they fit into the categories of eligible projects.

Categories of Eligible Projects in the Green Bond Principles

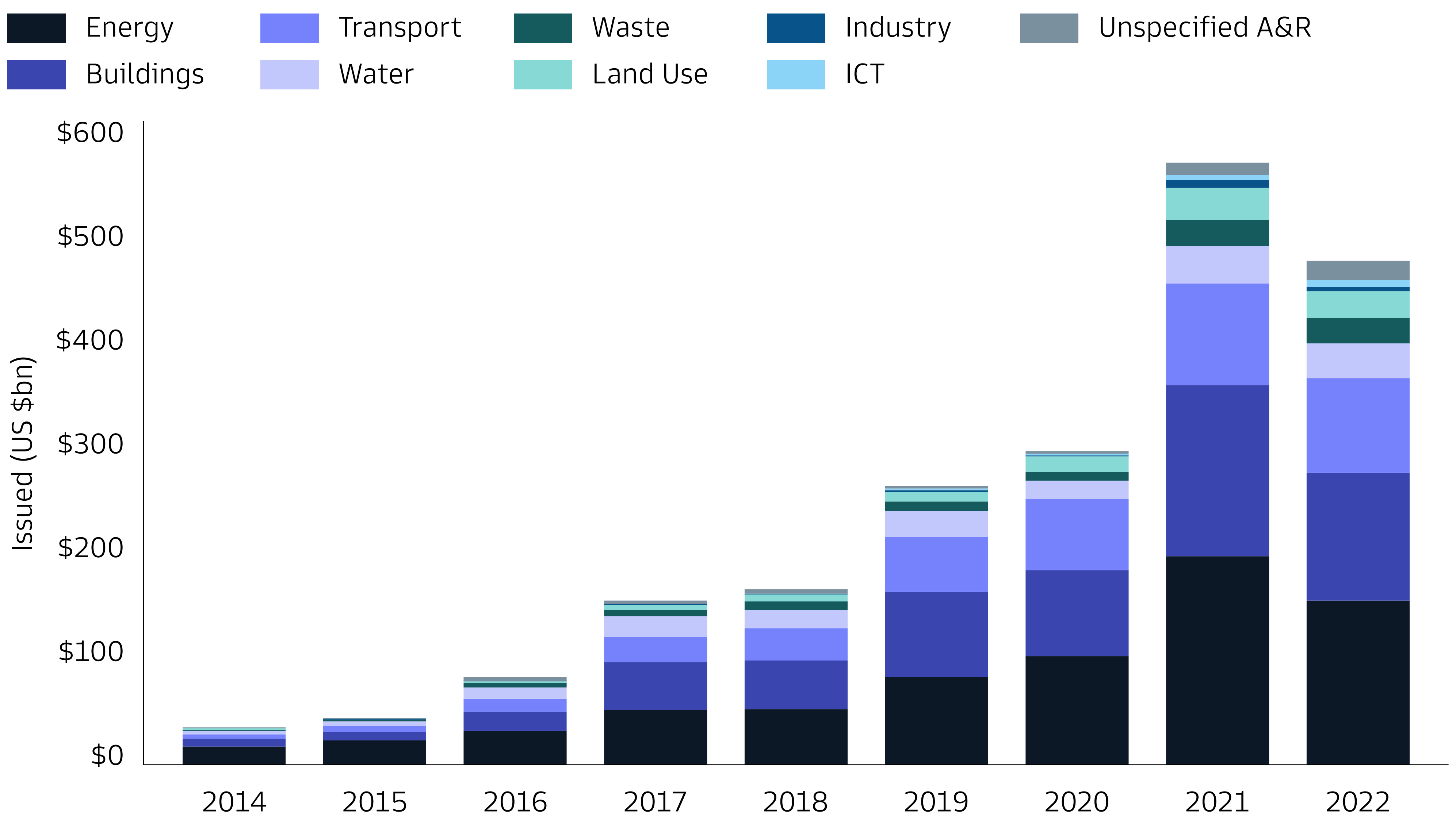
The eligible green project categories, listed in no specific order, include:

Renewable energy	Clean transportation
Energy efficiency	Sustainable water and wastewater management
Pollution prevention and control	Climate change adaptation
Environmentally sustainable management of living natural resources and land use	Eco-efficient and/or circular-economy-adapted products, production technologies and processes
Terrestrial and aquatic biodiversity conservation	Green buildings

Source: ICMA

Energy, buildings and transport top the list of use-of-proceeds categories financed by green bonds, according to the Climate Bonds Initiative.[17] They accounted for 77% of the total green bond volume at the end of 2022, down from the peak of 85% in 2020. Smaller categories are gaining share as issuers, including large sovereigns, finance a wider range of projects, the data show.

Breakdown of Global Annual Green Bond Issuance by Use-of-Proceeds Category



Source: Climate Bonds Initiative. Data as of December 31, 2022.

17 "Interactive Data Platform," Climate Bonds Initiative website. Data as of June 30, 2022. For illustrative purposes only.

REVIEW AND REPORTING

Most issuers commission **independent reviews** of their green bond frameworks as well as specific bonds issued to establish the credibility of their environmental ambitions. The Green Bond Principles also encourage a high degree of transparency and recommend an external review to supplement the issuer's project evaluation and selection process.

External reviews come in various forms.[18] A second-party opinion is provided by an institution with environmental expertise and normally assesses a bond's alignment with the Green Bond Principles. Issuers can obtain independent verification for bonds against a designated set of criteria, usually related to business processes and environmental criteria. Issuers can also have their green bonds certified against a recognized external standard or label, or use a third party to evaluate them according to a scoring or rating methodology.

In 2022, second-party opinions remained issuers' preferred option, followed by certification under the Climate Bonds Standard.[19] The Oslo-based Centre for International Climate and Environmental Research, or CICERO, which conducted the external review on the World Bank's first green bond in 2008, was the largest provider of such reviews in 2022. Amsterdam-based Sustainalytics, a unit of Morningstar, was the largest verifier for certified climate bonds.[20]

These external evaluations play an important role in the issuance process. They enable issuers to demonstrate the quality of their approach and investors to make informed decisions and supplement their due diligence. They provide insight into the sustainability value of projects to be financed, the issuer's governance in terms of the projects it selects, and how the issuer manages the proceeds and executes reporting.

Post-issuance reporting is also an integral component of the green bond market because it provides evidence that the proceeds of a green bond are truly allocated to eligible green projects. Issuers are expected to report at least once a year on the allocation of proceeds. There is also increasing demand for issuers to disclose the expected and achieved environmental impacts of their green bonds. Issuers tend to include the relevant information in their annual report or publish a dedicated green bond report.

There is also a growing trend for issuers to report the impact of their bonds in terms of the United Nations' Sustainable Development Goals,[21] which have emerged as a common language for understanding how companies and portfolios are positioned for environmental and social impact. Issuers can also increase the quality and reliability of their reporting by submitting their post-issuance reports to a financial auditor.

18 "Guidelines for Green, Social, Sustainability and Sustainability-Linked Bonds External Reviews," ICMA. As of June 2022.
19 "Sustainable Debt: Global State of the Market 2022," Climate Bonds Initiative. As of April 2023.
20 Ibid.
21 The SDGs, adopted in 2015, are a 15-year action plan for protecting the environment, ending poverty and reducing inequality.

REGULATORY INITIATIVES

While voluntary best-practice guidelines such as the Green Bond Principles and the Climate Bonds Standard and Certification Scheme have helped increase investors' confidence in green bonds, regulators around the world are considering further rule changes to address the challenge of "greenwashing." Definitions of this term can vary, but most focus on the misrepresentation of the green credentials of securities and investment funds.[22] (See the related discussion of managing greenwashing risks on page 34.) The most significant recent regulatory changes are occurring in two leading green bond markets, Europe and China.

In Europe, negotiators for the European Parliament and the Swedish EU presidency reached a provisional agreement at the end of February 2023 on the **European Green Bond Standard**.[23] This is intended to provide issuers with a tool to show they are funding green projects aligned with the EU's taxonomy, which establishes a list of environmentally sustainable economic activities.[24] For investors, the new standard aims to provide greater transparency and reduce the risk of greenwashing.

Use of the European Green Bond label will be voluntary. Issuers wishing to use the designation will need to ensure that all proceeds of a bond are invested in economic activities aligned with the EU taxonomy, provided these activities are already covered in the evolving classification system.[25] The new standard also requires detailed and uniform disclosure in a standardized template, including information such as the use of proceeds and how these investments feed into plans for transitioning toward achieving net zero greenhouse gas emissions. The regulation establishing the European Green Bond Standard has yet to be adopted by the bloc's two legislative bodies, the European Parliament and the Council of the European Union. It would start to apply 12 months after entering into force.

Regulators in China introduced new **China Green Bond Principles** in July 2022 that are intended to bring the country's fast-growing market into closer alignment with global standards.[26] ICMA, which advised the China Green Bond Standard Committee on the guidelines, said that "overall" they are based on and aligned with the global

22 This lack of a standard definition was one of the issues that led the EU's top financial regulators to launch a public consultation in late 2022 aimed at improving understanding of greenwashing. See "ESAs Launch Joint Call for Evidence on Greenwashing," European Securities and Markets Authority press release. As of November 15, 2022. In response, ICMA – the industry group that administers the Green Bond Principles – proposed the following possible definition: "For financial regulatory purposes, greenwashing is a misrepresentation of the sustainability characteristics of a financial product and/or of the sustainable commitments and/or achievements of an issuer that is either intentional or due to gross negligence." See "Response of ICMA to the ESAs' Call for Evidence on Greenwashing," ICMA. As of January 12, 2023.

23 "Sustainable Finance: Provisional Agreement Reached on European Green Bonds," Council of the European Union press release. As of February 28, 2023.

24 The taxonomy, based on a regulation that entered into force in 2020, was designed to provide a clear definition of sustainability and common terms to increase transparency in the market. See "EU Taxonomy for Sustainable Activities," European Commission website. As of May 21, 2023.

25 Because the taxonomy is not yet complete, the draft legislation allows 15% of the proceeds of a green bond to be invested in economic activities that meet the taxonomy requirements, but for which no screening criteria have yet been established to determine if they contribute to a green objective. See "Legislators Strike Deal on a New Standard to Fight Greenwashing in the Bond Markets," European Parliament press release. As of February 28, 2023.

26 "China Launches Green Bond Principles to Standardise National Market," Responsible Investor. As of August 3, 2022.

Green Bond Principles which ICMA oversees, though they have some additional requirements and "very minor differences due to the local context."[27] Issuers adopt the new guidelines on a voluntary basis.[28]

The China Green Bond Principles are "an effort to call for harmonization of the different green bond regulations in China and the adoption of a 100% use-of-proceeds approach," according to ICMA. They build on the country's harmonized taxonomy, the Green Bond Endorsed Projects Catalogue, which was updated in 2021.[29]

In addition, the EU and China have developed a **Common Ground Taxonomy** that includes 72 climate mitigation activities recognized by the EU taxonomy for sustainable activities and China's Green Bond Endorsed Projects Catalogue.[30] This work has been carried out within the International Platform on Sustainable Finance (IPSF), which was launched by the EU in 2019 to bring together regulators from around the world with the aim of mobilizing private capital for environmentally sustainable investment.[31] Its members include the People's Bank of China, India's Ministry of Finance and HM Treasury in the United Kingdom. The IPSF believes the Common Ground Taxonomy could be used to improve the comparability and compatibility of taxonomies around the world.

27 "Analysis of China's Green Bond Principles," ICMA. As of September 2022. The China Green Bond Standard Committee is a joint effort of the People's Bank of China, the National Association of Financial Market Institutional Investors and the China Securities Regulatory Commission, with private sector institutions also participating.
28 "China's New Principles for Green Bond Issuance," Sustainable Fitch. As of August 16, 2022.
29 "PBC, NDRC and CSRC Issue the Green Bond Endorsed Projects Catalogue (2021 Edition)," People's Bank of China press release. As of April 27, 2021.
30 "Common Ground Taxonomy – Climate Change Mitigation," IPSF Taxonomy Working Group. As of June 3, 2022.
31 "International Platform on Sustainable Finance," European Commission website. As of May 21, 2023.

FROM NICHE TO MAINSTREAM

MARKET EXPANSION

The green bond market got off to a relatively slow start following its debut in 2007. Issuance was sparse at first, and green bonds were very much a niche product in the fixed income universe. This began to change with ICMA's publication of the Green Bond Principles in 2014. One year later, the adoption of two international climate agreements – the UN Sustainable Development Goals (SDGs) and the Paris Agreement – further spurred expansion as governments and companies rallied to address climate change.

The SDGs are a 15-year action plan for protecting the environment, ending poverty and reducing inequality.[32] The Paris Agreement, signed by world leaders at the UN Climate Change Conference (COP21) in 2015, is an international treaty that aims to cut GHG emissions and limit global warming this century to well below 2°C compared with pre-industrial levels.[33] These two agreements have contributed to the growth of sustainable investing, including green bonds, by driving home the urgent need for investment and setting critical targets.

The SDGs and the Paris Agreement have provided issuers and investors in the green bond market with a common purpose and a framework for identifying investment priorities and assessing progress towards global climate goals. Increasingly, issuers are aligning their securities with these global initiatives, and asset managers offering exposure to the green bond market are using the goals spelled out in these agreements to screen bonds for potential investment and to demonstrate the impact of their portfolios.

SUSTAINABLE DEVELOPMENT GOALS

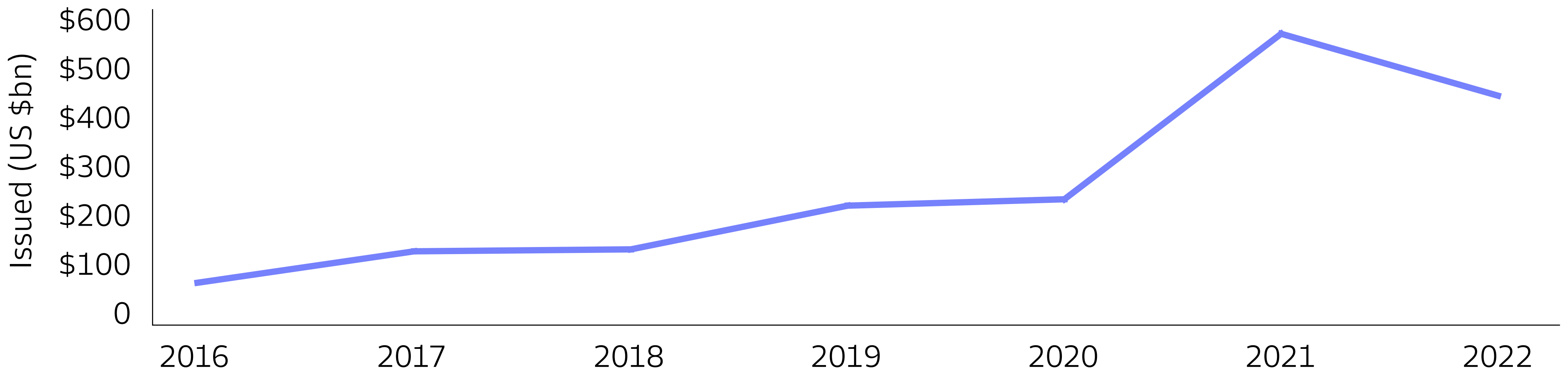
The expansion of the green bond market can be seen in the increase in issuance to $610 billion in 2021 from about $87 billion in 2016.[34] Issuance slipped to $491 billion in 2022 in a tough year for fixed income generally, but that was still nearly twice the level seen in 2020.[35] Because of this rapid growth and the widening range of investment funds offering exposure to green bonds, we believe investors can incorporate them into their fixed income allocation without sacrificing liquidity. The number of mutual funds and exchange-traded funds (ETFs) with a climate-related mandate, including dedicated green bond funds, soared to 1,206 globally at the end of 2022 from about 950 a year earlier, according to Morningstar.[36]

32 "Unanimously Adopting Historic Sustainable Development Goals, General Assembly Shapes Global Outlook for Prosperity, Peace," UN press release. As of September 25, 2015.
33 "Historic Paris Agreement on Climate Change: 195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius," UN press release. As of December 12, 2015.
34 Goldman Sachs Asset Management, Bloomberg. As of April 30, 2023.
35 Goldman Sachs Asset Management, Bloomberg. As of April 30, 2023.
36 "Investing in Times of Climate Change 2023," Morningstar. As of May 2, 2023.

We believe the momentum in the green bond market reflects a growing commitment to building a sustainable economy, driven by a combination of issuers' increasingly determined climate-change responses and investors seeking to support the transition to a low-carbon economy while generating financial returns.

Policymakers are playing a key role in the expansion of the green bond market by creating the right incentives for sustainable investment. They also set standards for measuring the environmental impact of projects that can help support green bond issuance and investment. A government that encourages the production of electric vehicles, for example, provides car companies with an opportunity – and an incentive – to finance research and development with green bonds, while motivating investors to own those bonds to align their financial and environmental investment goals.

Annual Global Green Bond Issuance



Source: Goldman Sachs Asset Management, Bloomberg. Data as of December 31, 2022.
For illustrative purposes only.

GREEN BOND MARKET HIGHLIGHTS

Select the year to read more

2007 — 2008 — 2010 — 2013 — 2014 — 2015 — 2016 — 2017 — 2019 — 2021 — 2022

Case studies and examples are for illustrative purposes only.

CASE STUDY[37]

STATE OF THE NETHERLANDS

In May 2019, the Dutch State Treasury Agency (DSTA) issued the world's first AAA rated sovereign green bond, raising €6 billion.[38] Investor appetite was strong, with an order book of more than €21 billion.[39] The bond's proceeds were used entirely to finance work undertaken in 2018 and 2019 across a variety of environmentally beneficial projects.[40]

Half of the proceeds went toward the development of railway infrastructure for passenger rail and the maintenance and management of railway infrastructure generally. Nearly 30% was allocated to support the Dutch government's Delta Program, established to protect the low-lying country from flooding, mitigate the impact of extreme weather events and ensure a sufficient supply of fresh water.[41]

About 17% of the bond's proceeds were earmarked to spur sustainable energy production, including offshore wind and solar power. The government uses subsidies to provide long-term economic security for the operators of renewable energy power plants with the aim of boosting generation. The remainder of the proceeds was used to support an improvement in energy savings in the social rental housing sector through an existing government incentive scheme.

In its reporting on the bond, the DSTA explains how the eligible projects support the SDGs:

Allocation	SDGs Supported
Railway Infrastructure	9 Industry, Innovation and Infrastructure; 11 Sustainable Cities and Communities
Delta Program	6 Clean Water and Sanitation; 13 Climate Action
Sustainable Energy Production	7 Affordable and Clean Energy
Energy Savings in the Rental Housing Sector	7 Affordable and Clean Energy; 11 Sustainable Cities and Communities

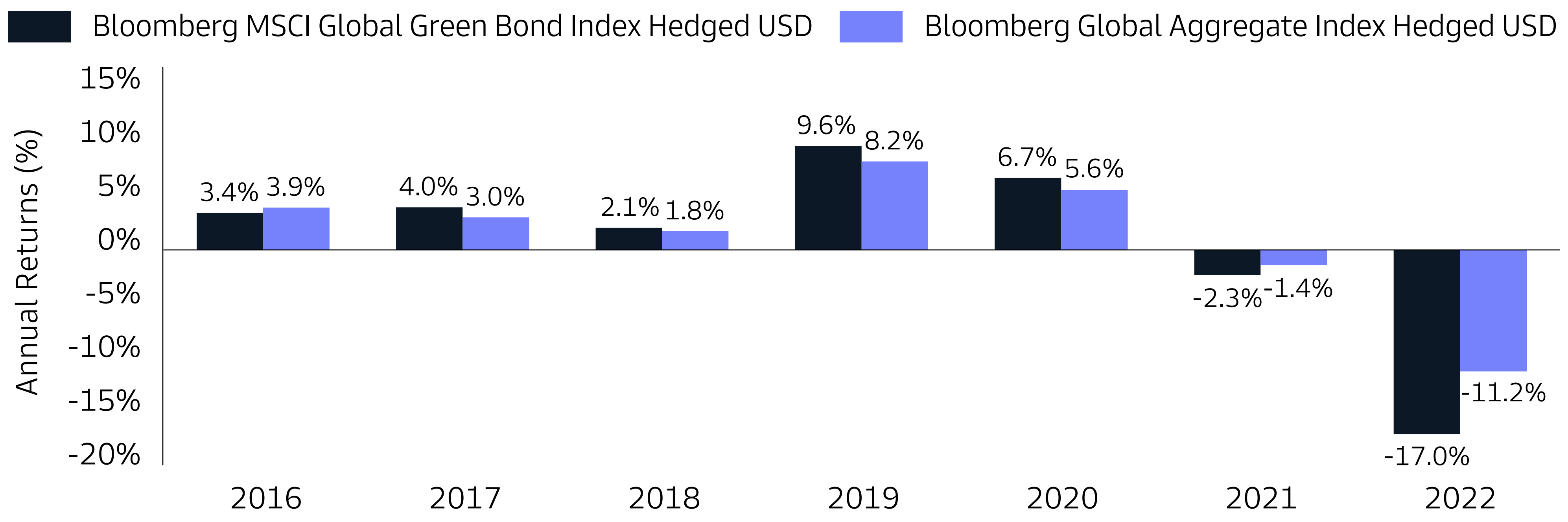
37 For illustrative purposes only.
38 "€5.98 Billion Issued in New 20-Year Green DSL 2040," DSTA press release. As of May 21, 2019.
39 "World's First AAA Sovereign Green Bond Sale Gets Bumper Orders," Bloomberg News. As of May 21, 2019.
40 "State of the Netherlands Green Bond Report," Dutch State Treasury Agency. As of May 28, 2020.
41 "Delta Program: Flood Safety, Freshwater and Spatial adaptation," Dutch government website. As of May 4, 2023.

MARKET PERFORMANCE

The ultimate goal of any fixed income investment is to maximize risk-adjusted returns, and green bonds are no different. Analysis by our Green, Social and Impact Bonds team shows that investors can expect risk-adjusted returns from green bonds that are similar to those delivered by their conventional counterparts.

In the six-year period from 2016 through 2021, the **global green bond market** delivered slightly lower annualized returns than the broader fixed income market. This conclusion is based on a comparison of the hedged Bloomberg MSCI Global Green Bond Index with the hedged Bloomberg Global Aggregate Index, both calculated in US dollars.[42] Differences in performance between these two indices in a given year are largely the result of their relative average duration. Prior to 2016, the green bond market was not sufficiently developed to allow for a meaningful comparison.

Global Green Bond Performance Versus Aggregate Index



Source: Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.
Past performance does not predict future returns and does not guarantee future results, which may vary.

Euro-denominated green bonds, which account for more than half of the total green bond market,[43] delivered a stronger relative return from 2016 through 2021. They outperformed their non-green equivalents by 52 basis points on an annualized basis, based on a comparison of the Bloomberg MSCI Euro Green Bond Total Return Index with the benchmark Bloomberg MSCI Euro Aggregate Total Return Index.

In 2022, green bonds trailed their conventional peers in performance. At the global level, the green bond index fell by 17% that year, while the aggregate index declined by 11.2%, according to Bloomberg data. Euro-denominated green bonds also fell behind their conventional peers in 2022, when the green bond index dropped by 21.4% compared with 17.2% for the broader market.

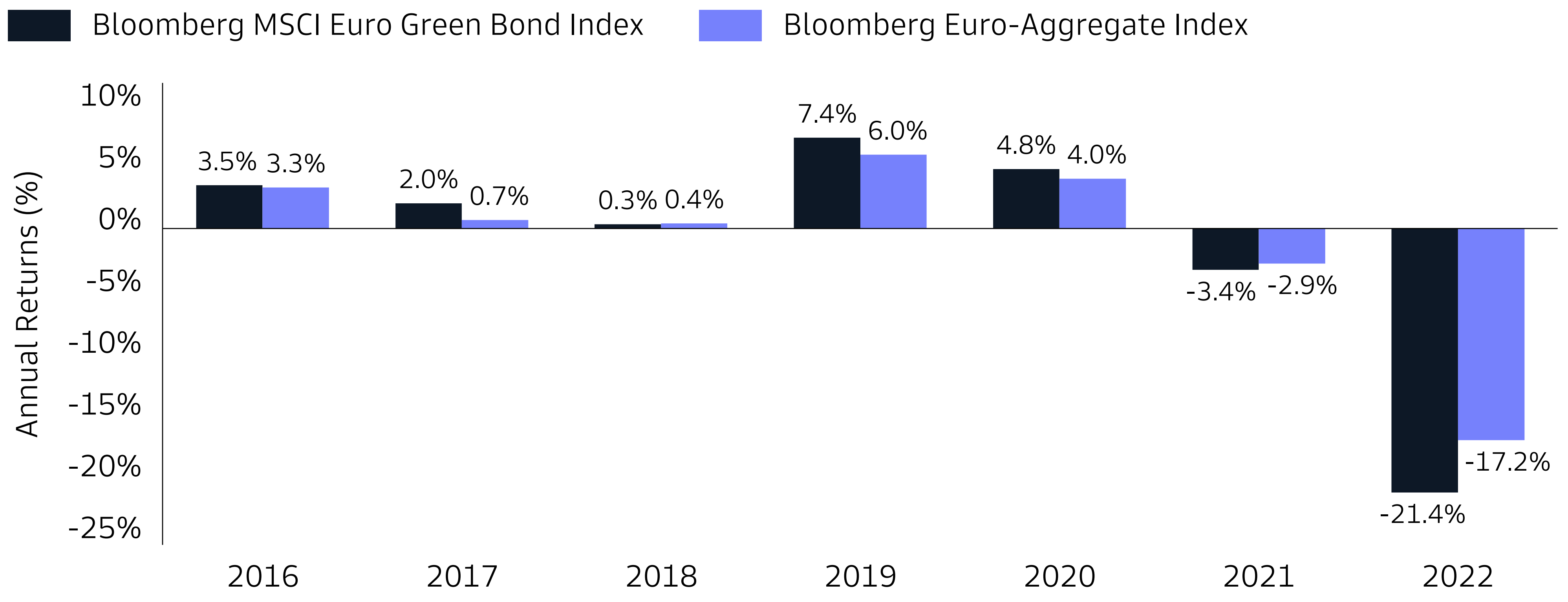
This underperformance in 2022 was primarily the result of index-level nuances that investors should keep in mind. First, the global green bond index and the euro-denominated green bond index used in our analysis have a longer average duration than their non-green equivalents. In the euro market, this is largely the result of the EU and its member states issuing at the long end of the curve when interest rates were lower.[44] Their longer average duration made the green bond indices more

42 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2021.
43 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022, euro-denominated green bonds made up 52% of the market.
44 Goldman Sachs Asset Management, Bloomberg. As of March 24, 2023.

sensitive to the aggressive rate increases adopted in 2022 by many central banks in their bid to curb inflation.

The underperformance of the global and euro-denominated green bond indices also resulted from their greater exposure to real estate investment trusts (REITs), which underperformed in 2022.[45] For example, REITs accounted for 4.4% of the global green bond benchmark in 2022, compared with 0.5% for the global aggregate index. In addition, the green bond indices do not include oil and gas companies, which outperformed as energy prices soared.

Performance of Euro-Denominated Green Bonds Versus Aggregate Index

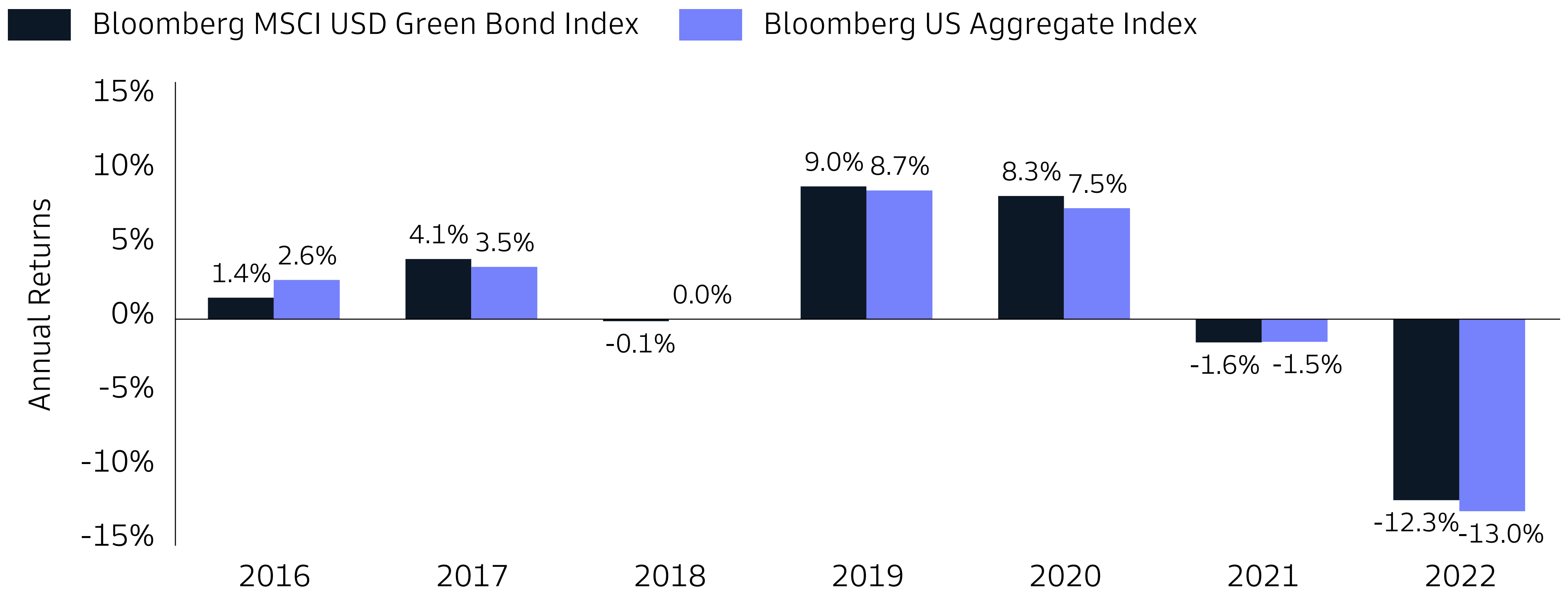


Source: Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.
Past performance does not predict future returns and does not guarantee future results, which may vary.

Green bonds denominated in US dollars were on par with their conventional peers in the 2016-2021 period, based on a comparison of the Bloomberg MSCI USD Green Bond Index with the broader Bloomberg US Aggregate Index.[46] In 2022, in contrast to the overall and euro-denominated markets, dollar-denominated green bonds outperformed their conventional peers. The green bond index declined by 12.3% that year compared with a 13% drop in the aggregate index.

One reason for this outperformance is that the US dollar-denominated green bond index had a shorter average duration than the non-green index in 2022, so it performed better in an environment of rising interest rates. In addition, the green bond index had a higher percentage of corporate bonds than the aggregate index. Corporate bonds are often viewed as riskier investments and have lower credit ratings than treasuries and government-related bonds. As a result, they have wider credit spreads. When spreads tighten, as they did in the fourth quarter of 2022, corporate green bonds see a greater increase in price.

Performance of US Dollar-Denominated Green Bonds Versus Aggregate Index



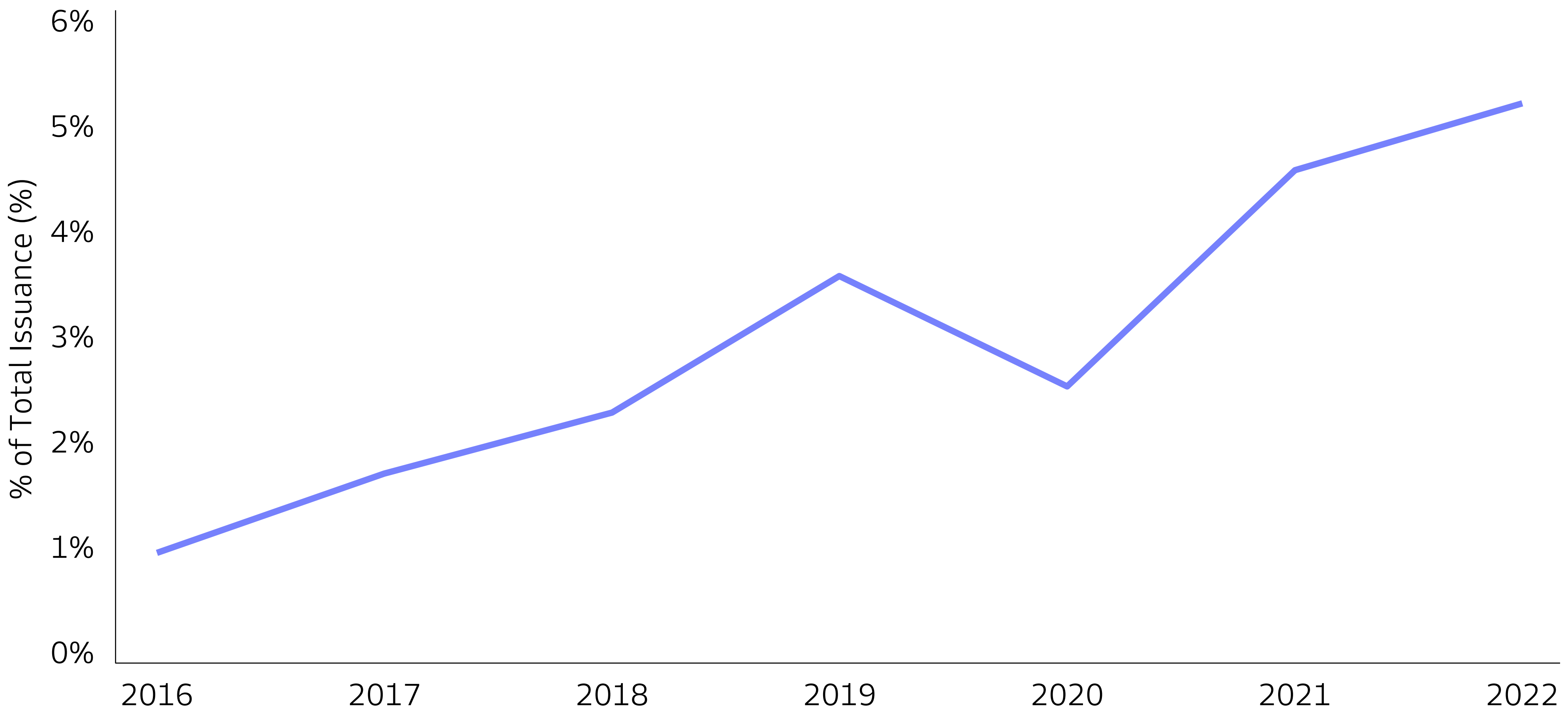
Source: Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.
Past performance does not predict future returns and does not guarantee future results, which may vary.

45 Goldman Sachs Asset Management, Bloomberg. As of March 24, 2023.
46 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2021.

While green bond performance faced headwinds in 2022, there was a silver lining in a very tough year for fixed income generally. In the global investment-grade (IG) market, **issuance of green bonds as a share of total issuance** increased to 5.3% from 4.7% in 2021,[47] indicating the resilience of the green bond market and the potential for further expansion when market conditions stabilize.

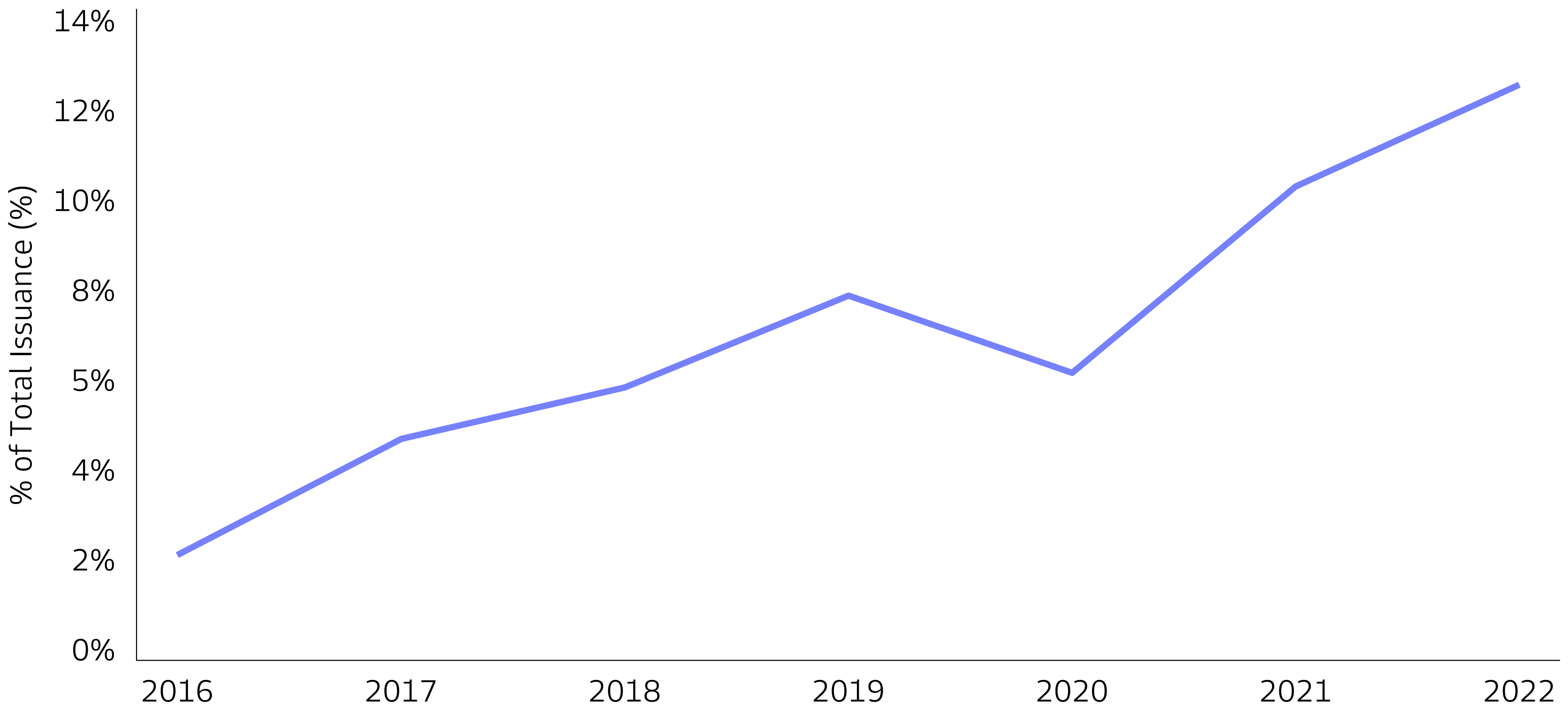
A similar trend was seen in the euro-denominated investment-grade market, where green bond issuance rose to 12.8% of total issuance in 2022 from 10.6% a year earlier.

IG Green Bond Issuance as Share of Total IG Bond Issuance



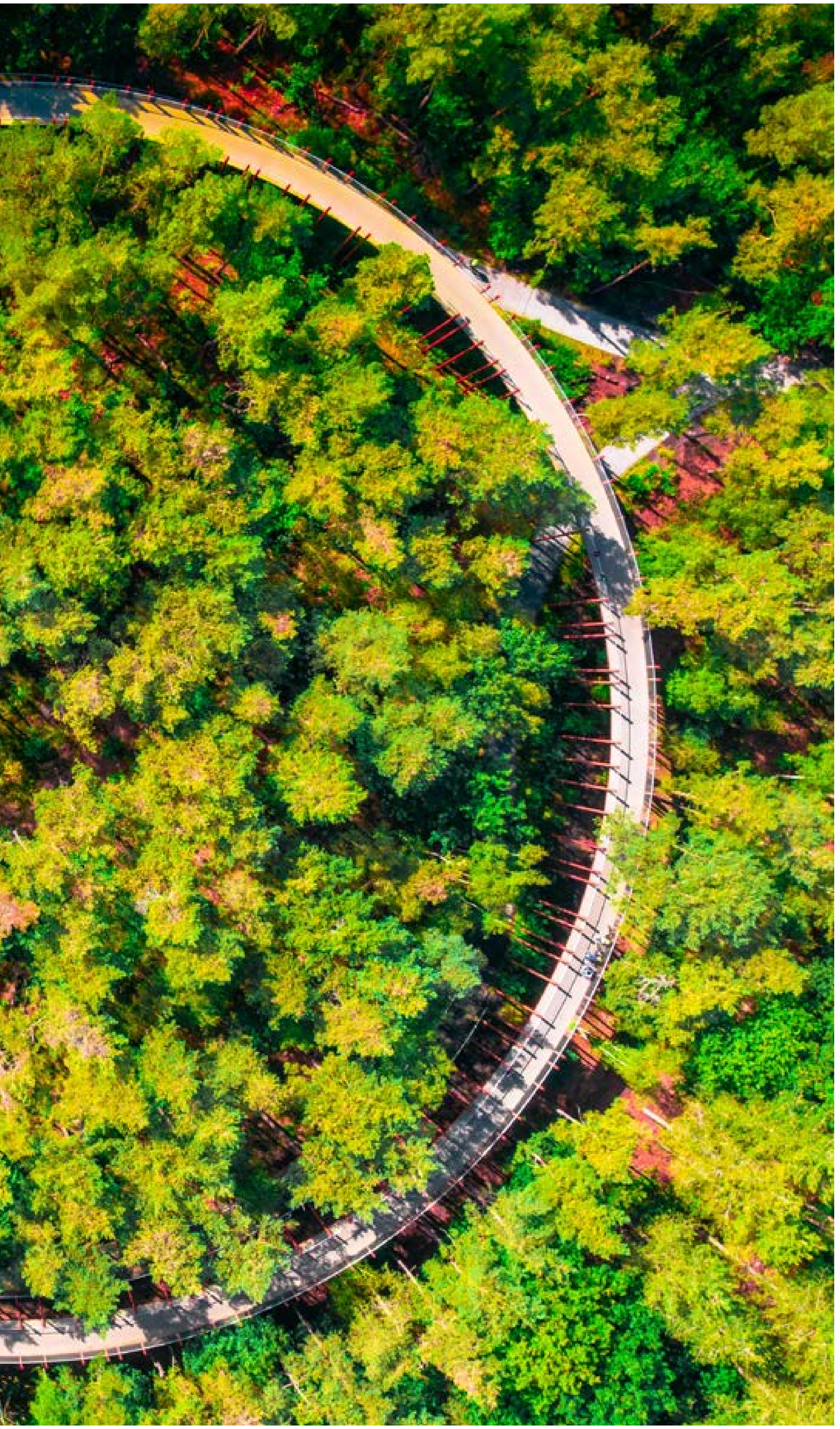
Source: Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022. For illustrative purposes only.

IG Green Bond Issuance in Euros as Share of Total IG Bond Issuance in Euros



Source: Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022. For illustrative purposes only.

47 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.



MARKET DEVELOPMENTS

As the diversity of the green bond market has increased, the green bond investor base has also broadened. No longer limited to dedicated ESG and impact investors, green bond holders now increasingly include traditional fixed income investors. Improving transparency and labeling are also contributing to the segment's popularity.

Stocks exchanges around the world have established dedicated ESG bond sections, which include green bonds. Of the more than 120 exchanges tracked by the Sustainable Stock Exchanges Initiative, 46 have ESG bond sections, including Brazil's B3 exchange, the Johannesburg Stock Exchange, the London Stock Exchange, Nasdaq and the Shanghai Stock Exchange.[48] These dedicated ESG sections in major markets play a vital role in improving market access, helping generate liquidity and raising the profile of green bonds.

Another important step in the development of the green bond market has been the creation of dedicated green bond benchmarks. These yardsticks enable investors to evaluate performance and assess the risk of their investments and help fund managers to report on the comparative performance of their green bond investments. Solactive introduced the first green bond index in 2014, and a number of other indices were established later in that same year. Most apply eligibility criteria that reflect the Green Bond Principles.

48 "Green Finance," Sustainable Stock Exchanges Initiative website. As of May 18, 2023. The SSE Initiative is a UN Partnership Program organized by UNCTAD, the UN Global Compact, the UN Environment Programme Finance Initiative and the UN-supported Principles for Responsible Investment.

MARKET COMPOSITION

Europe has long been the main driving force in the green bond market, fueled by a diverse mix of issuers across the region. In 2022, Europe claimed the top three spots in global issuance, with the EU in first place and the EIB in second followed by Germany in third, according to the Climate Bonds Initiative.[49] The region's leading role in the market is reflected in the volume of euro-denominated green bonds, which accounted for 52% of the market at the end of 2022.[50]

US dollar-denominated bonds issued by corporates and local authorities in the US as well as other issuers around the world were a distant second at 19% of the market. The remainder of the market was made up of bonds issued in other currencies, led by the Chinese renminbi, pound sterling, Swedish krona and Canadian dollar.

We expect the European market to continue to expand in the years ahead, driven by the ambitious issuance plans announced by the EU as part of its NextGenerationEU program. The EU's plan to issue as much as €250 billion in green bonds to finance the program would make it the world's largest green bond issuer.[51]

We also expect to see expansion of issuance in US dollars as green bonds continue to become a mainstream asset class in the US, the world's largest fixed income market. An indication of this growth potential is that the world's two most frequent issuers of green bonds in 2022 were both in the US: the Government National Mortgage Association, a government-sponsored enterprise (GSE) commonly called Ginnie Mae, and the Federal National Mortgage Association, better known as Fannie Mae.[52]

One constraint on expansion of the US green bond market is that issuance continues to be driven largely by corporates, states and local authorities, and it remains unclear if the US Treasury will start issuing green bonds in the future.

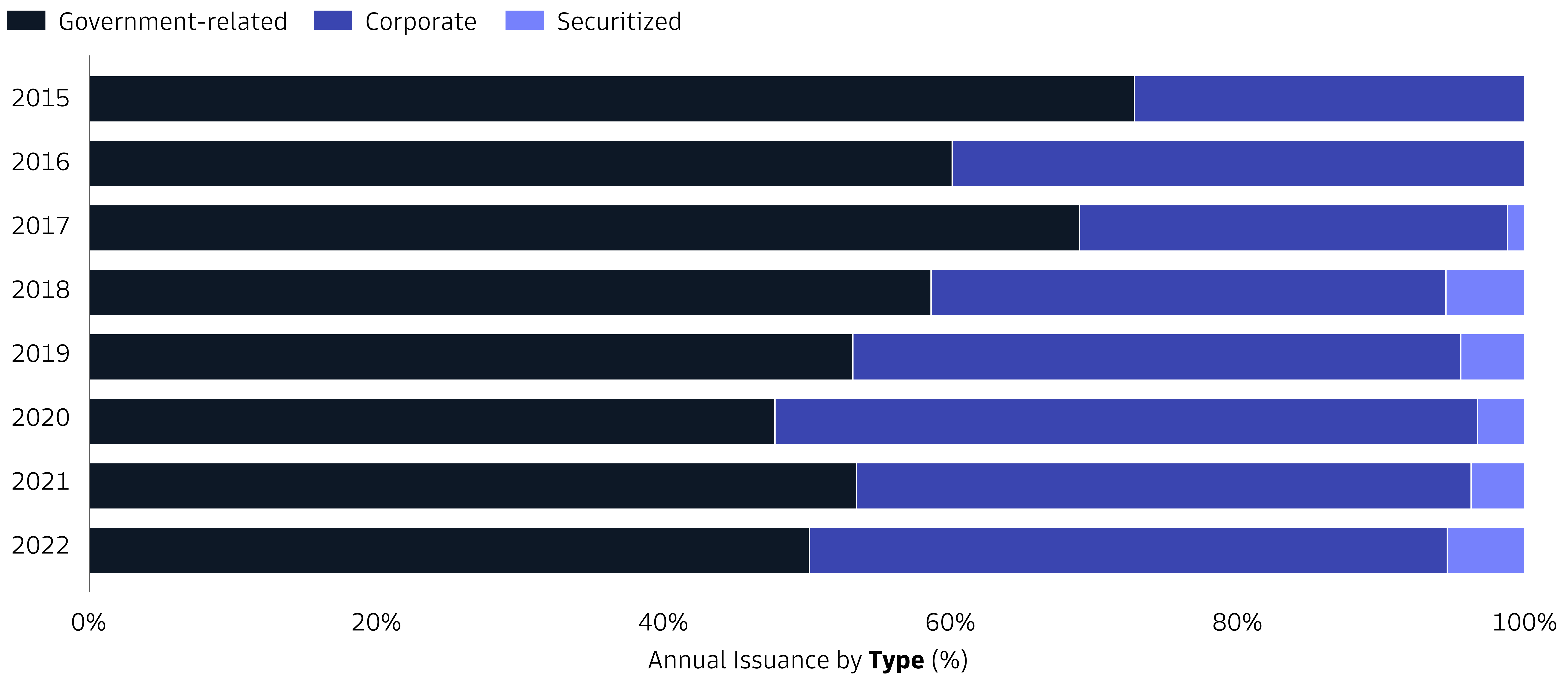
China updated its green bond standards in mid-2022 to align them more closely with global market guidelines. (A more detailed discussion begins on page 13.) This overhaul could increase transparency and potentially spur market growth by making Chinese green bonds more attractive to international investors. Elsewhere in emerging markets, where issuance has been slow, green bonds could allow companies and governments to broaden their investor base by appealing to sustainable investors.

49 "Sustainable Debt: Global State of the Market 2022," Climate Bonds Initiative. As of April 2023.
50 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.
51 "NextGenerationEU," European Commission website. As of May 15, 2023.
52 "Sustainable Debt: Global State of the Market 2022," Climate Bonds Initiative. As of April 2023.

Green Bond Market Composition

Click here to show issuance by:

TYPE | SECTOR | REGION | CURRENCY | RATING



Source: Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023. For illustrative purposes only.

CASE STUDY[53]

AMGEN

An increasing number of US companies have issued green bonds in recent years. For example, Apple entered the market in 2016, raising $1.5 billion – then the largest green bond issued by a US corporation.[54] More recently, the California-based biotechnology medicines firm Amgen tapped the market for the first time in 2022 with a $750 million green bond.[55]

The issue was six times oversubscribed, demonstrating the continued strength of investor appetite for green bonds. This allowed Amgen to trim its borrowing costs by about eight basis points, the company said at the time.[56] This downward pressure on yields is known as the green premium, or "greenium." (See the discussion of the greenium on page 35.)

The use of proceeds from the seven-year green bond was aligned with Amgen's Green Financing Framework, which sets out eligible projects in five categories: green buildings, eco-efficient operations and processes, eco-efficient products, renewable energy and clean transportation.[57] The green buildings category covers expenditures related to buildings or facilities expected to receive a gold or platinum LEED (Leadership in Energy and Environmental Design) rating.[58] The eco-efficient operations category includes projects to boost energy efficiency, promote sustainable water and prevent pollution.

Projects under Amgen's eco-efficient products category include developing more sustainable packaging and using chemical processes that reduce waste and conserve energy. The renewable energy category includes developing wind and solar power, while clean-transportation projects include adding electric vehicles (EVs) to Amgen's fleet and installing EV charging stations at the company's locations.

In its Green Financing Framework, Amgen outlines how its eligible projects align with the SDGs:

Category	SDGs Supported
Green Buildings	11 SUSTAINABLE CITIES AND COMMUNITIES
Eco-efficient Operations and Processes	6 CLEAN WATER AND SANITATION; 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Eco-efficient Products	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Renewable Energy	7 AFFORDABLE AND CLEAN ENERGY
Clean Transportation	11 SUSTAINABLE CITIES AND COMMUNITIES

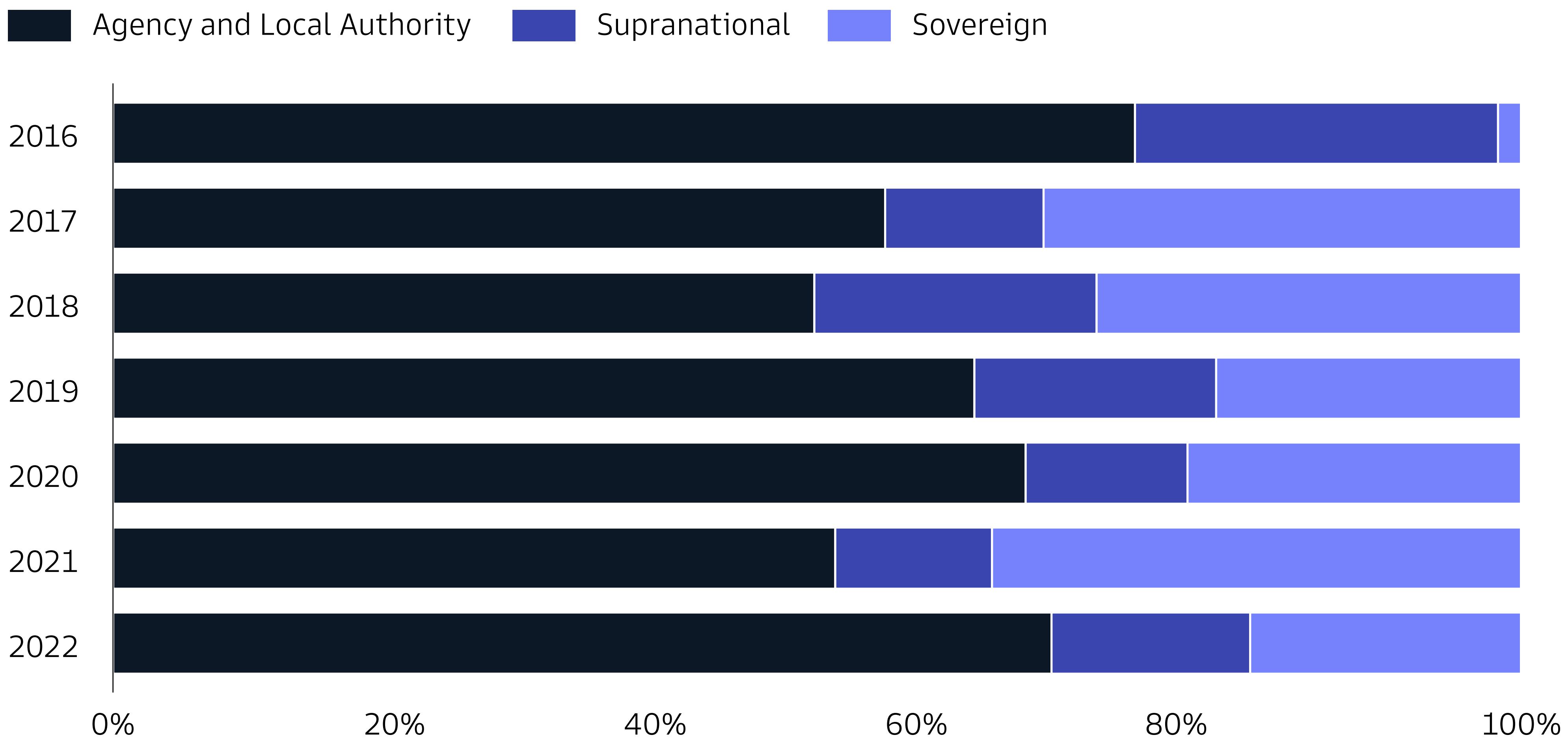
53 For illustrative purposes only. Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities.
54 "Apple Issues $1.5 Billion in Green Bonds in First Sale," Reuters. As of February 17, 2016.
55 "Amgen Issues Inaugural Green Bond to Advance ESG Goals," Amgen press release. As of February 22, 2022.
56 "Amgen Mulls More Green Bonds After 'Robust Interest' in Debut," Bloomberg News. As of March 29, 2022.
57 "Green Financing Framework 2022," Amgen. As of February 16, 2022.
58 The LEED certification program was developed by the non-profit US Green Building Council. See "LEED Rating System," USGBC website. As of May 20, 2023.

GOVERNMENT-RELATED ISSUERS

The Bloomberg Global Sector Classification Scheme divides the green bond market into four broad issuer categories: treasury, government-related, corporate and securitized.[59] For the purposes of this guide, we include treasury in the government-related category.

The early years of the green bond market were dominated by government-related (including treasury) issuance, though this category has gradually ceded market share to corporate issuance and securitized bonds such as asset-backed securities (ABS), mortgage-backed securities (MBS) and covered bonds, which are collateralized against a pool of assets. In 2022, government-related green bonds amounted to 53% of the market, compared with 43% for corporate bonds and 4% for securitizations.[60]

Share of Annual Government-Related Green Bond Issuance by Sector



Source: Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023. For illustrative purposes only.

The government-related category covers all issuers with government affiliations, dividing them into four subsectors: agency, sovereign, supranational and local authority. The agency section is further divided into three groups. Government-guaranteed issues carry direct guarantees of timely payment of interest and principal. Government-owned no-guarantee issuers are 50% or more owned by central governments, but issue debt that carries no guarantee of timely repayment. Government-sponsored issuers are less than 50% owned by central governments and have no guarantee but carry out government policies and benefit from "closeness" to the central government.

Ranking sovereign issuers

#	Country	Amount Issued (in USD billion)	#	Country	Amount Issued (in USD billion)
1.	France	62	6.	Netherlands	18
2.	Germany	47	7.	Hong Kong	16
3.	United Kingdom	43	8.	Ireland	12
4.	Italy	24	9.	Spain	10
5.	Belgium	18	10.	Chile	7

Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023. For illustrative purposes only.

59 "Bloomberg Barclays Methodology," Bloomberg. As of April 21, 2020.
60 Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023.

CASE STUDY[61]

ADIF ALTA VELOCIDAD


Image: Adif Archive

Adif Alta Velocidad, a public service company within the Spanish Ministry of Transport, Mobility and the Urban Agenda, issued its first green bond in 2017, making it the first Spanish public entity to tap the market. The company has returned to the market regularly since that time to help finance its core tasks: building and managing the country's high-speed rail network. In April 2023, Adif AV issued its seventh green bond, raising €500 million.[62]

Adif AV's issuance is governed by its Green Financing Framework, which is aligned with the Green Bond Principles.[63] The company invests the proceeds in eligible projects that fall into two categories: new rail lines and line extensions; and maintaining, upgrading and improving the energy efficiency of the high-speed rail system.

Among the eligible projects for green-bond financing, one of the biggest outlays has been on the high-speed line linking Madrid and the region of Galicia in northwest Spain.[64] Significant investment has also been made in the high-speed rail link between Madrid and the Levante region on Spain's Mediterranean coast. Funds have also been allocated to the development of reversible substations that recover energy generated by braking trains and return it to the network.

Adid AV's green bonds support three of the UN's SDGs, according to the company[65]:

SDGs Supported

61 For illustrative purposes only. Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities.
62 "Adif AV cierra una emisión de 500 M€ en 'bonos verdes' para seguir financiando proyectos sostenibles," Adif AV press release. As of April 18, 2023.
63 "Green Financing Framework," Adif AV. As of August 2022.
64 "Fixed Income Investor Presentation," Adif AV website. As of April 2023.
65 Ibid.

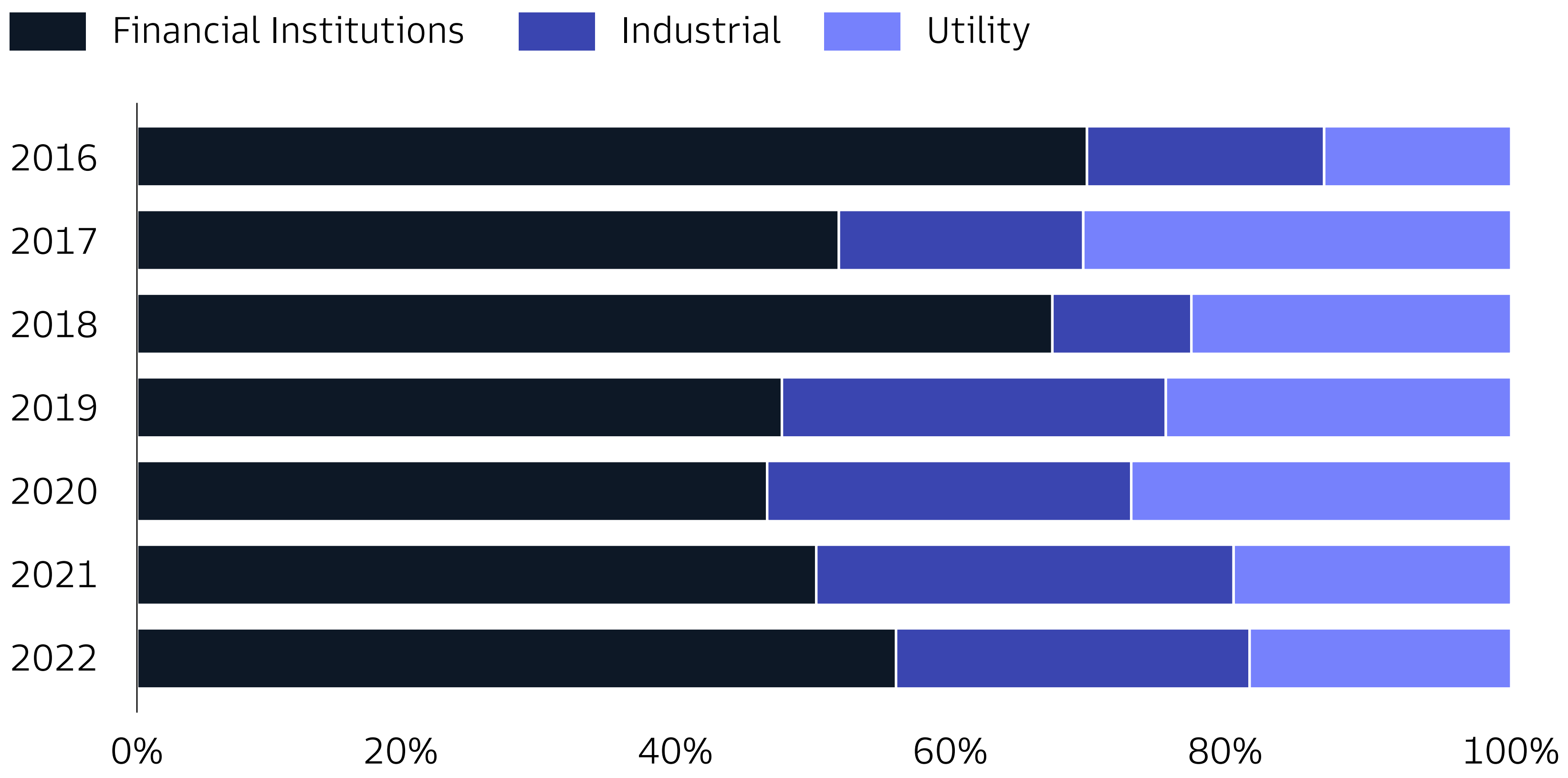
CORPORATE ISSUERS

The corporate green bond market kicked off in 2013, led by issuers such as Credit Agricole Corporate and Investment Bank,[66] Bank of America[67] and Vasakronan, one of Sweden's largest property companies.[68] It began expanding the following year, facilitated by ICMA's publication of the Green Bond Principles.

Financial firms have dominated corporate green bond issuance for years, and accounted for 52% of outstanding bonds in 2022.[69] The largest financial corporate green bond of 2022 – $4.7 billion – was issued by the Bank of China to raise money for projects including renewable energy, low-carbon transport and waste recycling.[70] The industrial and utilities sectors both had a market share of about 24%.

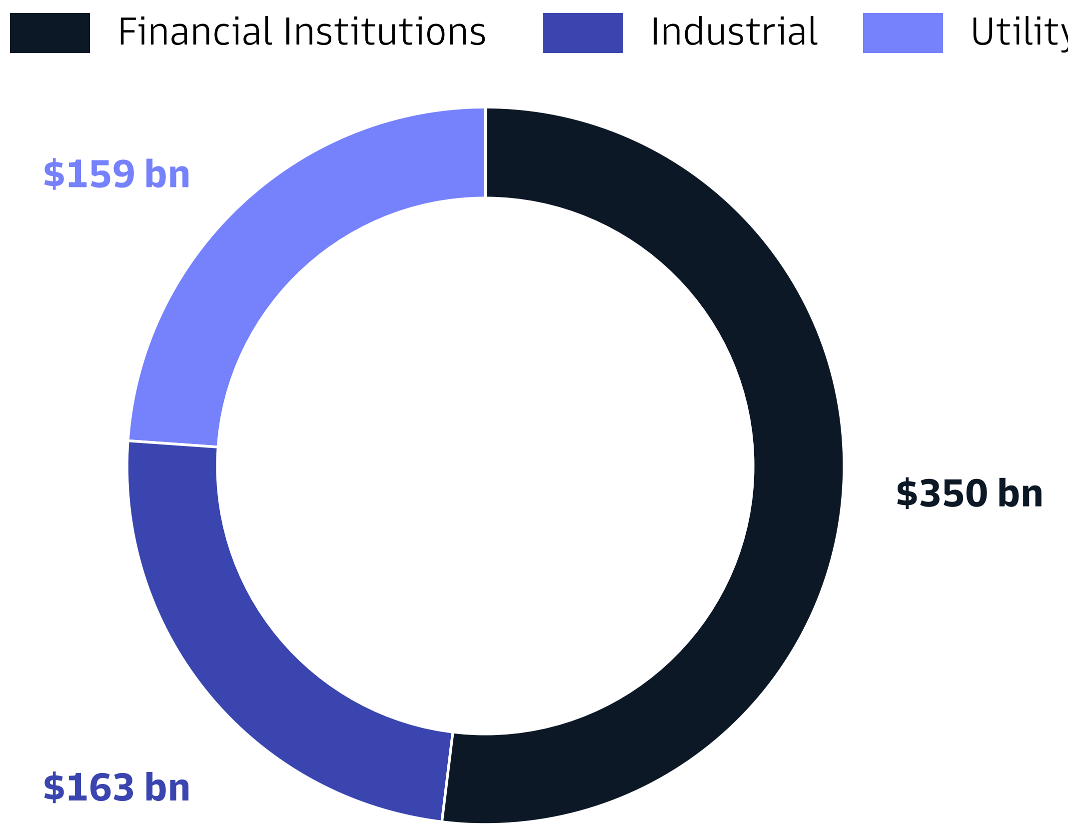
Investors should keep in mind that the composition of the corporate green bond market differs significantly from the non-green equivalent. In the broader market, industrial companies issue the majority of bonds – approximately 52% at the end of 2022 – while financial institutions accounted for nearly 40% and utilities for just over 8%.[71] These and other differences could affect investors' decisions about how much they want to allocate to green bonds and which conventional bonds they can replace in their portfolios. (A more detailed discussion of how green bonds fit into a fixed income portfolio begins on page 32.)

Annual Corporate Green Bond Issuance by Sector



Source: Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023.
For illustrative purposes only.

Outstanding Corporate Green Bonds in 2022



Source: Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023.
For illustrative purposes only.

66 "Sustainable Banking," Credit Agricole CIB website. As of June 7, 2023.
67 "ESG-Themed Issuances," Bank of America website. As of June 7, 2023.
68 "Green Financing," Vasakronan website. As of May 16, 2023.
69 Goldman Sachs Asset Management, Bloomberg. As of February 28, 2023. Composition based on the Bloomberg MSCI Global Green Bond Corporate 5% Issuer Cap Index.
70 "Sustainable Debt: Global State of the Market 2022," Climate Bonds Initiative. As of April 2023.
71 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022. Composition based on the Bloomberg Global Aggregate Corporate Total Return Index.

CASE STUDY[72]

NTT GROUP

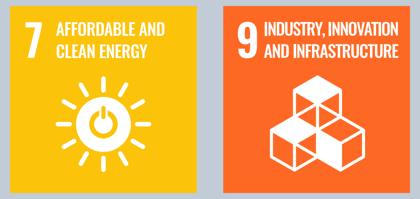
Green bond issuance is growing in the Asia-Pacific region, accounting for 20% of the global market at the end of 2022.[73] While China is the largest issuer in the region, Japan has emerged as a force in the market, with the equivalent of about €50 billion in green bonds outstanding at the end of 2022.[74] Financial corporates were the largest Japanese issuers in 2021, followed by non-financial corporates and government-backed entities.[75]

Japanese telecommunications giant Nippon Telegraph and Telephone (NTT) tapped the green bond market in 2021, raising a total of €1.5 billion. The bonds were issued by the company's financing arm, NTT Finance Corp., under NTT Group's Green Bond Framework. The largest share of the proceeds was allocated to investment related to developing Japan's 5G mobile telecommunications network, followed by investment in fiber-to-the-home (FTTH) programs involving the installation of optical fiber to individual buildings to provide high-speed internet access.[76] Smaller allocations financed investment in green buildings and renewable energy.

The installation of 5G base stations can save power compared with older models, improving energy efficiency, according to NTT Finance.[77] New base stations can also save standby power by automatically shifting to sleep mode at night and when traffic is slow. This will be critical in the years ahead, with the amount of traffic expected to increase exponentially, according to the company. FTTH investment is also expected to contribute to greater energy efficiency.

By helping boost energy efficiency, NTT Finance says its 5G and FTTH programs support two of the UN SDGs:

SDGs Supported



72 For illustrative purposes only. Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities.
73 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2022.
74 Ibid.
75 "Japan Green Finance: State of the Market 2021," Climate Bonds Initiative. As of December 2022.
76 "Fund Allocation Status Reporting (April 2021 – March 2022)," NTT Finance website. As of June 14, 2022.
77 "NTT Group Green Bond Framework," NTT Finance website. As of June 2022.

A GREEN COMPLEMENT TO YOUR FIXED INCOME ALLOCATION

THE ROLE OF GREEN BONDS IN YOUR PORTFOLIO

Green bonds' transparent use-of-proceeds structure and their focus on delivering measurable environmental benefits make them an effective tool for issuers to finance the climate transition. For investors, green bonds exhibit similar risk and return characteristics as traditional bonds, while helping improve a portfolio's alignment with global climate initiatives such as the UN Sustainable Development Goals.

Like conventional bonds, green bonds come in investment and non-investment grade, though most corporate green bonds are investment grade. The credit profile of a green bond is the same as that of a traditional bond from the same issuer, and green bond holders have the same recourse to the issuer. In terms of yield, there is no significant difference between green and non-green bonds.

Replacing a portion of a conventional fixed income portfolio with green bonds can potentially bring benefits beyond helping investors achieve their climate ambitions. Green bonds can finance environmentally beneficial assets such as green buildings that could bear a lower credit risk over time. They can help reduce climate change-related risks in portfolios resulting from policy changes such as carbon taxation that could lead to stranded assets. Green bonds may also come with tax incentives that can improve investors' real returns.[78]

There are differences between green and conventional bonds, of course, and they go beyond the green label. Financial institutions and utilities account for a larger share of the corporate green bond market than they do in the broader corporate fixed income market, while industrial companies make up a smaller share.[79] The green bond market is led by euro-denominated bonds, whereas in the overall market the US dollar occupies the top spot. These and other differences could affect investors' decisions about how much they want to allocate to green bonds and which conventional bonds they can replace in their portfolios.

78 See "Tax incentives for issuers and investors," Climate Bonds Initiative website. As of May 17, 2023.
79 Goldman Sachs Asset Management, Bloomberg. As of December 6, 2022.

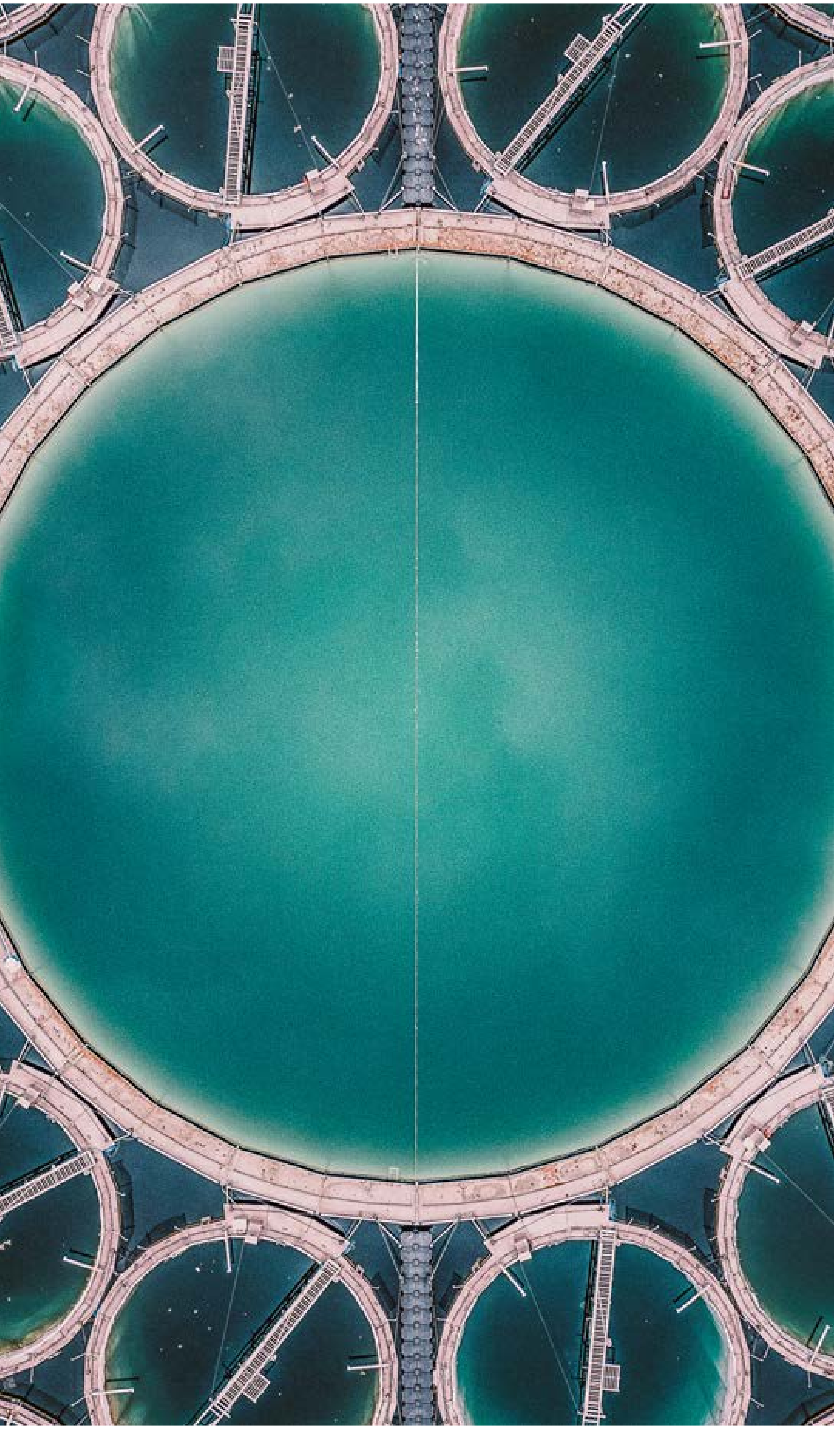
ACTIVE MANAGEMENT

At Goldman Sachs Asset Management, we believe that investing in green bonds requires the same **active investment approach** as traditional bonds. Selecting an asset manager with a strong fundamental research process and robust risk management is crucial, and can help investors avoid controversies, limit downside risk and uncover the opportunities with the most attractive potential returns.

In active management of green bonds, it falls on the asset manager to analyze the use of proceeds at a project level. We believe it is important to use asset managers that employ screening criteria to align with green bond guidelines such as the Green Bond Principles and Climate Bonds Standard. It is also important to find an asset manager that can consider the overall sustainability profile of a green bond issuer beyond a single issuance.

It is an asset manager's fiduciary duty to allocate clients' capital to its best use and to ensure the best use is made of that capital through engagement with bond issuers. We believe that asset managers who have frequent **dialogue with issuers** throughout the life of a bond – from preparing for issuance to reporting on impact – can deliver results that benefit investors. This regular contact gives the manager a better understanding of both the issuer's sustainability profile and the individual issue to help ensure exposure to bonds and companies that do not overstate their impact. Engagement with bond issuers is particularly important when it comes to high-yield and emerging-market issuers, as these companies and governments often have fewer resources to devote to thorough sustainability reports.

For a green bond with a 10-year maturity, for example, an asset manager needs to have the ability to monitor and understand the project's environmental impact over that time horizon. And just like traditional asset managers, asset managers reviewing green bonds should conduct credit analysis to provide a fundamental view of a company's creditworthiness and its ability to meet financial obligations.



MANAGING GREENWASHING RISK

The risk of greenwashing is much discussed in the green bond market. The term describes the practice of making overstated or misleading claims about the environmental ambition of a project, asset or activity.

Our Green, Social and Impact Bonds team applies a broader concept of greenwashing that goes beyond misleading climate claims. For example, if an issuer has no strategy for adopting a more sustainable business model, the credibility of a green bond issuance could be diminished. By contrast, companies with long-term sustainability strategies could be considered more forward-looking, innovative, and resilient to the negative spill-over effects of climate change.

Stringent selection criteria can help in mitigating potential greenwashing risks. Investors should pay particular attention to bond documentation, the green impact of a bond – including alignment with accepted green bond standards – and the sustainability strategy of a bond issuer. Engagement with green bond issuers can also support the assessment of an issuer's creditworthiness. Selecting an asset manager with a strong fundamental research process, detailed reporting, and robust risk management is crucial, and can help investors avoid controversies, limit downside risk and uncover the opportunities with the most attractive potential returns.

DOES IMPACT COME AT A COST?

Another much-debated topic among investors is the "greenium," or green premium, which implies that supporting environmental concerns by investing in green bonds comes at the cost of financial performance. The idea is that a green bond with the same terms as a conventional bond such as rating and maturity can trade at a lower spread and higher price compared with a conventional bond. As a result, holding such bonds to maturity could yield a lower return.

In theory, there is no reason why the fact that a bond is green should affect its value. Green bonds rank on an equal footing with other bonds with the same financial characteristics from the same issuer. Although green bond issuance does involve some additional costs relating to third-party review and certification, these have been declining over time.

One aspect of the market that has supported the greenium has been the combination of high investor demand for green bonds and relatively short supply. This is especially true of issuers in sectors other than financials and utilities that are underrepresented in the green bond universe. As issuance increases, the willingness of investors to pay more for green bonds may wane.

While there is some evidence that indicates the existence of a greenium in some less-developed sectors of the green bond market, across the market as a whole, the greenium has narrowed considerably in recent years.

INVESTMENT TEAM[80]

Green, Social and Impact Bonds

Bram Bos
Global Head of Green, Social and Impact Bonds
Experience since 2001

Douglas Farquhar
Lead Portfolio Manager Green, Social and Impact Bonds
Experience since 1999

Alfred Meinema
Portfolio Manager Green, Social and Impact Bonds, and Co-Head of Investment Grade Credit
Experience since 2000

Jurre Halsema
Portfolio Manager Green, Social and Impact Bonds
Experience since 2010

Roel van Broekhuizen
Portfolio Manager Green, Social and Impact Bonds
Experience since 2020

Isobel Edwards
Green, Social and Impact Bonds Analyst
Experience since 2015

Kaili Mao
Green, Social and Impact Bonds Analyst
Experience since 2016

Panagiota Batziou
Green, Social and Impact Bonds Analyst
Experience since 2020

Yun-Chun Liu
Green, Social and Impact Bonds Analyst
Experience since 2018

Rob Heins
Sr. Portfolio Specialist
Experience since 1996

Other Credit Investment Teams
European HY
US IG/HY Credit
Asian IG/HY Credit

Macroeconomic Research
Macro Economists

Sustainable Investing & Innovation Platform
ESG

80 As of September 11, 2023.

RISK DISCLOSURES

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Investments in fixed income securities are subject to the risks associated with debt securities generally, including credit, liquidity, interest rate, prepayment and extension risk. Bond prices fluctuate inversely to changes in interest rates. Therefore, a general rise in interest rates can result in the decline in the bond's price. The value of securities with variable and floating interest rates are generally less sensitive to interest rate changes than securities with fixed interest rates. Variable and floating rate securities may decline in value if interest rates do not move as expected. Conversely, variable and floating rate securities will not generally rise in value if market interest rates decline. Credit risk is the risk that an issuer will default on payments of interest and principal. Credit risk is higher when investing in high yield bonds, also known as junk bonds. Prepayment risk is the risk that the issuer of a security may pay off principal more quickly than originally anticipated. Extension risk is the risk that the issuer of a security may pay off principal more slowly than originally anticipated. All fixed income investments may be worth less than their original cost upon redemption or maturity.

The portfolio risk management process includes an effort to monitor and manage risk but does not imply low risk.

Capital is at risk.

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Indices are unmanaged. The figures for the index reflect the reinvestment of all income or dividends, as applicable, but do not reflect the deduction of any fees or expenses which would reduce returns. Investors cannot invest directly in indices.

The indices referenced herein have been selected because they are well known, easily recognized by investors, and reflect those indices that the Investment Manager believes, in part based on industry practice, provide a suitable benchmark against which to evaluate the investment or broader market described herein.

Past performance does not guarantee future results, which may vary. The value of investments and the income derived from investments will fluctuate and can go down as well as up. A loss of principal may occur.

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Date of first use: October 5, 2023. 334988-OTU-1879570.

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