Goldman Sachs Asset Management

GREEN BOND MARKET GUIDE

Financing the Climate Transition

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Contents

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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. We believe 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 $3.2 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 – 43% per year from 2016 through 2023[2] – has changed that, in our view. Once a niche product, these bonds that finance environmentally beneficial projects and programs have entered the fixed income mainstream. We believe that market expansion and the widening range of mutual and exchange-traded funds offering exposure to green bonds have made them a viable complement to existing fixed income allocations, subject to investors' risk tolerance and investment objectives, that offers a potentially positive contribution to the global push to manage 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 guidelines 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 overall bond market in terms of performance and composition, providing a detailed view of green bonds' rapid development.

The guide's third section, **A Complement to your Fixed Income Allocation**, lays out the fixed income investment opportunity in green 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 have historically traded at a premium to conventional peers.

Bram Bos
Global Head of Green, Social and Impact Bonds

1 "Updated cost curve shows diverging trends between power and transport," Carbonomics, Goldman Sachs Global Investment Research. As of November 27, 2023.
2 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2023. The growth value provided is the geometric mean covering the years stated.

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, typically 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 $2.5 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 June 30, 2024.
5 "World Bank and SEB Partner With Scandinavian Institutional Investors to Finance 'Green' Projects," World Bank press release. As of November 6, 2008.

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[6] that was earmarked for lending projects related to renewable energy and energy efficiency, two areas that the EIB deemed critical for international climate protection.[7]

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.[8] 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.[9]

Following that inaugural climate awareness bond, the EIB ramped up its issuance significantly. By the end of the second quarter of 2024, total issuance had reached the equivalent of €75.9 billion.[10] 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[11] 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.[12]

6 "European Investment Bank Celebrates Green Bonds' 10th Anniversary," UniCredit Credit View. As of June 28, 2017.
7 "EPOS II - The 'Climate Awareness Bond': EIB Promotes Climate Protection Via Pan-EU Public Offering," EIB press release. As of May 22, 2007.
8 "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.
9 Ibid.
10 Data provided by the EIB. As of June 30, 2024.
11 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.
12 "Evaluation of the EIB's Climate Awareness Bonds," EIB. As of April 2021.

Promoting Sound Issuance

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

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 2022.
14 "Green Bond Principles Governance Established, ICMA Appointed Secretariat," ICMA press release. As of April 14, 2014.

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 4.1," Climate Bonds Initiative. As of February 2024.
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

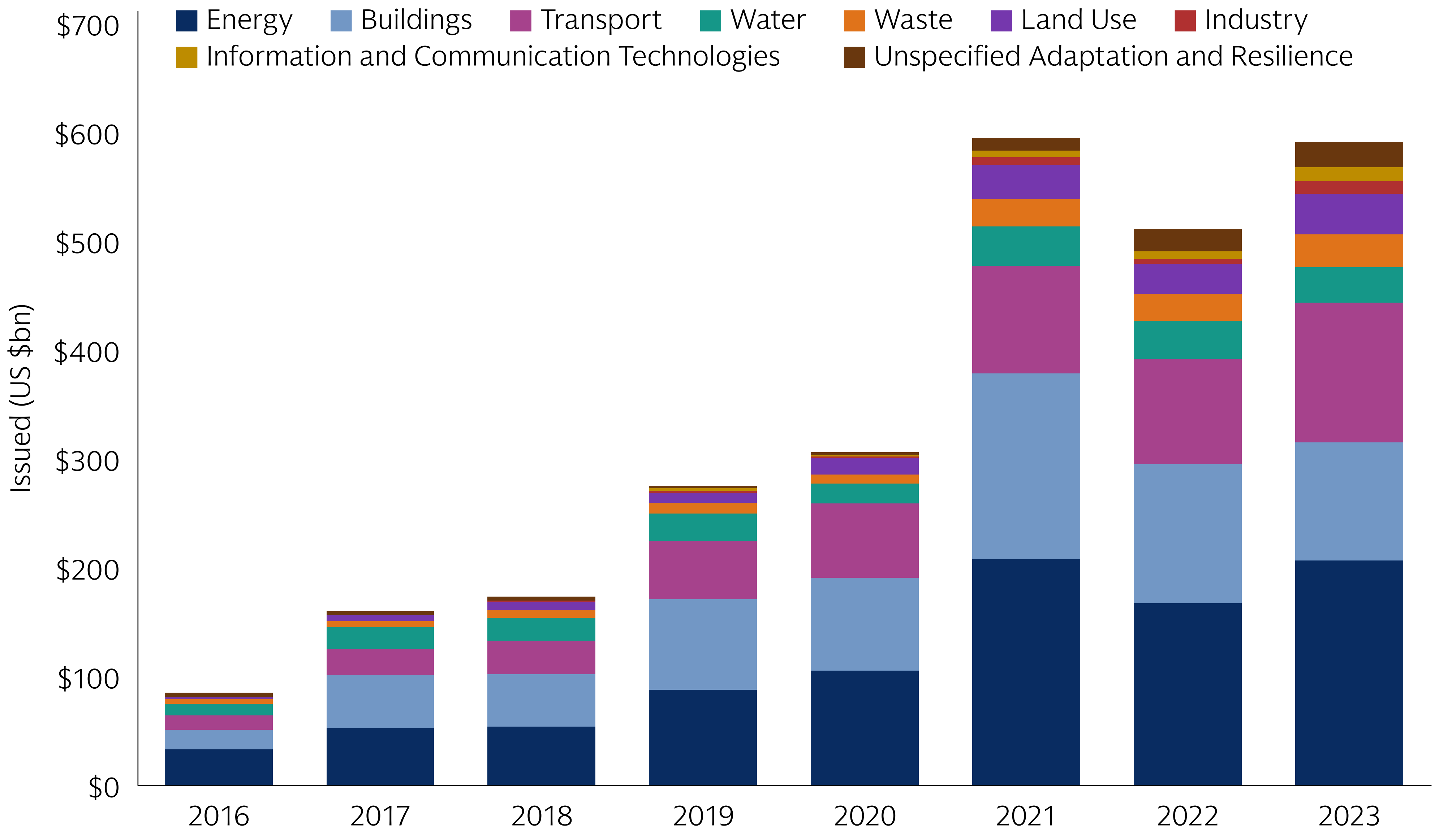
The eligible green project categories, listed in no specific order, include:

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. As of June 2022. For illustrative purposes only.

Energy, buildings and transport top the list of use-of-proceeds categories financed by green bonds, according to the Climate Bonds Initiative. They accounted for 75% of the total green bond volume at the end of 2023, down from 77% in the previous year. Smaller categories are gaining share as issuers, including large sovereigns, finance a wider range of projects, the data show.[17]

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



Source: Climate Bonds Initiative. Data as of December 31, 2023. For illustrative purposes only.

17 "Interactive Data Platform," Climate Bonds Initiative website. Data as of December 31, 2023. 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 2023, second-party opinions remained issuers' preferred option, with an 18% increase in volume from the previous year. The Oslo-based Centre for International Climate and Environmental Research, or CICERO, which conducted the external review of the World Bank's first green bond in 2008, was the largest provider of such reviews in 2023, followed by Amsterdam-based Sustainalytics, a unit of Morningstar.[19]

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,[20] 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 2023," Climate Bonds Initiative. As of May 2024.
20 The SDGs, adopted in 2015, are a 15-year action plan for protecting the environment, ending poverty and reducing inequality. See "The 17 Goals," United Nations website. As of October 16, 2024.

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 promote transparency in sustainable financial market and 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.[21] (See the related discussion of managing greenwashing risks on page 34).

In Europe, the EU has enacted the **European Green Bond Standard** with the goal of setting "a clear gold standard" for green bonds.[22] 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.[23] 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 at least 85% of the 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.[24] 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 emission.

Countries around the world have joined the EU in establishing taxonomies of sustainable activities, starting with China's **Green Bond Endorsed Projects Catalogue**, which was updated in 2021.[25] The catalogue underpins the China Green Bond Principles, introduced in 2022, which were intended to bring the country's fast-growing market into closer alignment with global standards.[26]

21 The European Union's top financial regulators have set out their understanding of greenwashing as "a practice where sustainability-related statements, declarations, actions, or communications do not clearly and fairly reflect the underlying sustainability profile of an entity, a financial product, or financial services. This practice may be misleading to consumers, investors, or other market participants." See "Final Report on Greenwashing," European Securities and Markets Authority. As of June 4, 2024.

22 "The European Green Bond Standard – Supporting the Transition," EU website. As of July 17, 2024.

23 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 July 17, 2024.

24 Because the taxonomy is not yet complete, the 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 "Regulation (EU) 2023/2631 of the European Parliament and Council," Official Journal of the European Union. As of November 22, 2023.

25 "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.

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

In addition, the EU and China have developed a **Common Ground Taxonomy** that includes a range of climate mitigation activities recognized by the EU taxonomy for sustainable activities and China's Green Bond Endorsed Projects Catalogue.[27] 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. The IPSF believes the Common Ground Taxonomy could be used to improve the comparability and compatibility of taxonomies around the world.[28]

More recently, Brazil's Finance Ministry began a public consultation on a sustainable-activities taxonomy in September 2023.[29] Three strategic objectives have been set for the **Brazilian Sustainable Taxonomy**: mobilizing public and private financing and investment into activities with positive climate, environmental and social impacts; promoting technological development to advance sustainability; and providing the basis for reliable information on sustainable finance flows. The ministry plans to require mandatory use of the taxonomy starting in January 2026.[30]

The Monetary Authority of Singapore launched its **Singapore-Asia Taxonomy for Sustainable Finance** in December 2023. The taxonomy aims to provide clarity on what constitutes sustainable and transition financing, to reduce the risk of misleading green and transition claims and to provide a standard with which financial products and activities can be aligned. MAS has also begun an exercise to map its taxonomy to the Common Ground Taxonomy.[31]

In April 2024, the Association of Southeast Asian Nations (ASEAN) published an update of its taxonomy intended to promote sustainable finance across the region.[32] The **ASEAN Taxonomy for Sustainable Finance** enables assessment of economic activities using a principles-based Foundation Framework or a Plus Standard that has a more detailed methodology using technical screening criteria. The latest version of the taxonomy provides these criteria for two new sectors: transportation and storage, and construction and real estate.[33]

The Australian Sustainable Finance Institute began a first round of public consultation in May 2024 on a taxonomy it is developing in partnership with the Australian government. The goals of the **Australian Sustainable Finance Taxonomy** include supporting market transparency, addressing greenwashing and boosting investor confidence.[34]

Also in May 2024, the Hong Kong Monetary Authority unveiled a new taxonomy intended to provide a clear definition of green products, increase interoperability and help reduce greenwashing risks. The **Hong Kong Taxonomy for Sustainable Finance** covers 12 economic activities under four sectors: power generation, transportation, construction, and water and waste management. It is also designed to facilitate navigation among the Common Ground Taxonomy, China's Green Bond Endorsed Projects Catalogue and the EU taxonomy.[35]

27 "Common Ground Taxonomy – Climate Change Mitigation," IPSF Taxonomy Working Group. As of June 3, 2022.
28 "International Platform on Sustainable Finance," European Commission website. As of July 17, 2024.
29 "Taxonomia Sustentável Brasileira Consulta pública do Plano de Ação," Brazilian Finance Ministry. As of September 21, 2023.
30 "Sustainable Taxonomy of Brazil: Action Plan," Brazilian Finance Ministry. As of December 2023.
31 "MAS Launches World's First Multi-Sector Transition Taxonomy," MAS press release. As of December 3, 2023.
32 ASEAN brings together 10 countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. See: "About ASEAN," ASEAN website. As of September 26, 2024.
33 "ASEAN Taxonomy for Sustainable Finance Version 3," ASEAN Capital Markets Forum. As of April 25, 2024.
34 "Consultation process for Australian taxonomy commences," Australian Sustainable Finance Institute press release. As of May 28, 2024.
35 "Hong Kong Taxonomy for Sustainable Finance," Hong Kong Monetary Authority press release. As of May 3, 2024.

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 expansion of the green bond market can be seen in the increase in issuance to $655 billion in 2021 from about $87 billion in 2016. Issuance tailed off slightly after 2021, but remained well above $500 billion in both 2022 and 2023.[36] Investment-grade green bond issuance has also increased as a share of overall IG issuance, rising from 1.3% in 2016 to 6.2% in the first half of 2024.[37]

The strength of green bonds is also reflected in the growth of the mutual funds and exchange-traded funds that offer exposure to this global market. The number of funds with a climate-related mandate, including dedicated green bond funds, soared to more than 1,500 globally as of December 2023, up from fewer than 200 in 2018, according to Morningstar.[38] In Europe, assets under management in cross-border green bond funds increased to €18.5 billion at the end of the second quarter of 2024 from €2.2 billion at the end of 2018. While actively managed funds still dominate the market, passive funds have made inroads and currently account for 29% of total assets under management in European cross-border green bond funds.[39]

The SDGs are a 15-year action plan for protecting the environment, ending poverty and reducing inequality.[40] 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.[41] 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.

36 Goldman Sachs Asset Management, Bloomberg. Data as of December 31, 2023. Calculation made on June 30, 2024.
37 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.
38 "Investing in Times of Climate Change: 2023 in Review," Morningstar. As of April 19, 2024.
39 Goldman Sachs Asset Management, Broadridge. As of June 30, 2024.
40 "Unanimously Adopting Historic Sustainable Development Goals, General Assembly Shapes Global Outlook for Prosperity, Peace," UN press release. As of September 25, 2015.
41 "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.

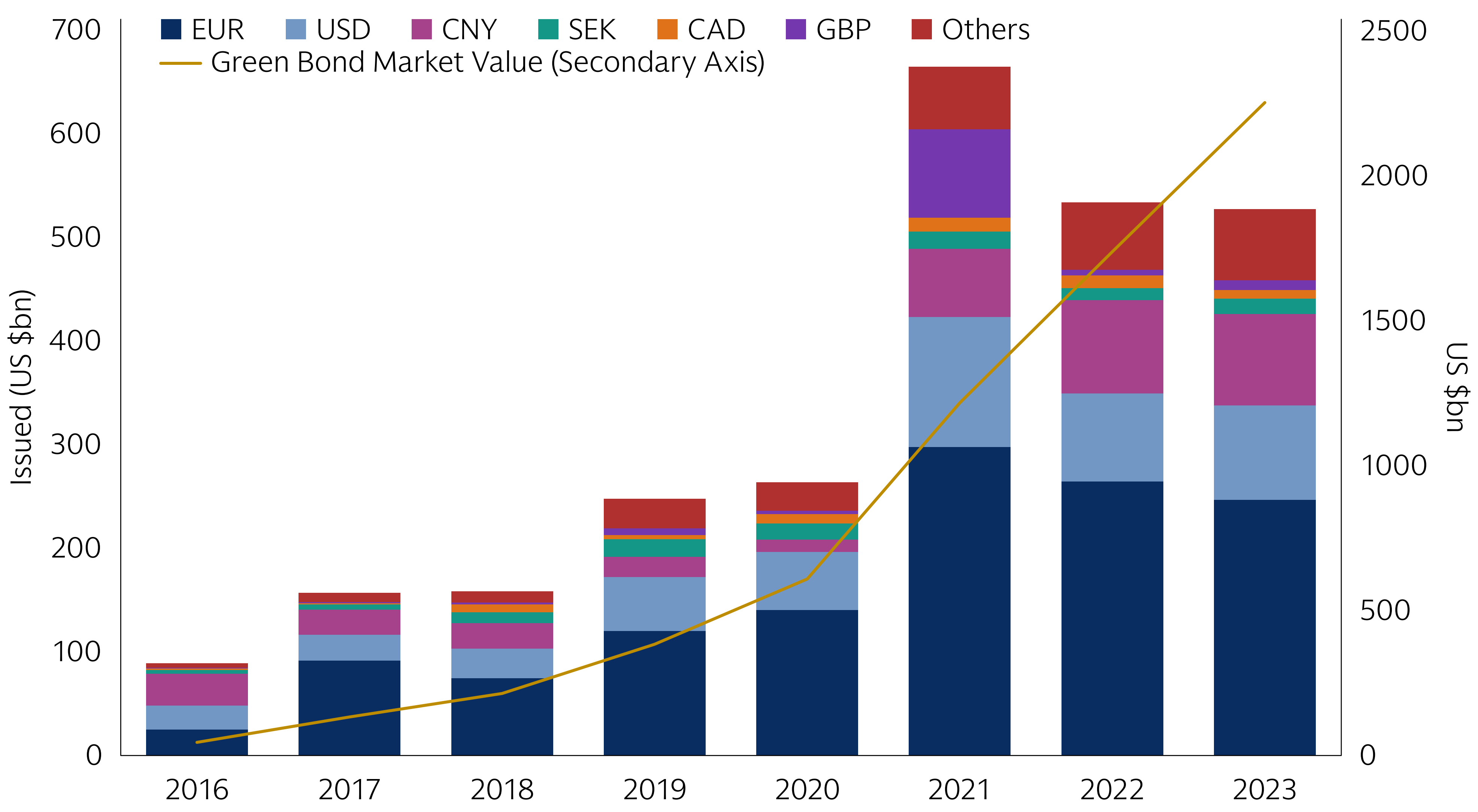
The SDGs and the Paris Agreement have provided issuers and investors in the green bond market with a common purpose and a framework for identifying investment priorities and assessing progress towards global climate goals. Increasingly, issuers are aligning their securities with these global initiatives, 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.

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.

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 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.

Green Bond Market Value and Annual Issuance by Currency



Source: Goldman Sachs Asset Management, Bloomberg. Data as of December 31, 2023. For illustrative purposes only.

Green Bond Market Highlights

Select the year to read more

2007 | 2008 | 2013 | 2014 | 2015 | 2016 | 2017 | 2019 | 2021 | 2022 | 2023

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CASE STUDY

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.[42] Investor appetite was strong, with an order book of more than €21 billion.[43] The bond's proceeds were used entirely to finance work undertaken in 2018 and 2019 across a variety of environmentally beneficial projects.[44]

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.[45]

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

42 "€5.98 Billion Issued in New 20-Year Green DSL 2040," DSTA press release. As of May 21, 2019.

43 "World's First AAA Sovereign Green Bond Sale Gets Bumper Orders," Bloomberg News. As of May 21, 2019.

44 "State of the Netherlands Green Bond Report," Dutch State Treasury Agency. As of May 28, 2020.

45 "Delta Program: Flood Safety, Freshwater and Spatial adaptation," Dutch government website. As of May 4, 2023.

Market Performance

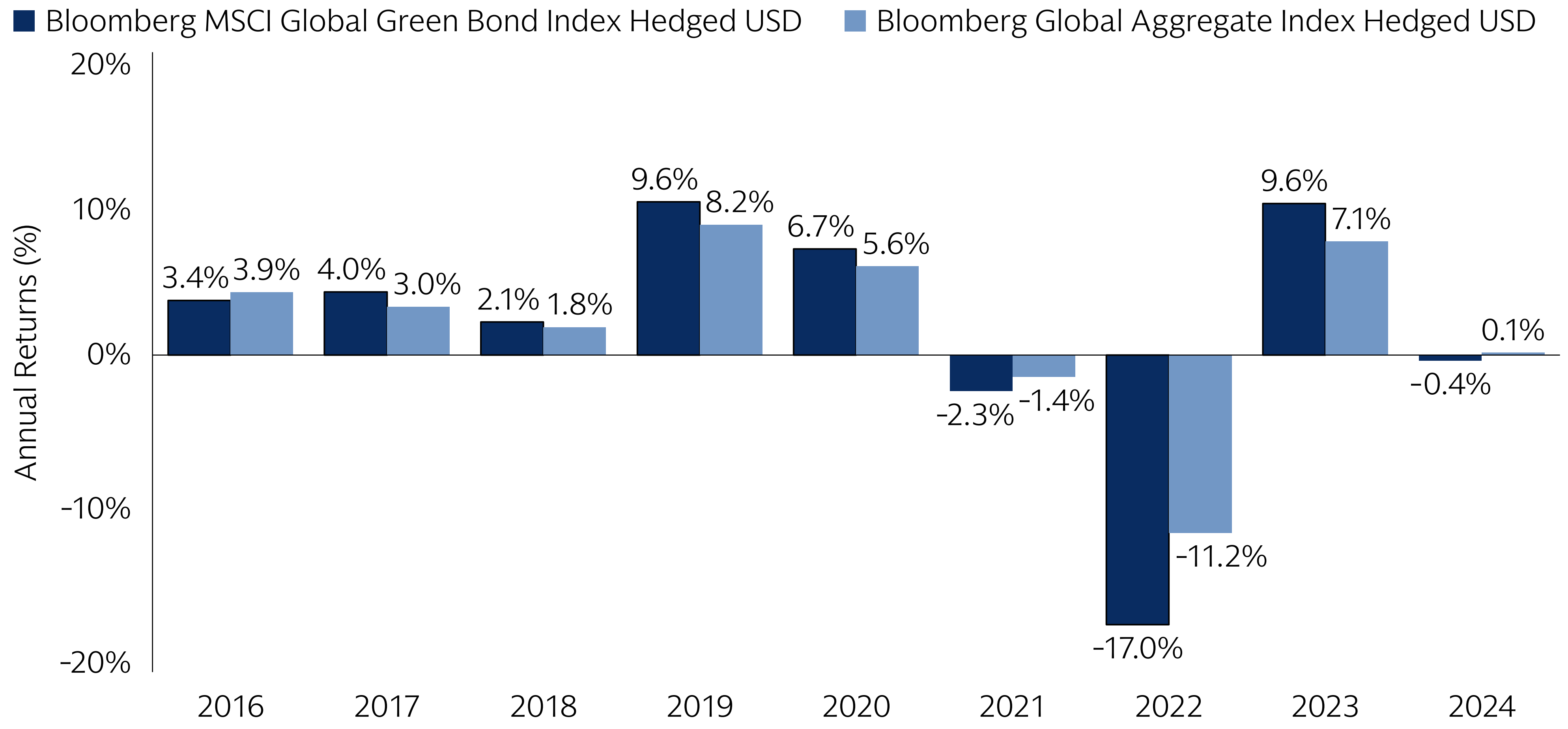
The ultimate goal of any fixed income investment is to maximize risk-adjusted returns, and green bonds are no different. Analysis by our Green, Social and Impact Bonds team shows that risk-adjusted returns from green bonds were similar to those delivered by their conventional counterparts over the period from 2016 through the first half of 2024.

In the 8.5-year period from 2016 through the first half of 2024, the **global green bond market** delivered an annualized return of 2%, slightly lower than the 2.1% returned by the broader bond 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.[46] Prior to 2016, the green bond market was not sufficiently developed to allow for a meaningful comparison.

Differences in performance between these two indices in a given year are largely the result of two factors, in our view. The first is relative average duration, which matters in comparing green bond performance with the broader market for two related reasons. First, green bond indices have typically had a longer duration than their non-green counterparts. At the end of June 2024, the green bond index in our analysis had an average duration of 6.7 years, compared with 6.5 years for the aggregate index.[47] Second, bonds with longer duration have increased interest-rate sensitivity. When rates go up, as happened in 2022, they tend to underperform bonds with a shorter duration; when interest rates start to come down, the opposite applies, as seen in 2023.

The second factor contributing to comparative performance differences is the sector and issuer composition of the indices. Compared with the aggregate index, the global green bond index has limited exposure to industrial issuance and high exposure to financial companies and utilities. In addition, some large issuers are absent from the green bond market, including the Japanese and US governments. This creates a sizable difference and helps account for the smaller share of treasury bonds in the green bond index (21%) compared with the aggregate index (53%).[48]

Global Green Bond Index Performance Versus Aggregate Index



Source: Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.
Past performance does not predict future returns and does not guarantee future results, which may vary.

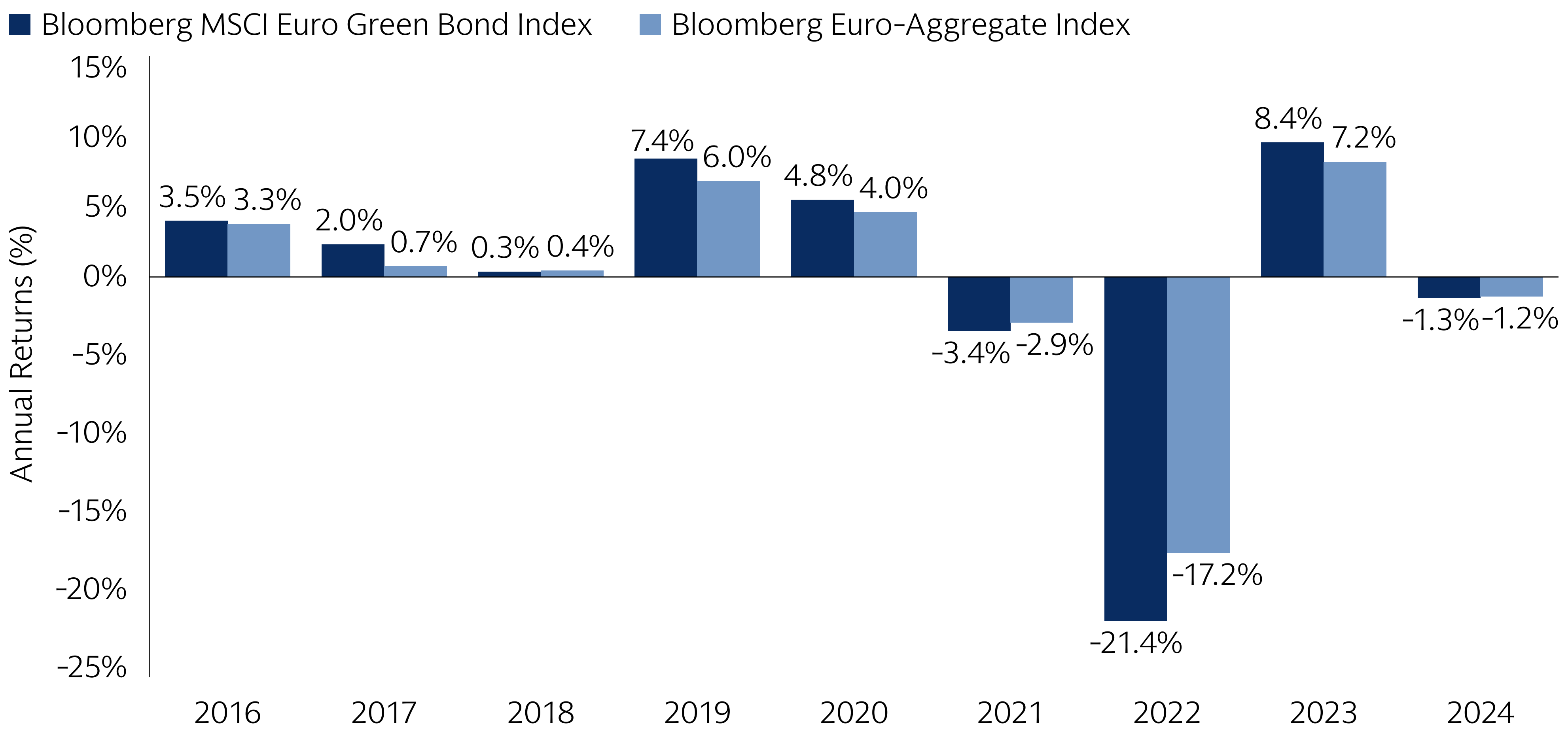
46 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.
47 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.
48 Ibid.

Euro-denominated green bonds, which account for nearly half of the total green bond market,[49] performed on par with their non-green counterparts over the 8.5 years through mid-2024. This conclusion is based on a comparison of the Bloomberg MSCI Euro Green Bond Index with the benchmark Bloomberg Euro Aggregate Index. Both indices returned an annualized 0% over the period.[50]

In our view, the parity in the performance of these two indices likely results from the fact that the euro-denominated green bond market is well developed and diversified and resembles the euro bond market in aggregate. The large share of government bonds in the euro green bond market also strengthened its alignment with the broader market. At the midway point of 2024, government and government-related bonds made up 60% of the euro green bond index compared with 74% in the aggregate index.[51]

Fluctuations in comparative performance from year to year are largely the result of duration differences between the indices. At the mid-point of 2024, the average duration of the euro green bond index was 7.1 years, versus 6.4 years for the aggregate index.[52] The longer duration of the green bond index is a consequence of the rapid expansion of the green bond market in the low-yield environment that prevailed from 2016 to 2021. Many governments and companies chose to issue long-dated green bonds during this period with the aim of locking in low yields.

Performance of Euro-Denominated Green Bonds Index Versus Aggregate Index



Source: Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.

Past performance does not predict future returns and does not guarantee future results, which may vary.

49 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024, euro-denominated green bonds made up 48% of the market.

50 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.

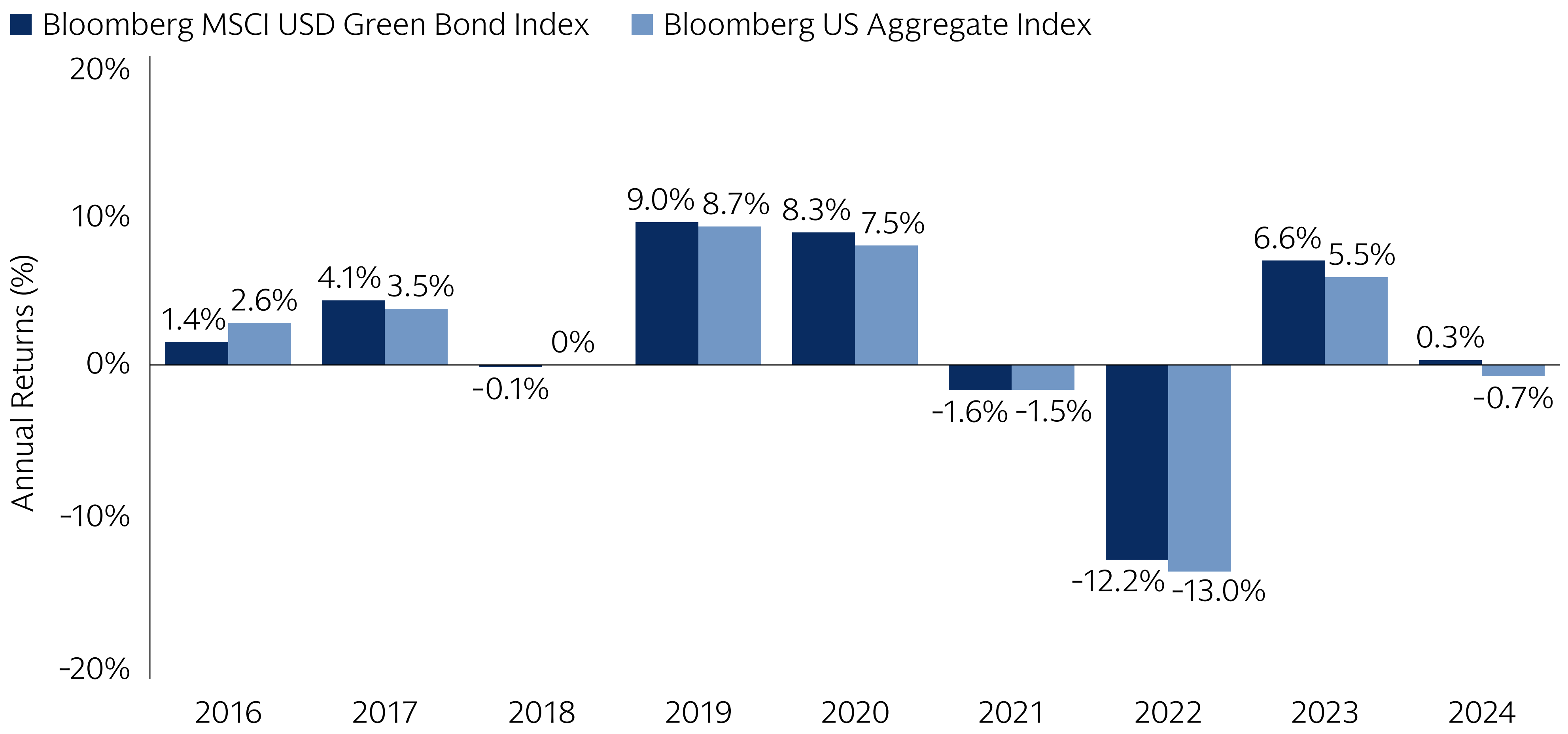
51 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.

52 Ibid.

Green bonds denominated in US dollars slightly outperformed their conventional peers over the period from 2016 through the first half of 2024, based on a comparison of the Bloomberg MSCI USD Green Bond Index with the broader Bloomberg US Aggregate Index.[53] The green bond index delivered an annualized return of 1.3% over this period, while the aggregate index returned 1.1%.

One reason for this outperformance is that the US dollar-denominated green bond index, unlike its euro equivalent, has a shorter duration than its non-green equivalent – 5.1 years and 6.1 years, respectively.[54] This allows the green bond index to perform better in an environment of rising interest rates. The green bond index also has a higher allocation to corporate and government-related issuers because the US government itself has not yet issued green bonds. This results in a higher risk premium or spread compared with the non-green index. This combination of shorter duration and higher spread contributed to the outperformance of the green bond index in five of the past six years, including 2022 when many central banks were aggressively raising rates in a bid to curb inflation.

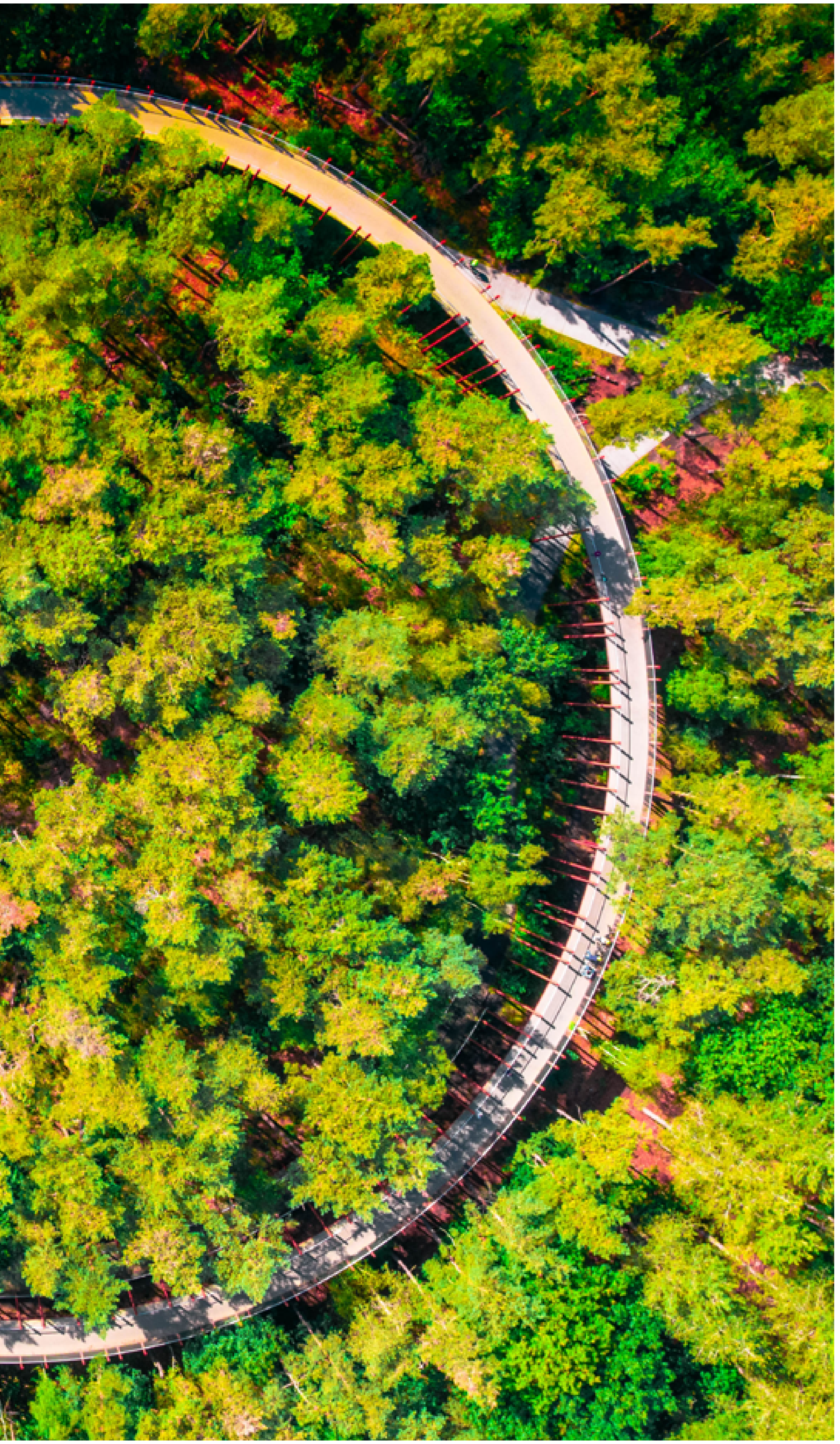
Performance of US Dollar-Denominated Green Bond Index Versus Aggregate Index



Source: Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.

Past performance does not predict future returns and does not guarantee future results, which may vary.

53 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.
54 Goldman Sachs Asset Management, Bloomberg, MSCI. As of June 30, 2024.



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 environmental, social and governance (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.

While Europe continues to lead the world in green bond issuance, countries around the world are increasingly tapping the market. In 2023, Albania, Cambodia, Cape Verde, Cyprus, Macedonia, Mongolia, Montenegro and Uzbekistan issued inaugural green bonds. In Africa, one of the regions most vulnerable to the risks of climate change, 11 issuers priced deals, led by the African Development Bank.[55]

Another important step in the development of the green bond market was the launch of the world's first tokenized government green bond. In tokenization, the rights to an asset are converted into a digital token on a blockchain. The government of Hong Kong raised HK$800 million in February 2023 under its Green Bond Programme.[56] The issuance demonstrated that a bond's lifecycle can be run using blockchain technology, bringing together the issuer, underwriting banks, custodians, agents and others on a single platform with a common set of records.[57]

Hong Kong followed up in February 2024 with an offering of about HK$6 billion of digital green bonds denominated in Hong Kong dollars, renminbi, US dollars and euros.[58] Other issuers of tokenized green bonds include French lender Societe Generale, whose first digital issuance was launched in November 2023.[59]

55 "Sustainable Debt: Global State of the Market 2023," Climate Bonds Initiative. As of May 2024.
56 "HKSAR Government's Inaugural Tokenized Green Bond Offering," Hong Kong Monetary Authority press release. As of February 16, 2023.
57 "Hong Kong's Tokenised Green Bonds," ICMA Thought Leadership in International Capital Markets. As of Q2 2024. The article was contributed by Georgina Lok, head of market development at the Hong Kong Market Authority.
58 "HSKAR Government's Digital Green Bonds Offering," Hong Kong Monetary Authority press release. As of February 7, 2024.
59 "Societe Generale issues a first digital green bond on a public blockchain," Societe Generale press release. As of December 4, 2023.

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 2023, Europe claimed the top three spots in global non-sovereign issuance, with KfW in first place, the EIB in second and the EU in third, according to the Climate Bonds Initiative.[60] The region's leading role in the market is reflected in the volume of euro-denominated green bonds, which accounted for 48% of the market as of mid-2024.[61]

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 plans to raise as much as €712 billion for the program, with up to 30% in green bonds. This would make the EU the world's largest green bond issuer.[62]

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. 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. An industry group that advises the Treasury said in a report published in May 2024 that "green bonds may bring in new demand for Treasuries and could warrant further study."[63] The report from the Treasury Borrowing Advisory Committee, a group of US securities dealers and investors that works closely with the Treasury, raised the possibility of green bond issuance in the context of expanding the potential types of securities sold by the government to benefit from shifts in demand.[64]

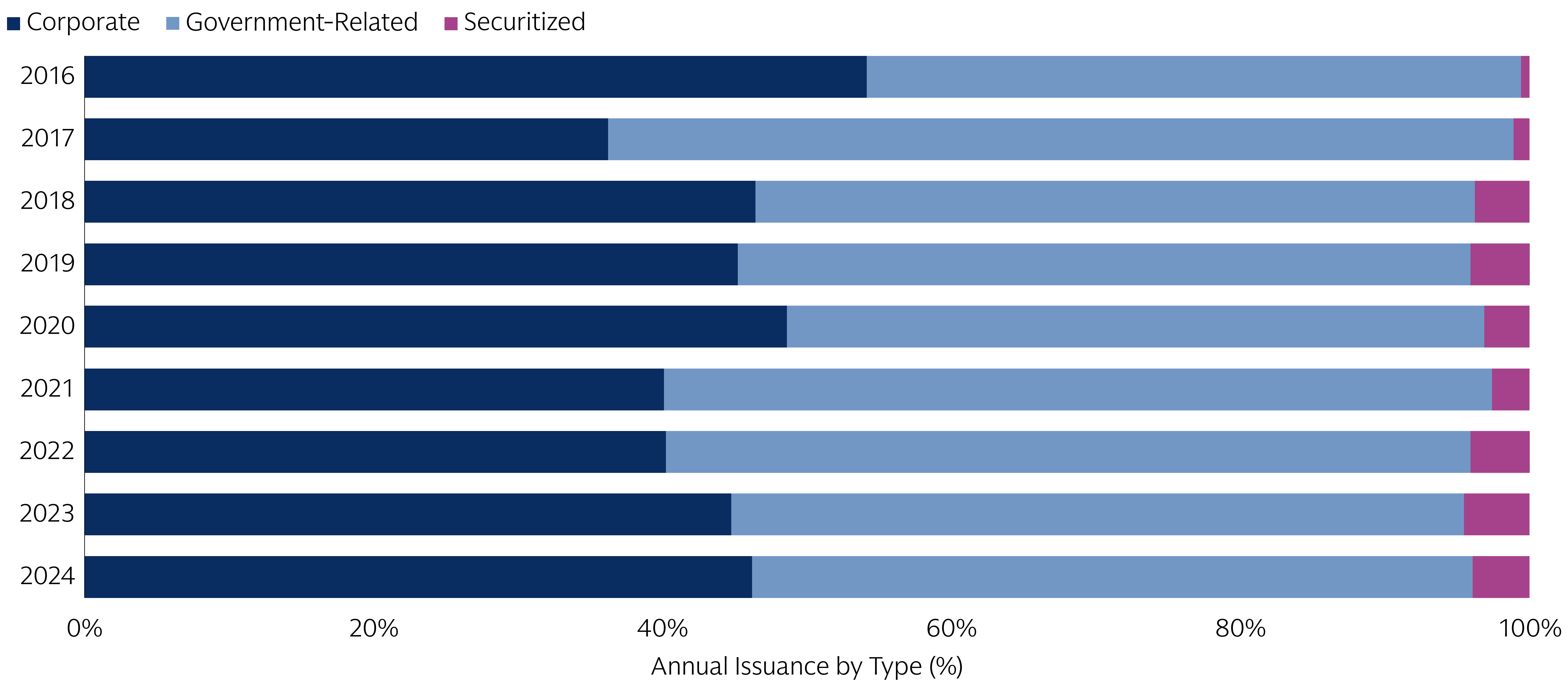
China updated its green bond standards in mid-2022 to align them more closely with global market guidelines. (A more detailed discussion begins on page 13.) This overhaul could increase transparency and potentially spur market growth by making Chinese green bonds more attractive to international investors. 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.

60 "Sustainable Debt: Global State of the Market 2023," Climate Bonds Initiative. As of May 2024.
61 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.
62 "EU Investor Presentation: Investing in EU-Bonds & EU-Bills," European Commission. As of September 30, 2024.
63 "Report to the Secretary of the Treasury from the Treasury Borrowing Advisory Committee," US Department of the Treasury website. As of May 1, 2024.
64 "U.S. Treasury Group Weighs First Green-bond Sales," Bloomberg News. As of May 1, 2024.

Green Bond Market Composition

Click here to show issuance by:

TYPE	SECTOR	REGION	CURRENCY	RATING



Source: Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024. For illustrative purposes only.

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.[65] More recently, the California-based biotechnology medicines firm Amgen tapped the market for the first time in 2022 with a $750 million green bond.[66]

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.[67] 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.[68] 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.[69] 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

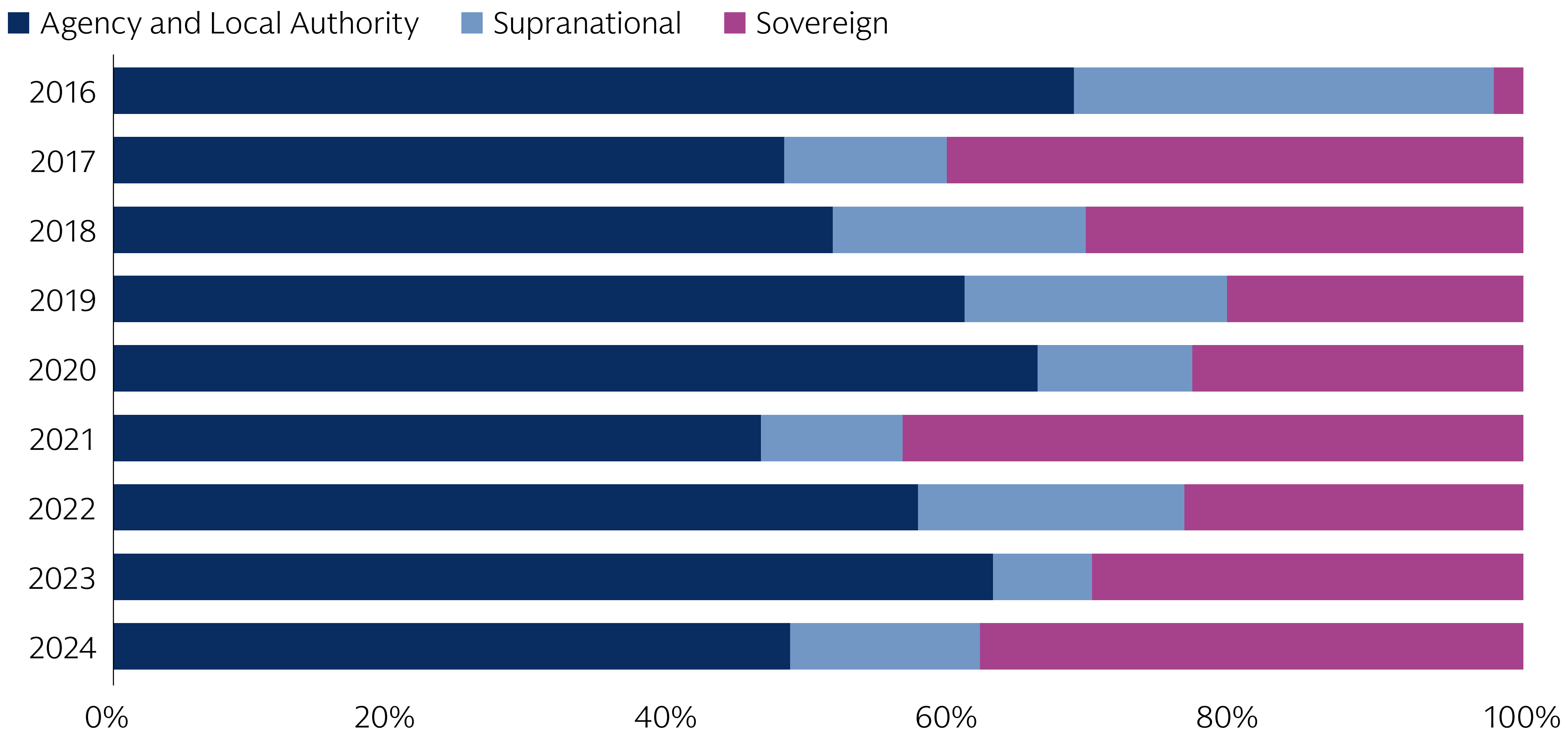
65 "Apple Issues $1.5 Billion in Green Bonds in First Sale," Reuters. As of February 17, 2016.
66 "Amgen Issues Inaugural Green Bond to Advance ESG Goals," Amgen press release. As of February 22, 2022.
67 "Amgen Mulls More Green Bonds After 'Robust Interest' in Debut," Bloomberg News. As of March 29, 2022.
68 "Green Financing Framework 2022," Amgen. As of February 16, 2022.
69 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.[70] 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. At the midway point in 2024, government-related green bonds amounted to 50% of the market, compared with 46% for corporate bonds and 4% for securitizations.[71]

Share of Annual Government-Related Green Bond Issuance by Sector



Source: Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024. 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 ($bn)	#	Country	Amount Issued ($bn)
1.	France	$81	6.	Hong Kong	$25
2.	Germany	$78	7.	Austria	$24
3.	United Kingdom	$72	8.	Belgium	$21
4.	Italy	$51	9.	Spain	$16
5.	Netherlands	$25	10.	Japan	$13

Source: Goldman Sachs Asset Management, Bloomberg. Based on Bloomberg data as of June 30, 2024. For illustrative purposes only.

70 "Bloomberg Barclays Methodology," Bloomberg. As of April 29, 2020.
71 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.

CASE STUDY

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 2024, Adif AV issued a €600 million green bond that was 5.5 times oversubscribed, making it the second-most oversubscribed issue in the company's history.[72]

Adif AV's issuance is governed by its Green Financing Framework, which is aligned with the Green Bond Principles.[73] 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.[74] 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:[75]

SDGs Supported

72 "Adif AV cierra una emisión de 600 M€ en 'bonos verdes' para seguir financiando proyectos sostenibles," Adif AV press release. As of April 17, 2024.
73 " Green Financing Framework," Adif AV. As of August 2022.
74 " Fixed Income Investor Presentation," Adif AV website. As of April 2023.
75 Ibid.

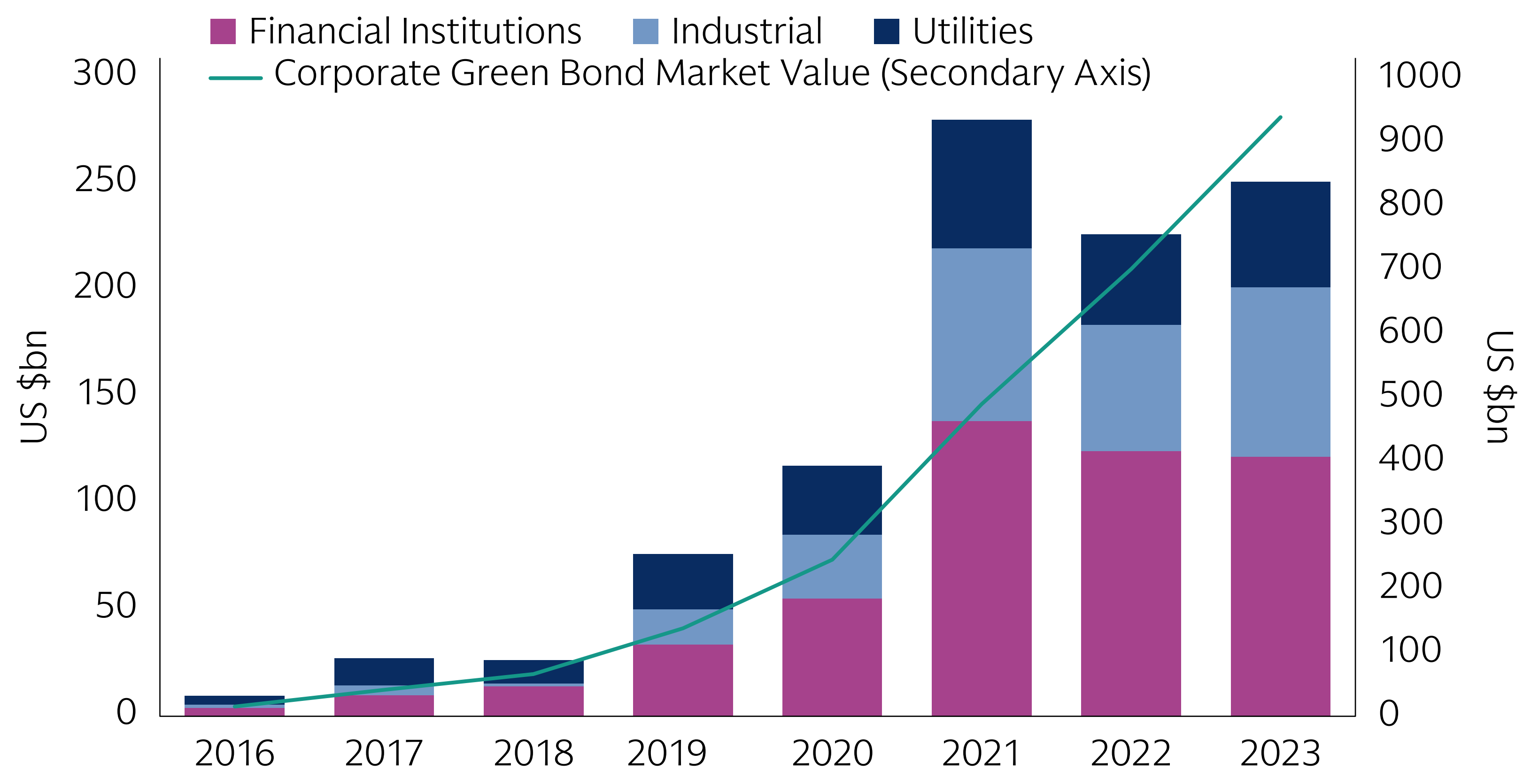
Corporate Issuers

The corporate green bond market kicked off in 2013, led by issuers such as Credit Agricole Corporate and Investment Bank,[76] Bank of America[77] and Vasakronan, one of Sweden's largest property companies.[78] 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 40% of outstanding bonds in the first half of 2024.[79] The largest financial corporate green bond of 2023 – $4.3 billion – was issued by China's Bank of Communications.[80] Issuance by industrial companies made up 34% of the market, followed by utilities at 26%.

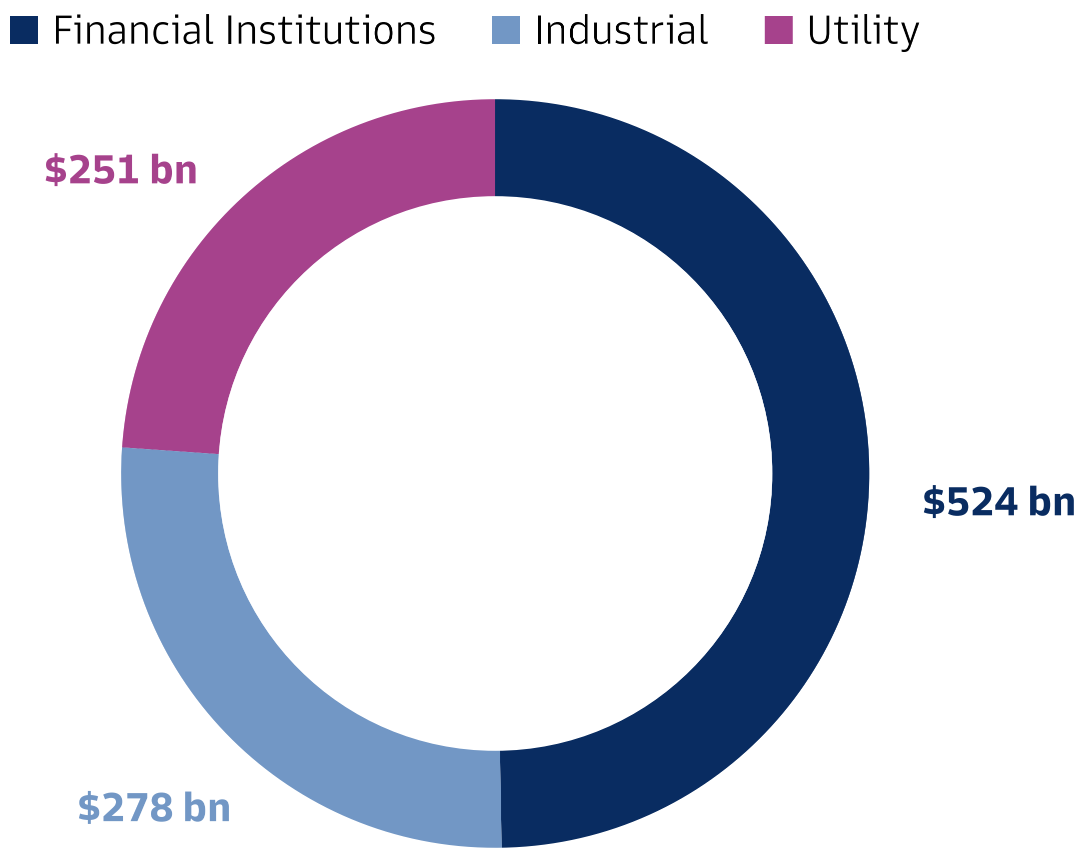
Investors should keep in mind that the composition of the corporate green bond market differs significantly from the non-green equivalent. In the broader market, industrial companies issue the majority of bonds -- approximately 52% at the midway point in 2024 -- while financial institutions accounted for 39% and utilities for 9%.[81] 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.)

Corporate Green Bond Market Value and Annual Issuance by Sector Breakdown



Source: Goldman Sachs Asset Management, Bloomberg. Data as of December 31, 2023.
For illustrative purposes only.

Outstanding Corporate Green Bonds in 2024



Source: Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.
For illustrative purposes only.

76 "Sustainable Banking," Credit Agricole CIB website. As of June 7, 2023.
77 "ESG-Themed Issuances," Bank of America website. As of June 7, 2023.
78 "Green Financing," Vasakronan website. As of May 16, 2023.
79 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024. Composition based on the Bloomberg MSCI Global Green Bond Corporate 5% Issuer Cap Index.
80 "Sustainable Debt: Global State of the Market 2023," Climate Bonds Initiative. As of May 2024.
81 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024. Composition based on the Bloomberg Global Aggregate Corporate Total Return Index.

CASE STUDY

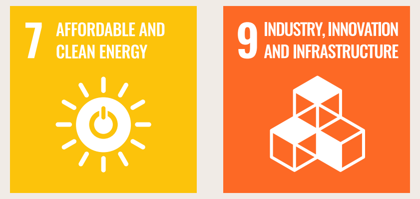
NTT Group

Green bond issuance has grown in the Asia-Pacific region, accounting for 21% of the global market at the end of 2023.[82] While China is the largest issuer in the region, Japan has emerged as a force in the market, with the equivalent of about €65 billion in green bonds outstanding at the end of 2023.[83] Non-Financial corporates were the largest Japanese issuers as of end-2023, followed by financial corporates and government-backed entities.[84]

Japanese telecommunications giant Nippon Telegraph and Telephone (NTT) first tapped the international 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.[85] 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.[86] New base stations can also help 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



82 Goldman Sachs Asset Management, Bloomberg. As of December 31, 2023.
83 Ibid.
84 Ibid.
85 "Fund Allocation Status Reporting (April 2023 – March 2024)," NTT Finance website. As of June 21, 2024.
86 "NTT Group Green Bond Framework," NTT Finance website. As of June 2022.

Case studies and examples are 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. Performance results vary depending on the client's investment goals, objectives, and constraints. There can be no assurance that the same or similar results to those presented above can or will be achieved. Company names and logos, excluding those of Goldman Sachs and any of its affiliates, are trademarks or registered trademarks of their respective holders. Use by Goldman Sachs does not imply or suggest a sponsorship, endorsement or affiliation.

A Potential Complement to Your Fixed Income Allocation

The Role of Green Bonds in Your Portfolio

We believe that 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 potentially 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 based on their risk and investment objectives. 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.

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.[87] The green bond market is led by euro-denominated bonds, whereas in the overall market the US dollar occupies the top spot.[88] 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 based on their risk tolerance and investment objectives.

87 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.
88 Goldman Sachs Asset Management, Bloomberg. As of June 30, 2024.

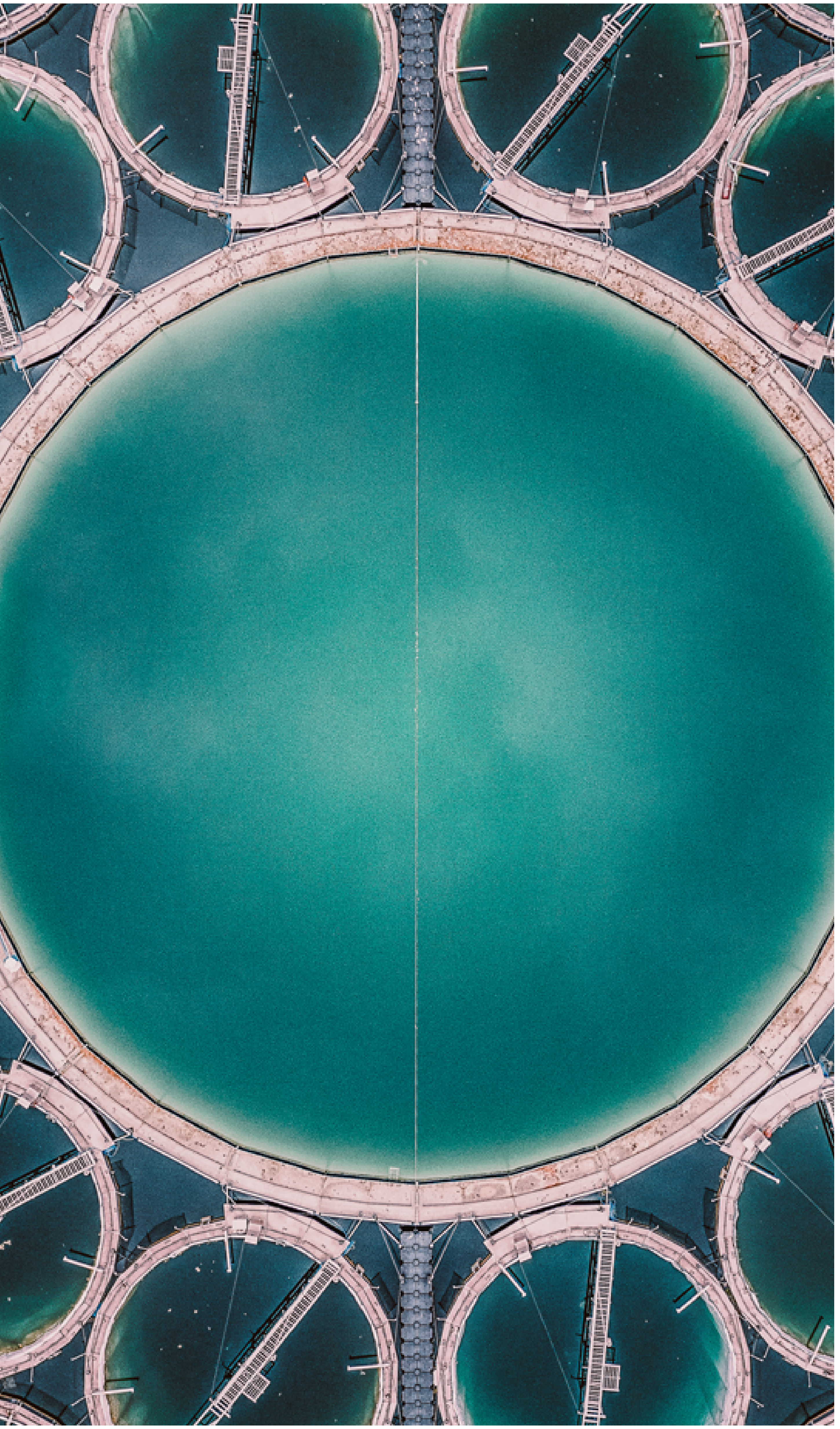
Active Management

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 in our view can potentially help investors 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. In our view, 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.

We believe it is an asset manager's fiduciary duty to allocate clients' capital to its best use and to ensure the optimal 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, we think 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 managing potential greenwashing risks. We believe 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 may also support the assessment of an issuer's creditworthiness. We think selecting an asset manager with a strong fundamental research process, detailed reporting, and robust risk management is crucial, and can help investors avoid controversies, manage downside risk and help 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 may trade at a lower spread and higher price compared with a conventional bond. As a result, holding such bonds to maturity could potentially 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[89]

Green, Social and Impact Bonds

Bram Bos
Global Head of Green, Social and Impact Bonds
23 Years of Experience

Douglas Farquhar
Client Portfolio Manager
Green, Social and Impact Bonds
25 Years of Experience

Alfred Meinema
Portfolio Manager Green, Social and Impact Bonds
24 Years of Experience

Jurre Halsema
Portfolio Manager
Green, Social and Impact Bonds
14 Years of Experience

Roel van Broekhuizen
Portfolio Manager
Green, Social and Impact Bonds
4 Years of Experience

Isobel Edwards
Green, Social and Impact Bonds
Research Analysis
9 Years of Experience

Kaili Mao
Green, Social and Impact Bonds
Research Analysis
8 Years of Experience

Panagiota Batziou
Green, Social and Impact Bonds
Research Analysis
4 Years of Experience

Yun-Chun Liu
Green, Social and Impact Bonds
Research Analysis
6 Years of Experience

Francesco Tassiano
Green, Social and Impact Bonds
Research Analysis

Rob Heins
Sr. Portfolio Specialist
8 Years of Experience

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

Sustainable Investing & Innovation Platform
ESG

89 As of September 1, 2024.

RISK DISCLOSURES

Environmental, Social and Governance ("ESG") strategies may take risks or eliminate exposures found in other strategies or broad market benchmarks that may cause performance to diverge from the performance of these other strategies or market benchmarks. ESG strategies will be subject to the risks associated with their underlying investments' asset classes. Further, the demand within certain markets or sectors that an ESG strategy targets may not develop as forecasted or may develop more slowly than anticipated.

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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Index Definitions

"The Bloomberg MSCI Global Green Bond Index aims to track fixed-income securities in which the proceeds, or an equivalent amount, will be applied to projects or activities that promote climate or other environmental sustainability purposes (green bonds). An independent research-driven methodology created by MSCI ESG Research, called the MSCI Green Bond and Green Loan Assessment Methodology, is used to evaluate index-eligible green bonds. The index excludes issuers with a "Red" MSCI ESG Controversy Flag and negatively screens issuers involved in certain business activities related to certain controversial weapons, or that derive 15% or more revenue from thermal coal mining. Unlike the Bloomberg Global Aggregate Index, the Bloomberg MSCI Global Green Bond Index does not have a minimum time to maturity of one year. Instead, the Index will hold bonds until final maturity." Source: Bloomberg MSCI ESG Fixed Income Indices, Bloomberg. As of July 30, 2024.

"The Bloomberg Global Aggregate Index is a flagship measure of global investment grade debt from twenty-eight local currency markets. This multi-currency benchmark includes treasury, government-related, corporate and securitized fixed-rate bonds from both developed and emerging markets issuers. There are four regional aggregate benchmarks that largely comprise the Global Aggregate Index: the US Aggregate, the Pan-European Aggregate, the Asian-Pacific Aggregate, and the Canadian Aggregate Indices. The Global Aggregate Index also includes Eurodollar, Euro-Yen, and 144A Index-eligible securities, and debt from five local currency markets not tracked by the regional aggregate benchmarks (CLP, COP, MXN, PEN, and ILS)." Source: Bloomberg Fixed Income Indices, Bloomberg. As of October 7, 2024.

"The Bloomberg MSCI Euro Green Bond Index aims to track fixed-income securities in which the proceeds, or an equivalent amount, will be applied to projects or activities that promote climate or other environmental sustainability purposes (Green Bonds). An independent research-driven methodology created by MSCI ESG Research, called the MSCI Green Bond and Green Loan Assessment Methodology, is used to evaluate index-eligible green bonds. The index excludes issuers with a "Red" MSCI ESG Controversy Flag and negatively screens issuers that have business activities related to certain controversial weapons, or that derive 15% or more revenue from thermal coal mining. Unlike the Bloomberg Global Aggregate Index, the Bloomberg MSCI Euro Green Bond Index does not have a minimum time to maturity of one year. Instead, the Index will hold bonds until final maturity." Source: Bloomberg MSCI ESG Fixed Income Indices, Bloomberg. As of July 30, 2024.

"The Bloomberg Euro Aggregate Bond Index is a broad-based flagship benchmark that measures the investment grade, euro-denominated, fixed-rate bond market, including treasuries, government-related, corporate and securitized issues. Inclusion is based on currency denomination of a bond and not country of risk of the issuer. The Euro Aggregate is a component of other flagship indices, such as the multi-currency Global Aggregate Index and Pan-European Aggregate Index." Source: Bloomberg Fixed Income Indices, Bloomberg. As of December 15, 2023.

"The Bloomberg MSCI US Green Bond Index aims to track fixed-income securities in which the proceeds, or an equivalent amount, will be applied to projects or activities that promote climate or other environmental sustainability purposes (Green Bonds). An independent research-driven methodology created by MSCI ESG Research, called the MSCI Green Bond and Green Loan Assessment Methodology, is used to evaluate index-eligible green bonds. The index excludes issuers with a "Red" MSCI ESG Controversy Flag and negatively screens issuers that have business activities related to certain controversial weapons, or that derive 15% or more revenue from thermal coal mining. Unlike the Bloomberg Global Aggregate Index, the Bloomberg MSCI US Green Bond Index does not have a minimum time to maturity of one year. Instead, the Index will hold bonds until final maturity." Source: Bloomberg MSCI ESG Fixed Income Indices, Bloomberg. As of July 30, 2024.

"The Bloomberg US Aggregate Bond Index is a broad-based flagship benchmark that measures the investment grade, US dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, fixedrate agency MBS, ABS and CMBS (agency and non-agency). Provided the necessary inclusion rules are met, US Aggregate-eligible securities also contribute to the multi-currency Global Aggregate Index and the US Universal Index." Source: Bloomberg Fixed Income Indices, Bloomberg. As of December 15, 2023.

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