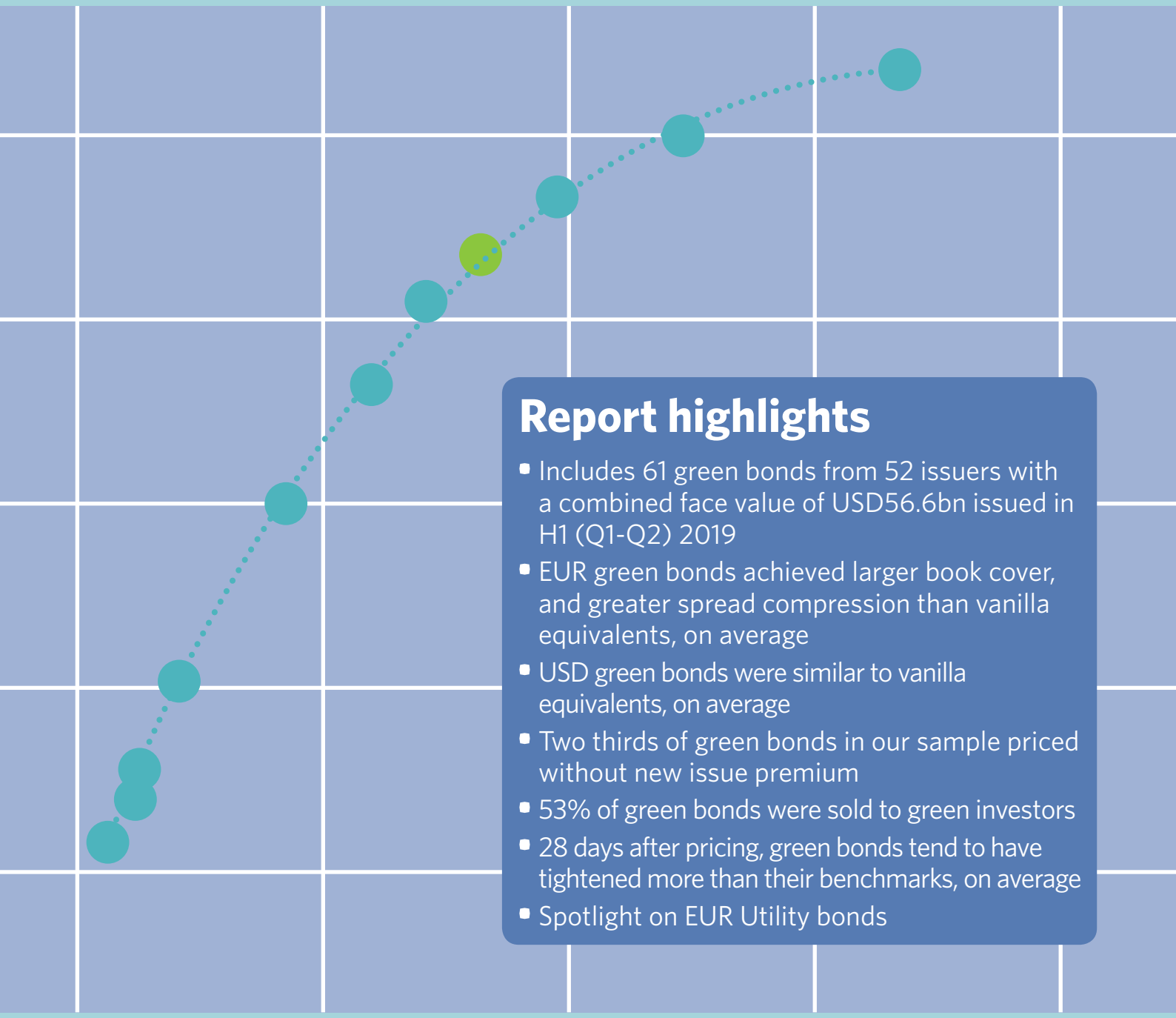
GREEN BOND PRICING IN THE PRIMARY MARKET:

January - June 2019

H1 (Q1-Q2) 2019



Report highlights

- Includes 61 green bonds from 52 issuers with a combined face value of USD56.6bn issued in H1 (Q1-Q2) 2019
- EUR green bonds achieved larger book cover, and greater spread compression than vanilla equivalents, on average
- USD green bonds were similar to vanilla equivalents, on average
- Two thirds of green bonds in our sample priced without new issue premium
- 53% of green bonds were sold to green investors
- 28 days after pricing, green bonds tend to have tightened more than their benchmarks, on average
- Spotlight on EUR Utility bonds

Climate Bonds Initiative

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LYXOR Asset Management
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With funding support by Obvion Hypotheken and Lyxor Asset Management

Introduction

This is the 8th report in our pricing series, in which we observe how green bonds perform in the primary markets. This report includes bonds issued in the first six months of 2019 (H1 2019).

During this period, USD117bn of green bonds were issued that complied with the Climate Bonds Taxonomy.[1] Our analysis for H1 2019 includes almost half of that, USD56.6bn split between 61 green bonds from 52 issuers. The overwhelming majority of this, USD45.6bn (EUR40.5bn), is denominated in EUR and split between 46 bonds. The remaining USD11.0bn comprises 15 USD-denominated bonds. In 2018 – the whole year - we looked at a total of 63 green bonds amounting to USD58.4bn. H1 2019 data highlights the substantial increase in benchmark-sized green bond issuance in EUR and USD.

Our methodology is designed to capture the most liquid portion of the market and therefore limited to USD- and EUR-denominated bonds with a minimum size of USD500m. See full details of our methodology on page 24.

Report highlights

- **On average, EUR green bonds achieved larger oversubscription and spread compression than vanilla equivalents (for the same sector and period).**
  See more on page 3
- **On average, USD green bonds achieved lower oversubscription and spread compression than vanilla equivalents.**
  See more on page 3
- **53% of green bonds were allocated to investors describing themselves as green.**
  See more on page 6
- **Six green bonds priced with a greenium. Overall, two thirds of green bonds in our sample did not have a new issue premium.**
  See more on page 7
- **Seven days after pricing, vanilla bonds had tightened more than green bonds, on average. After 28 days, green bonds had, on average, tightened more than vanilla bonds.**
  See more on pages 12
- **In Q3 more green benchmark Utilities were issued than vanilla bonds. We spotlight the Utility sector to determine what proportion of debt issued in 2019 is labelled green.**
  See more on pages 15

1. Market developments

Our pricing publications typically capture around 30% of the green bonds issued during the observation period. In H1 2019, however, our universe includes half the green bond issuance volume. This suggests that green bonds are getting larger, and indeed, 14 bonds in our sample were at least USD1bn, four of them Sovereigns.

In Europe, the increase in the number of large green benchmark bonds is concomitant with an increase in overall issuance in EUR bonds and an increase in appetite for yield, while in the US, overall issuance contracted. At the end of June, EUR-denominated investment grade issuance was 24.3% ahead of the same point in 2018.[2] In the US, investment grade credit issuance was just 87% of the same point in 2018.[3]

Debt markets had been challenging towards the end of 2018. At least two green bond issuers roadshowed in late 2018 but held off until 2019 to issue: **OP Bank** 2024 and **CPPIB Capital** 2029. In Europe, Brexit uncertainty and Italian budget concerns made investors wary. In the USA, the increasingly heated trade talks with China were having a similar effect. Credit markets rallied in the first four months of 2019, widening again in early May when the trade tension between US and China came back into focus, but edged back towards the end of June. Many issuers were and remain ready to capture lower borrowing costs.

Investors were keen to buy bonds, green or otherwise. The average book building numbers for both green and vanilla bonds in H1 2019 are the largest we have seen in any observation period since we began our pricing monitor in 2016. For example, in H1 2019 EUR green bonds were 3.9x oversubscribed and vanilla bonds were 3.3x oversubscribed compared to 2.6x and 2.1x respectively in H2 2018. Demand also increased for issuers in the USD market. In H1 2019, order books were 4.1x covered for green bonds and 4.5x for vanilla, while in H2 2018 they were 1.9x and 2.0x respectively.

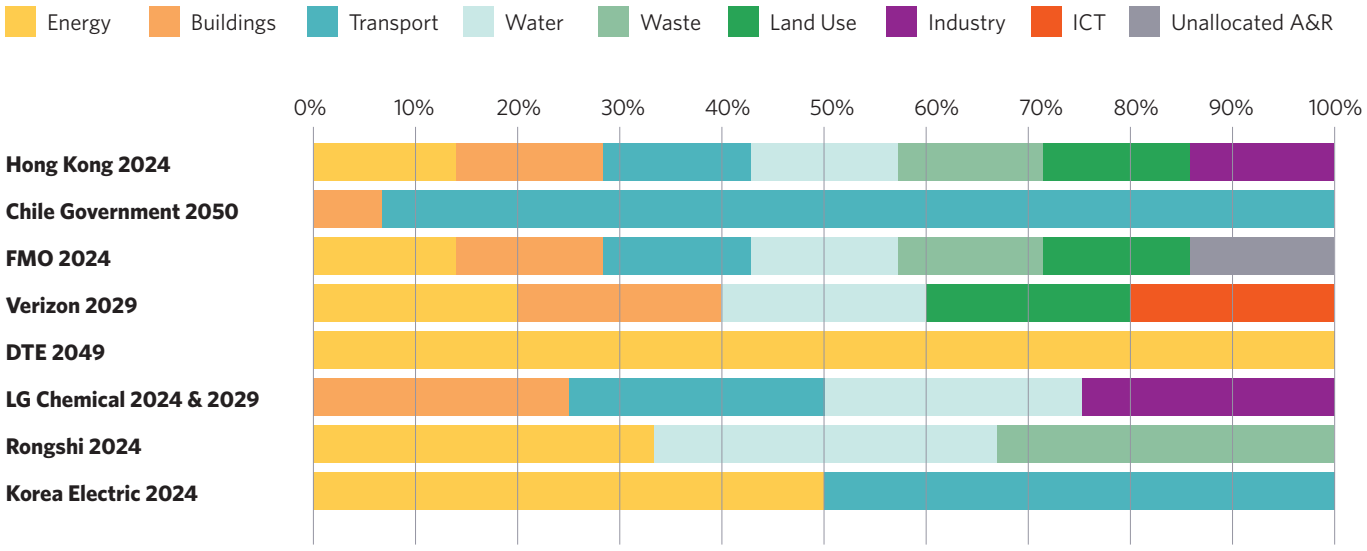
Twenty-four issuers revisited the market with a single green bond, and six repeat issuers brought two green bonds each: in EUR, **SNCF** issued a 2047 in January, and a 2029 in June. **Poland** (2029 and 2049), **TenneT** (2030 and 2039), **Engie** (2027 and 2029), and in USD **MidAmerican Energy** (2029 and 2049) each brought two tranche deals. **LBBW** issued a covered green bond in USD (2022) and a senior non-preferred in EUR (2024). **EIB** issued its 45th green bond, the 11th denominated in EUR. EBRD issued its 33rd green bond.

There are 23 debut green bond issuers covered in this paper, adding still much needed sector diversification. **Telefonica** 2024 was the anticipated first green bond from the telecom sector, closely followed by **Verizon** 2029 (USD), and **Vodafone** 2026. Korean **LG Chemical** issued the first green bonds from any chemical company, in a multi-currency (EUR and USD) three-tranche deal. **ESB** 2030 was the first green corporate bond from Ireland, following the Irish Government's Q4 2018 example. Use of proceeds among the new issuers is mixed, though renewable energy continues to dominate in both EUR and USD.

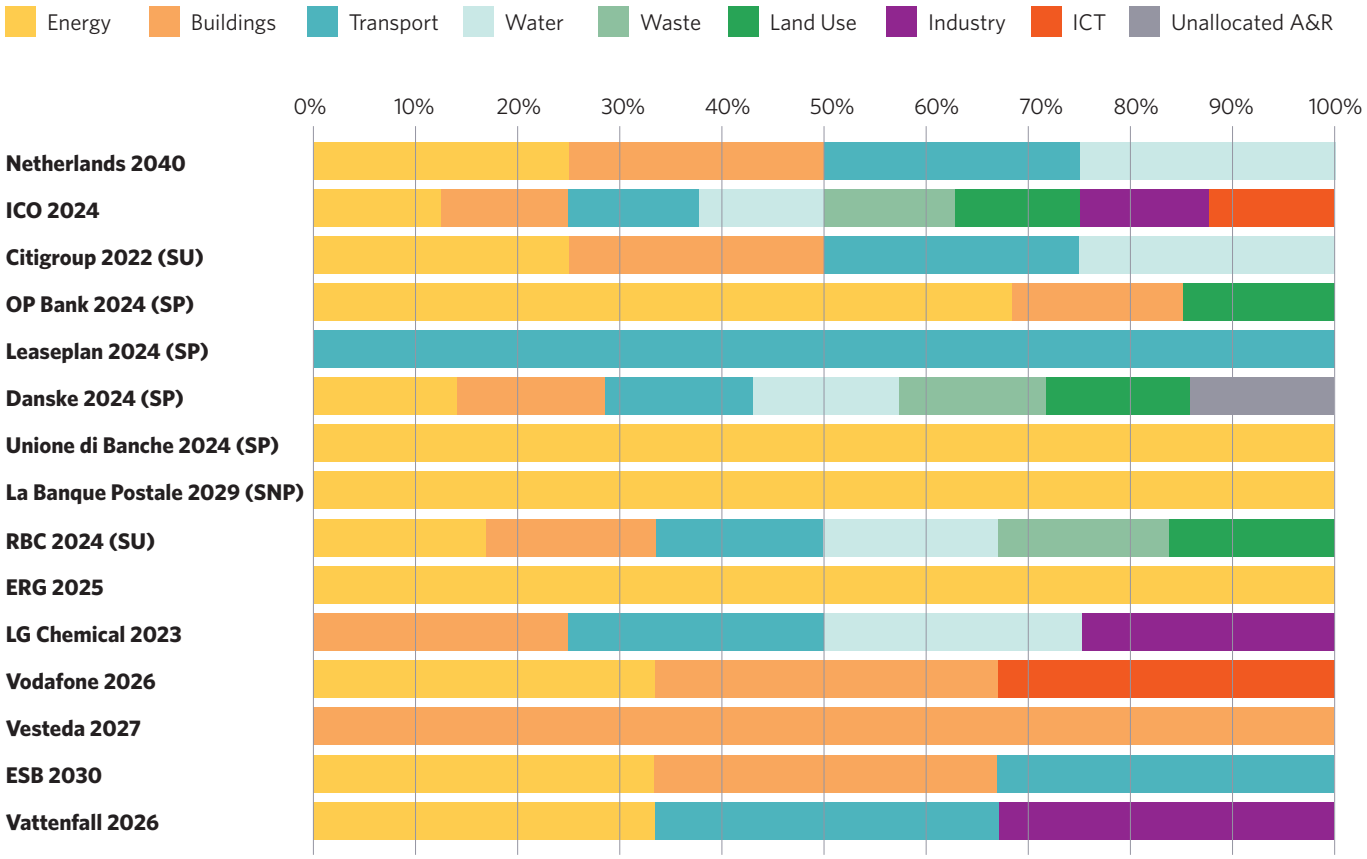
Remarks:

- Based on Moody's and S&P credit ratings, we have observed a broader range of seniority rankings for Financial Corporate green bonds in 2019. We have denoted the seniority rankings using the following abbreviations: Senior Preferred = SP, Senior Non-Preferred = SNP, Senior Unsecured = SU. As per our standard methodology, we match the payment rank of the green bond when selecting appropriate vanilla bonds with which to compare the performance.
- There is no index data for **LBBW** 2022 (USD, covered) because we don't have access to the correct index.
- We could not establish book cover data for **LG Chemical** 2029, and **FMO** 2024.
- Both **Societe du Grande Paris** & **SNCF Reseau** have been classified as SSA. They are compared to SSA indices, and comparable bonds have been chosen from this sector.

USD first time green bond issuers H1 2019: Energy is the preferred use of proceeds



EUR first time green bond issuers H1 2019: Energy is the preferred use of proceeds



2. Spread compression and book size: Spread compression and order book size of both green and vanilla bonds are the largest we have seen since 2016.

- **EUR:** Oversubscription average is 3.9x for green bonds, and 3.3x for vanilla bonds. Spread compression averaged -17 for green bonds and -16 for vanilla equivalents.
- **USD:** Oversubscription average is 4.1x for green bonds, and 4.5x for vanilla equivalents. Spread compression averaged -19 for green bonds and -20 for vanilla equivalents.

Green bonds are oversubscribed and undergo spread tightening during book building, just like vanilla bonds. We compare green bonds to vanilla equivalents to see whether there are any differences in the magnitude of change.

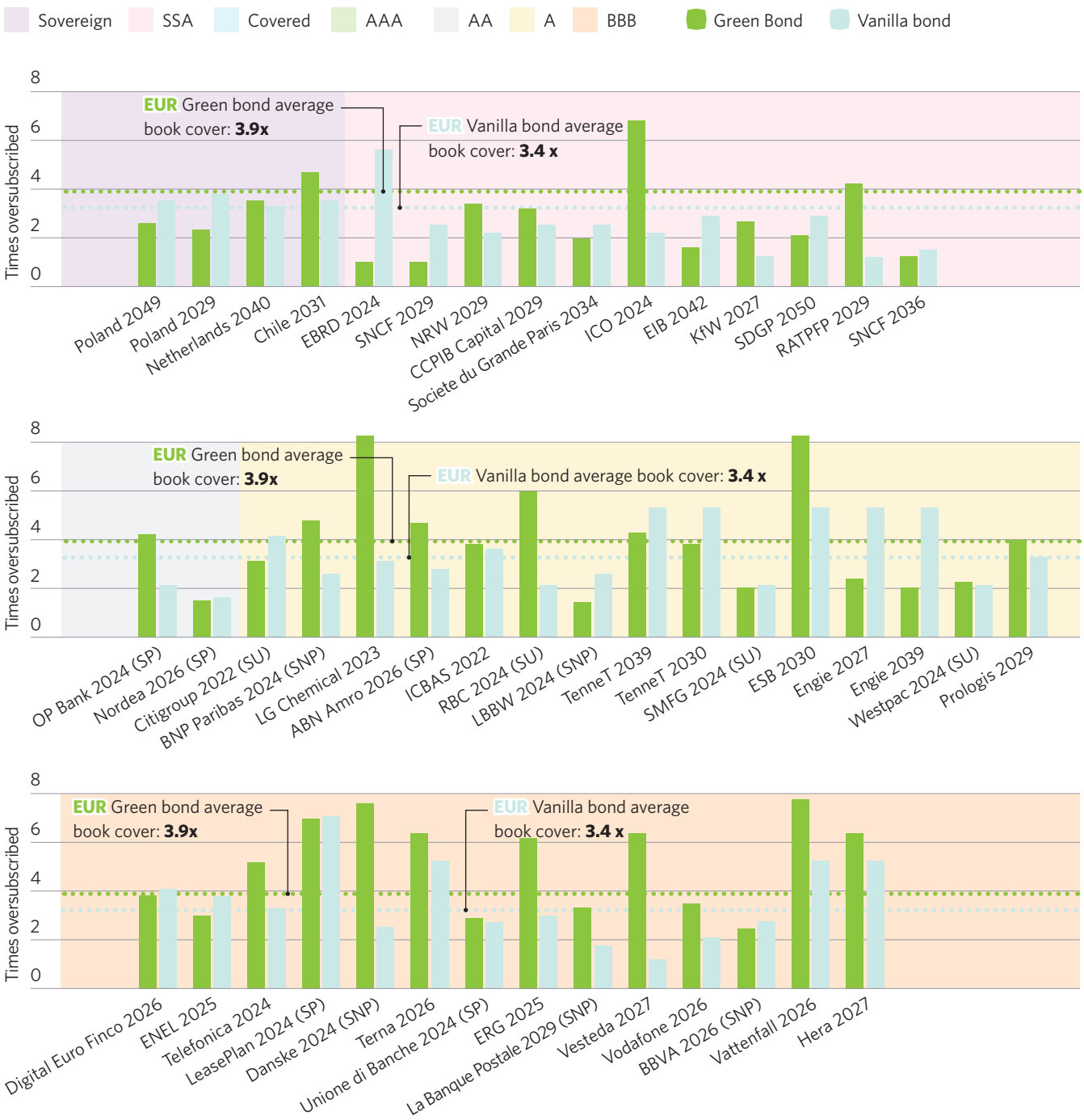
In H1 2019, average spread compression and oversubscriptions were the largest since we started monitoring them in January 2016. This applies both green and vanilla bonds. This indicates that investors wanted to buy all types of bonds. On average, EUR green bonds were more oversubscribed and tightened slightly more than vanilla equivalents, while in USD, vanilla bonds performed slightly better.

EUR green bond pricing

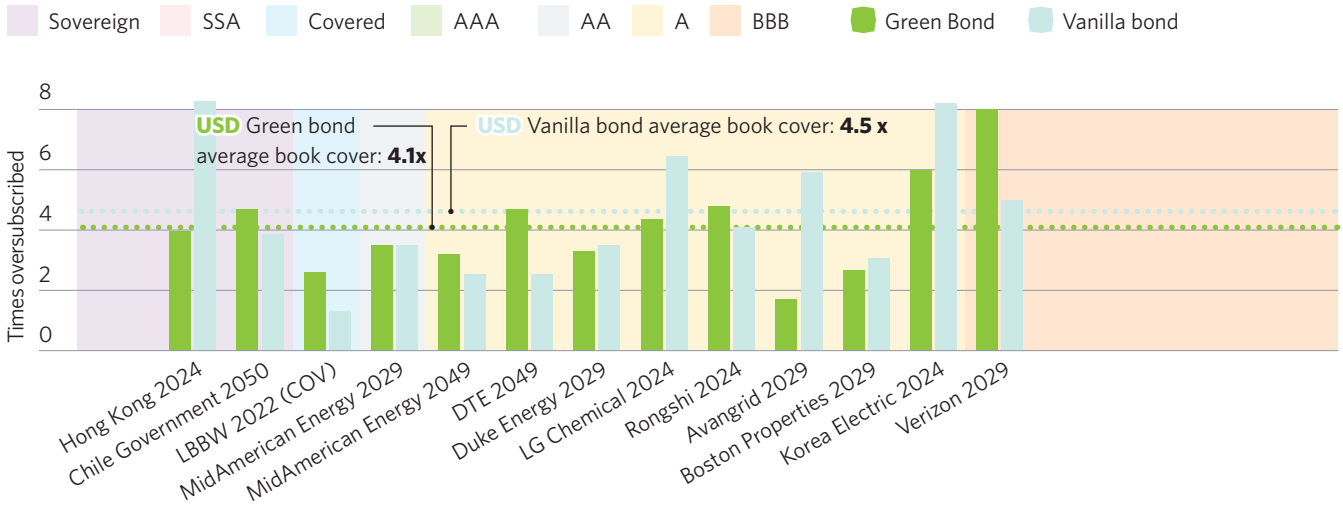
Individually, 26 out of 46 EUR green bonds attracted larger book cover than their vanilla baskets and 27 achieved greater spread compression during pricing.

Book cover. Prior to H1 2019, the largest

26 out of 46 EUR green bonds attracted higher book cover than vanilla equivalents



Seven out of 13 USD green bonds attracted higher book cover than vanilla equivalents



book cover we had seen for a EUR green bond in our sample was TenneT which attracted book cover of 7.5x when it issued two bonds in 2016 (2026 and 2036 maturities). Four of the EUR green bonds issued in H1 2019 exceeded that. Irish Utility ESB 2030 and Korean chemical company LG Chemical 2023 both attracted book cover of 8.2x their final size. ESB went on to price on its own yield curve, offering no new issue premium.

Spread compression. The highest spread compression in our EUR green bond sample had previously been 30bps (Lietuvos 2027, issued Q3 2017). In this observation period, three green bonds tightened by at least 32bps during book building. The most extreme example is Prologis 2029, which, having achieved 4x book cover, tightened by 35bps. We were unable to verify reports of a greenium for this bond, because there were insufficient bonds to build a yield curve.

USD green bond pricing

In USD, seven out of 13 green bonds attracted larger book cover than vanilla equivalents, while seven out of 15 exhibited larger spread compression.

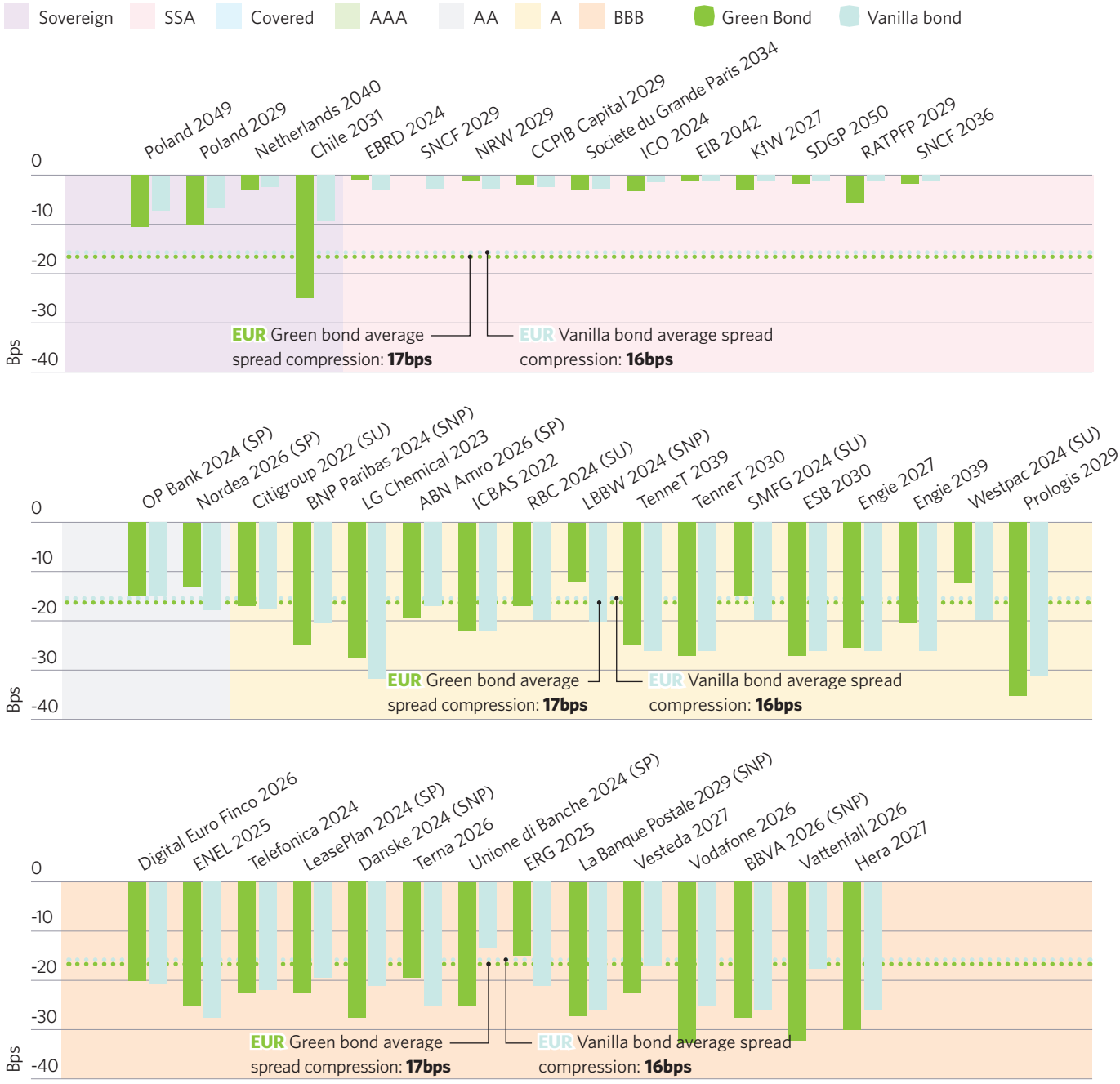
Book cover. Verizon 2029 had the largest book cover (eight times). The highest demand we have seen for a USD green bond in our sample remains Mexico City Airport 2026, issued in Q3 2016 which achieved book cover of 10x. Verizon 2029 has a Bloomberg composite credit rating of BBB+, but while Mexico City Airport introduced Emerging Market (EM) risk, Verizon has a Developed Market (DM) country of risk.[5] As the first green bond from a US Telecom company, the diversification opportunity would have also been a big draw for investors, and the bond priced on its own yield curve.

Spread compression. Green bonds achieving the largest spread compression were both domiciled in Emerging Markets (EM): Chinese development bank, Rongshi 2024 and Korean LG Chemical 2024 each tightened by 30bps.

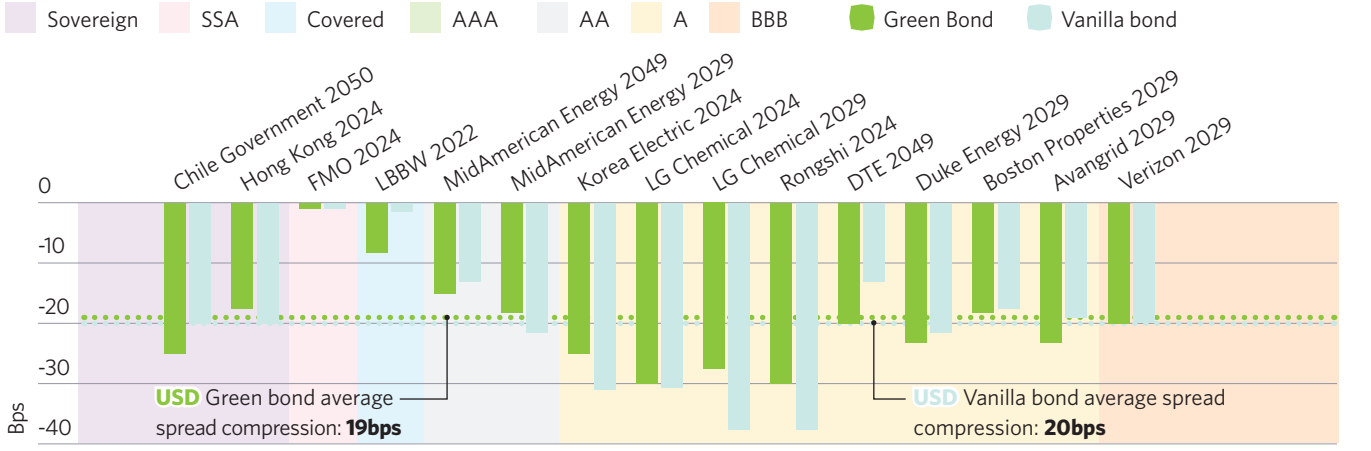
Following a subdued market towards the end of 2018, demand for all types of bonds has rebounded. Demand for green bonds is greatest in Europe and the green label appears to impact bookbuilding of EUR bonds. In H1 2019, this demand extended to USD-denominated names offering yield.

Methodology notes: Baskets comprise bonds that most closely match the green bonds and are issued during the same quarter. The baskets in this publication include between one and five bonds. For methodology discussion, see page 24, and for summary statistics of the baskets, see page 19-22.

26 out of 46 EUR green bonds tightened by more than their vanilla baskets during the pricing process



Seven out of 15 USD green bonds tightened by more than their vanilla basket during the pricing process



3. Green allocations: 53% of the amount raised by green bonds was allocated to investors declaring themselves as green

- 53% of the amount raised through green bonds in our sample was allocated to those labelling themselves as green or socially responsible.
- 31 issuers provided data and among those who did not, many reported high participation from green investors.

Investors declaring themselves as green are growing in number and constitute a unique category of support for green bonds. This has positive ramifications such as giving issuers more flexibility about the timing of taps, and repeat issuance.

Since none of the broad market indices actively exclude green bonds, there is a **growing contingent of mainstream investors** too. Non-dedicated green bond investors remain an important source of support for green bond issuers since they currently absorb close to half of green bond primary paper.

All issuers in our H1 2019 sample were asked what percentage of their bond was allocated to green investors. Twenty-eight issuers shared distribution data for 31 green bonds, split 25 EUR and six USD.

- **USD bonds:** The lowest allocation to investors describing themselves as green was 20% (DTE 2049) and the maximum was 70% (Verizon 2029).
- **EUR bonds:** the minimum allocation to green investors was 25% (ERG 2025) with the highest being Vesteda 2027 at 80%.

Demand from green investors is robust. The overall average of 53% matches exactly with the data from our H2 2018 publication.[6] This suggests that despite a material increase in the number of large green bonds issued in H1 2019, demand from green investors has remained robust. Verizon (2029) said that the company pushed allocations to green investors as high as it could to achieve investor diversification and reward ESG investors who otherwise cannot buy its offerings.

The market is still being supported by mainstream investors who have no reason not to buy green bonds, and indeed in some sectors, green bonds are becoming increasingly hard to avoid.

Credit Agricole CIB and Citi offer definitions of "green investor"

Twenty-four issuers, encompassing thirty green bonds, either could not or did not want to disclose how much of their green bond was allocated to green investors, citing the lack of a clear definition of a green investor.

One issuer noted that the investors they had not classified as 'green' had all signed the Principles for Responsible Investment (PRI). Signing the PRI is the starting point but is apparently not a commitment to green investment unless accompanied by further signaling. The emergence of clear definitions will ultimately enable identification of this investor category and make it easier for issuers to design bonds to meet investor needs.

For example, Credit Agricole CIB (CACIB) and Citi explained how they define a green investor, and the common thread is the public declaration of a commitment to invest in green bonds.

CACIB considers a "green bond investor" as any entity identified at least by two out of the three following criteria:

- Has taken a public commitment to invest in green bonds, potentially with target amounts.
- Has an internal organisation to analyse green bonds, including at least one expert person.
- Has been – to the best of our knowledge - noticeably more active in the green bond primary market than in the vanilla bond market.

CACIB acknowledged that while this classification was done in good faith, absence of official definition of "green bond investors" meant that it was by no means exhaustive.

For Citi's inaugural benchmark "green motivated investors" were defined as:

- Investors with a dedicated green/ESG bond fund.
- Investors with a public mandate to buy green bonds.
- Investors publicly active in the green bond market.
- Direct feedback from investors confirming their interest in the bond due to its green characteristics.

Dutch State Treasury Agency endorsed a formal "green investor" declaration

The Dutch State Treasury Agency (DSTA) endorsed a formal declaration by offering priority allocation of their first green Sovereign, Netherlands 2040, to 'real money' (unleveraged) bidders willing to declare their green credentials. Investors were invited to certify that they met at least three of the four criteria formulated by the DSTA with a letter signed by their head of compliance. The four criteria were:

1. It has established a dedicated team within its organisation, which performs Environmental, Social and Governance (ESG) analyses for the investment universe of the organisation;
2. It has specific ESG requirements and criteria related to green bonds (e.g. reporting), which need to be met in order to be able to invest in a green bond;
3. It aims to potentially purchase green bonds offered by the State of the Netherlands either for full or partial inclusion in a specific green (bond) fund or to take the purchased volume into account for a specific target on green bonds amounts;
4. It intends to transparently report on its investments in green bonds in its annual report or specific sustainability/ responsible investment report.

Prior to the auction, 32 investors were registered as green investors and could benefit from priority allocation over other real money investors. Priority allocation could be as much as up to 10% of their bids at the cut-off spread. At the cut-off spread, 82.5% of the bids from 'green real money' accounts were allocated (compared to 72.5% for 'real money accounts' and 18.5% for the 'other' category).

We are encouraged by these actions from prominent market participants, particularly a Sovereign issuer which could set an example for the market. We await further developments to establish clear definitions.

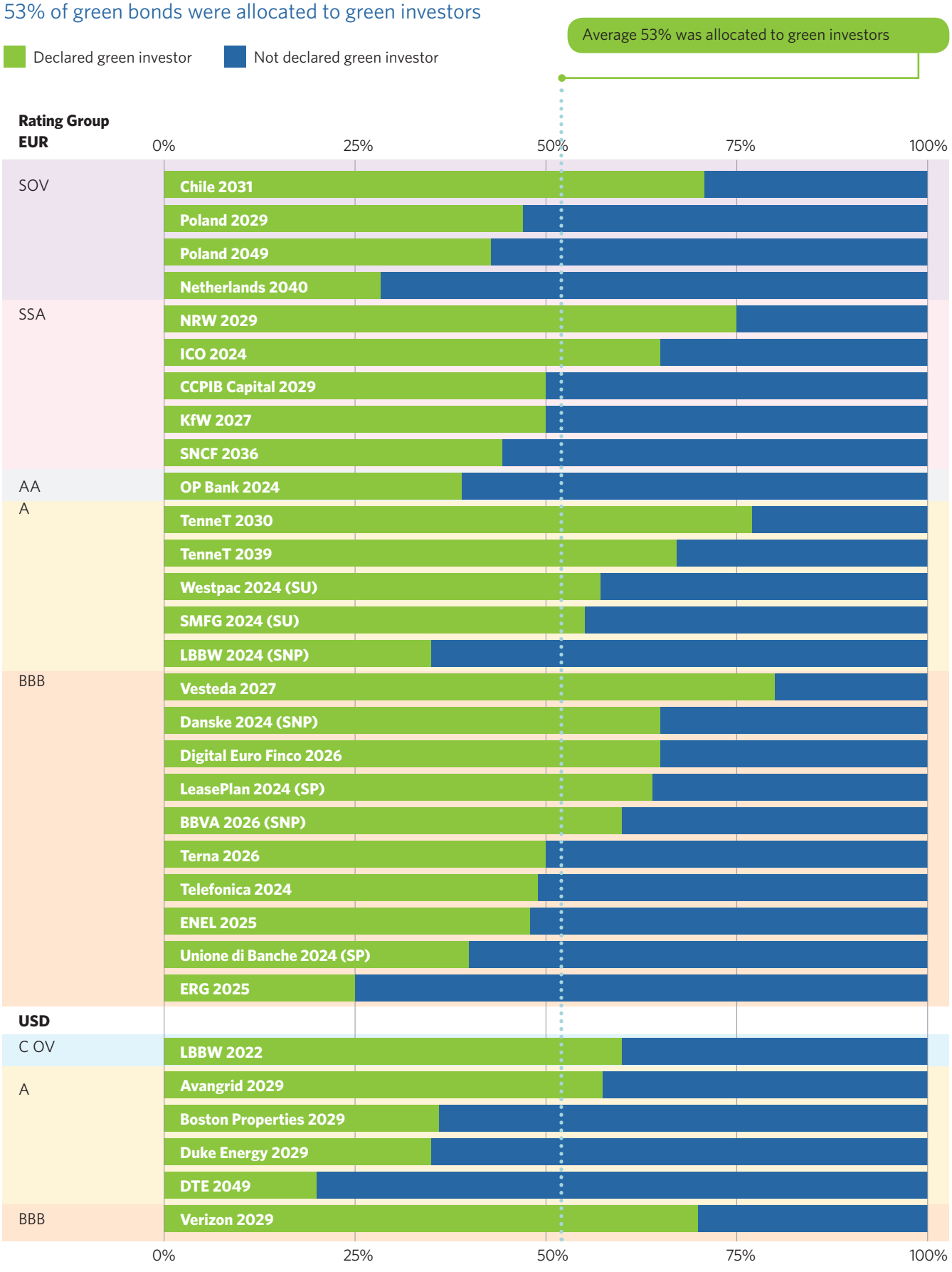
Even where precise allocations were not disclosed, it seems green investor participation was high

Among the issuers who did not want to disclose precise allocations, the tone of their responses suggested that green investor participation was substantial:

- **Enel** (2025) issued a media release describing participation from a "significant proportion of Socially Responsible Investors".[7]
- **Vodafone** (2026) told us that every investor who was allocated had at least one green or ESG specific fund.
- **Vattenfall** (2026) wrote: "There was significant interest from investors with specific SRI/green funds and this element was taken into consideration during the allocation process".
- **ABN Amro** (2026, SP) explained that more than half of the bond was allocated to investors who incorporate ESG considerations into their investment decisions.

Methodology notes: Green investor participation is provided by issuers. There is no methodology for defining a 'green' investor, and we acknowledge that there may be differing interpretations. There is also no way to monitor how investors split their allocations of green bonds among their different portfolios.

53% of green bonds were allocated to green investors



4. The Greenium: Two thirds of green bonds priced on or inside their yield curves

The new issue premium is extra yield that a buyer receives, and a seller pays for a new bond in comparison to where seasoned bonds from the same issuer are trading in the secondary market at the time of issuance. A new issue premium is a standard feature of the bond market.

Sometimes, a bond may be issued with a higher price, and thus lower yield compared to outstanding debt. The bond will price inside its own yield curve. This is known as a new issue concession, or when present in a green bond, we have termed it a greenium.

There is no reason why a bond being green should impact its price, since green bonds rank pari-passu (on equal footing) with bonds of the same rank and issuer. There is no credit enhancement to explain pricing differences and issuers of green bonds incur albeit negligible costs such as third-party review and certification. Green bonds and vanilla equivalents are subject to the same market dynamics such as supply, rate expectations, and geo-political issues.

Among our H1 2019 sample, 32 bonds from 26 issuers had enough data to build yield curves. Eighteen of those issuers have already issued at least one green bond. Twelve green bonds priced with normal new issue premia, 15 priced on their curves, and six exhibited a greenium: in EUR, EIB 2042, Terna 2026, Vodafone 2026, KfW 2027, and Netherlands 2040, and in USD Chile 2050.

Two of the six green bonds exhibiting a greenium were long dated sovereigns: Chile 2050 (USD), and Netherlands 2040 (EUR). Chile attracted at least 40 new investors because of the green label, the yield and the diversification angle may have been attractive to green investors enabling Chile to print with its lowest ever yield. The Dutch green bond was 3.5x covered. The relatively low risk, large and long-dated bond would have appealed to insurers and pension funds irrespective of a green mandate, but the green label would have attracted specialist investors, too, adding extra pressure to the pricing.

The fact that almost two thirds of the bonds in our sample priced without a normal new issue premium is quite extraordinary and emphasises the strength of demand for bonds in our sample.

Spotlight on TenneT

TenneT has not issued a vanilla bond since 2013. The Dutch state-owned transmission system operator has a total 18 bonds outstanding with a face value of EUR8.9bn (USD10.3bn).

Fourteen of those bonds are eligible for our yield curve analysis, and 11 are green, including the two issued in H2 2019. We plot the green and vanilla curves separately. The green curve sits inside the vanilla curve. The two new bonds are then plotted separately, and both sit on the green curve. We clearly see that the market attaches a value to the green label.

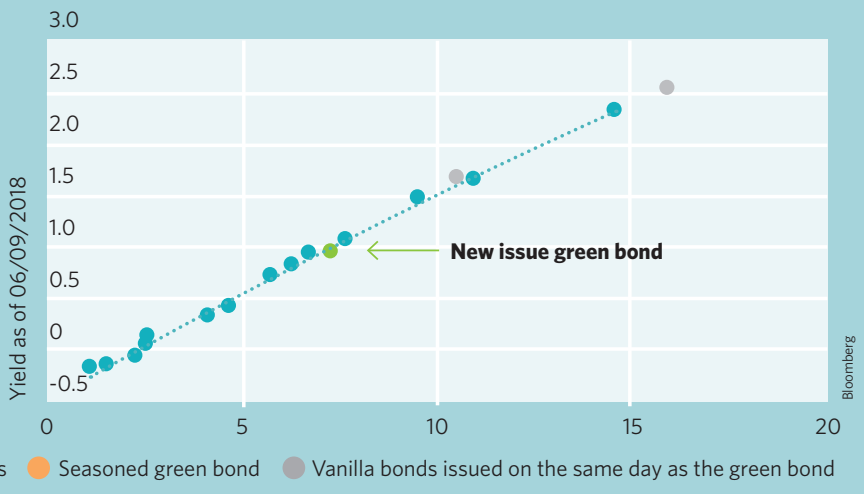
TenneT 2030 & 2039 EUR - on the green curve

Spotlight on Vodafone

Vodafone 2026 was issued on the same day as two more, longer dated bonds. Both the longer-dated bonds priced outside the existing curve, while the green bond priced slightly inside the curve.

Vodafone is only the second issuer to bring an EUR bond in the telecom sector, offering a diversification opportunity to EUR green bond investors.

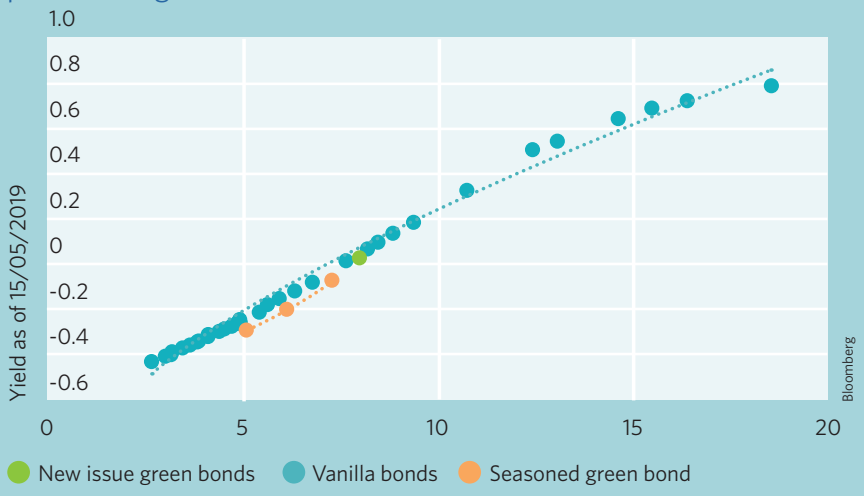
Vodafone 2026 EUR - greenium



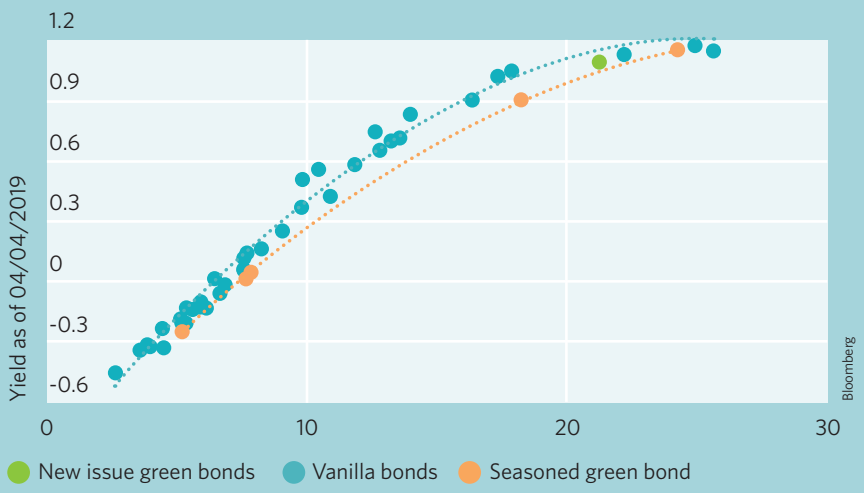
Spotlight on development bank green bond pricing

German development bank KfW and multi-lateral EIB both have secondary market green curves, which sit inside their vanilla curves. KfW 2027 priced outside its green curve, but with a greenium compared to its vanilla curve. EIB 2042 priced with a greenium to its vanilla curve, and on its green curve. As we have noted in past papers, where green yield curves are present for SSA bonds, green bonds can be priced relative to those rather than a vanilla cohort.

KFW 2027 EUR - greenium to vanilla curve, new issue premium to green curve

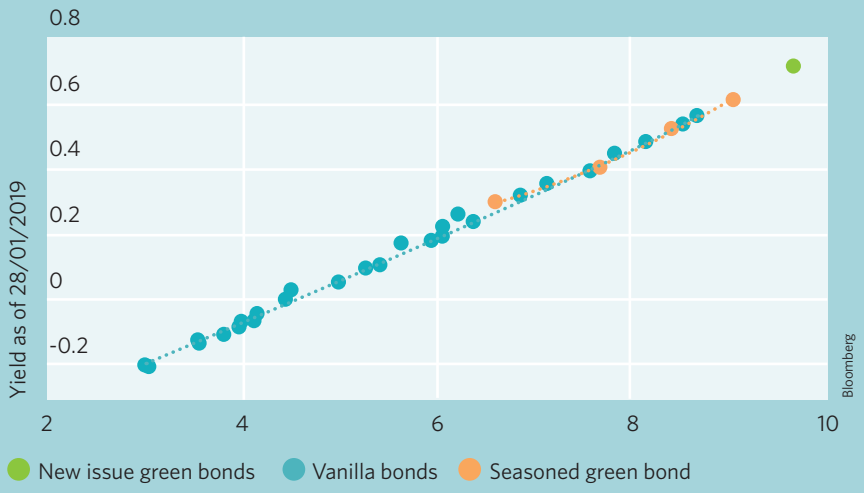


EIB 2042 EUR - greenium to vanilla curve, on the green curve

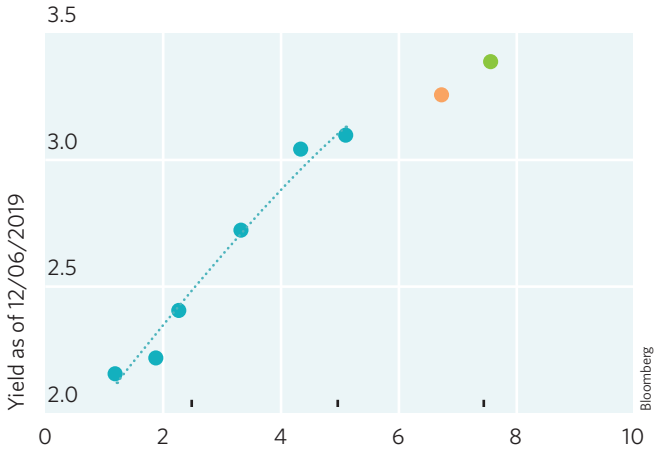


German state development bank NRW. Bank has a separate green curve, as well, comprising four bonds. This curve was trading in line with the vanilla curve when NRW Bank issued a new green bond in January 2019. The new green bond priced in line with the existing curves.

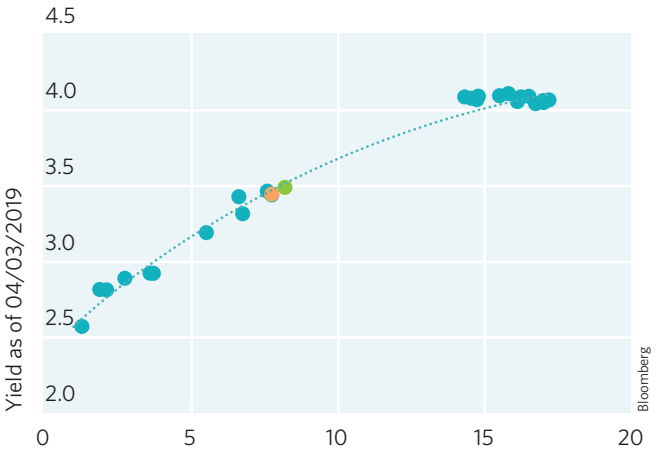
NRW Bank 2029 EUR - on the curve



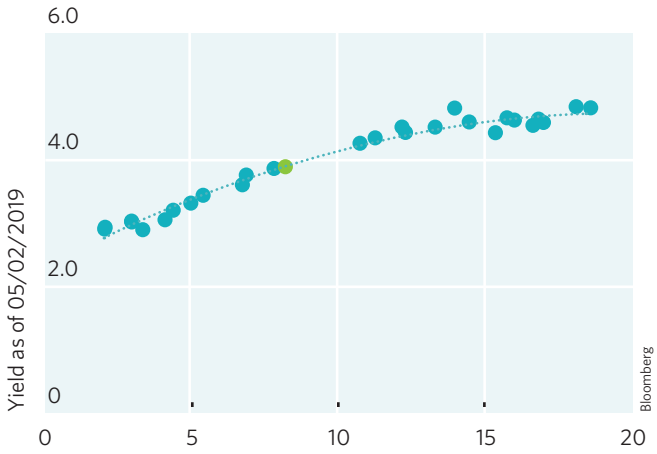
Boston Properties 2029 USD - on the curve



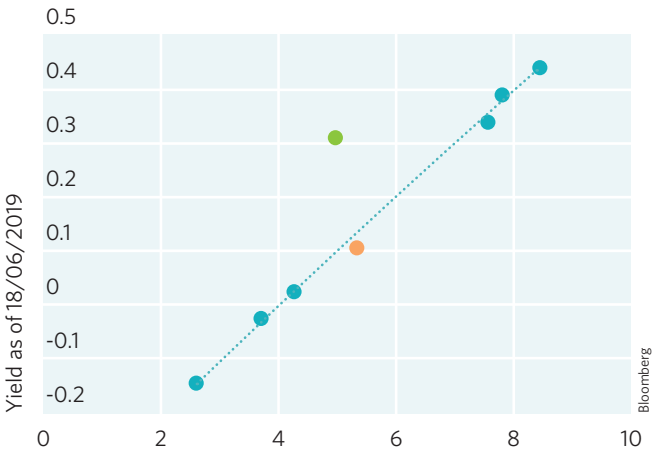
Duke Energy 2029 - priced on the curve



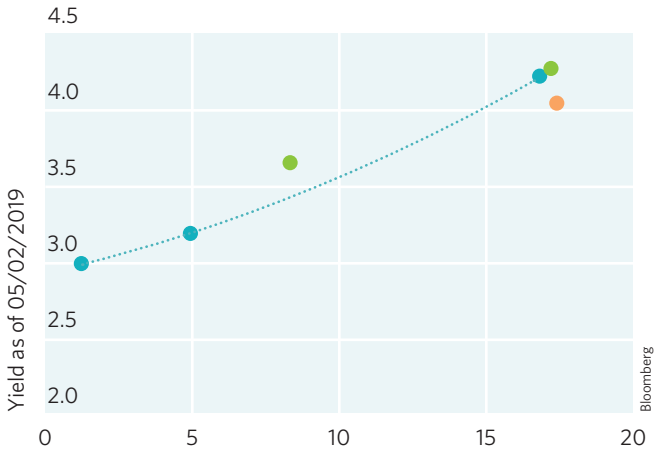
Verizon 2029 USD - on the curve



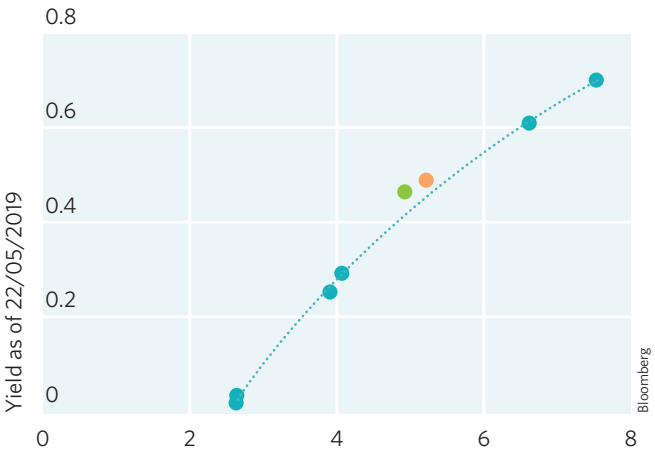
Westpac 2024 EUR - new issue premium



MidAmerican Energy 2029 & 2049 - new issue premium (2029) and on the curve (2049)

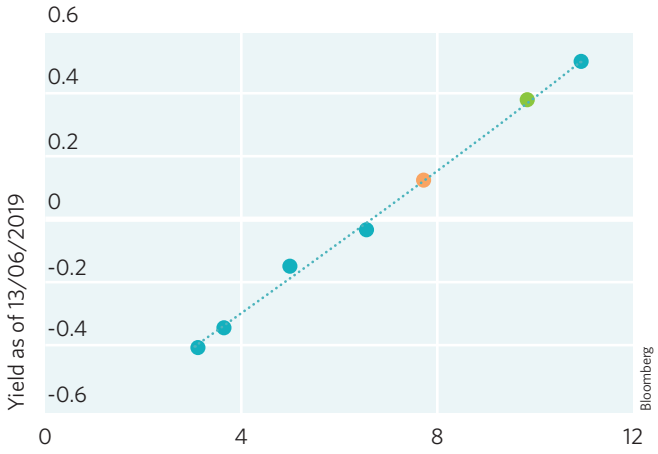


Sumibank 2024 (SU) EUR - new issue premium

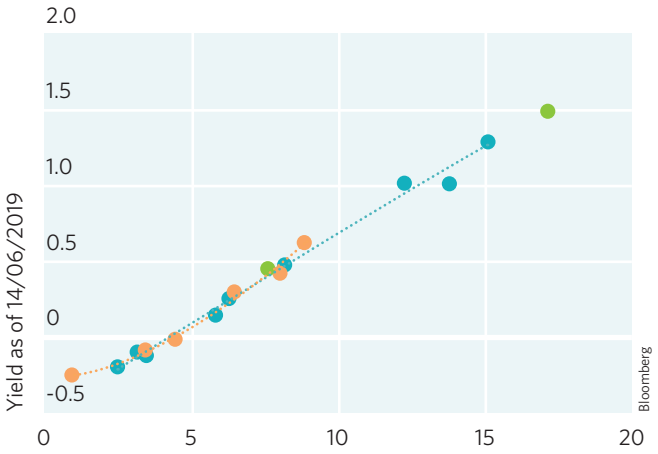


New issue green bonds Vanilla bonds Seasoned green bond Non-green bond issued on the same day as the green bonds

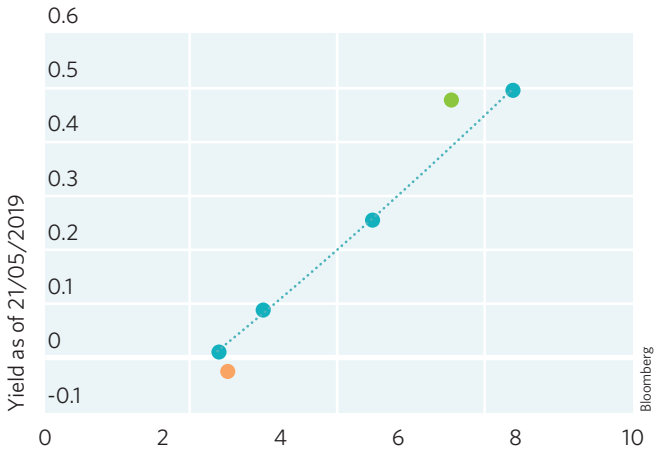
RATPFP EUR 2029 - on the curve



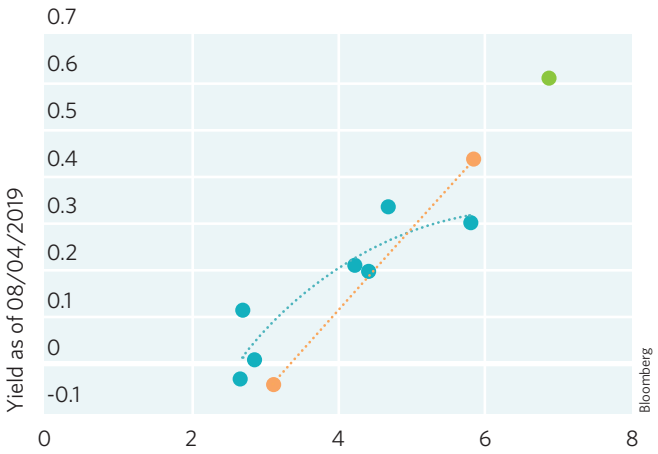
Engie 2027 & 2039 EUR - on the curve



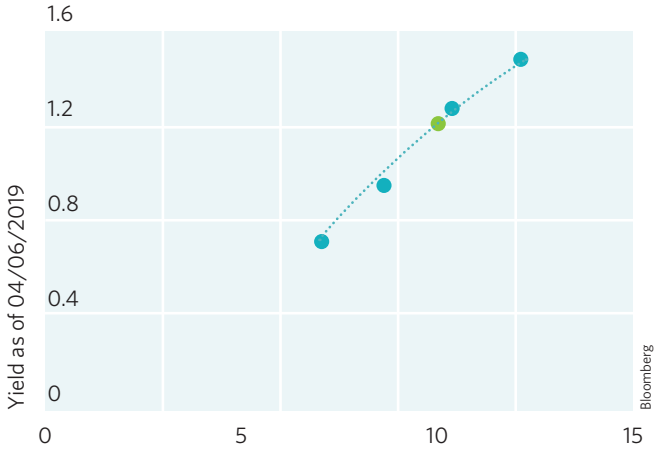
Nordea 2026 (SP) EUR - new issue premium



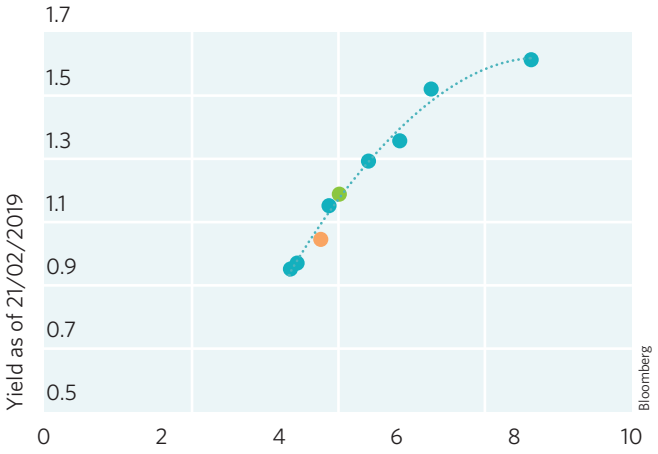
ABN 2026 EUR (SP) - new issue premium



ESB 2029 EUR - on the curve

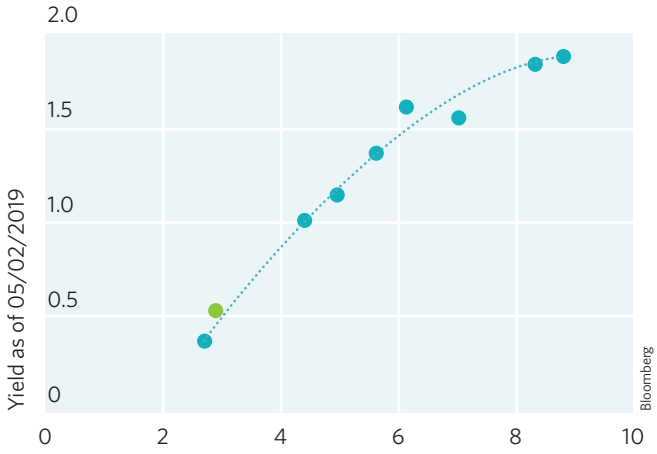


BNP 2024 (SNP) EUR - on the curve

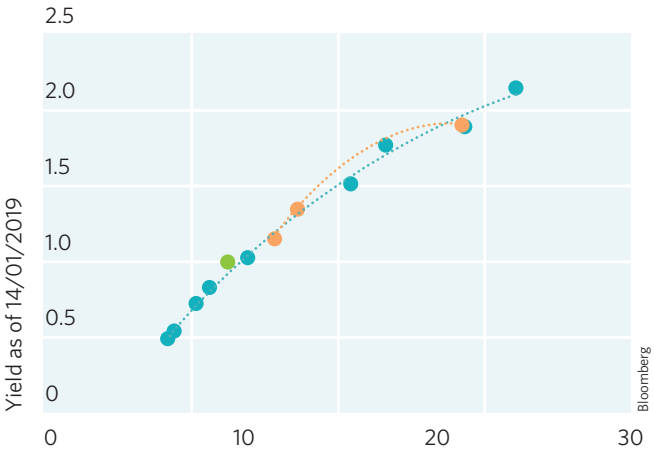


New issue green bonds Vanilla bonds Seasoned green bond Non-green bond issued on the same day as the green bonds

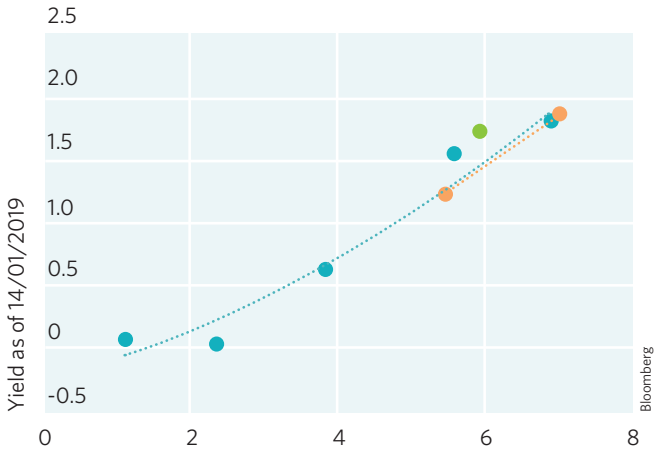
C 2022 EUR (SU) - new issue premium



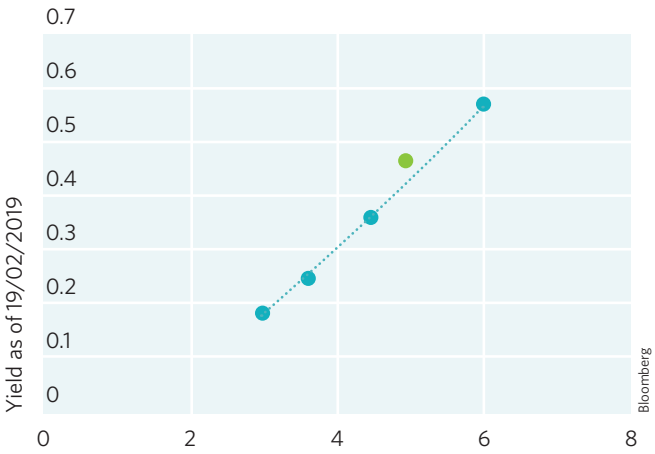
SNCF 2029 EUR - new issue premium



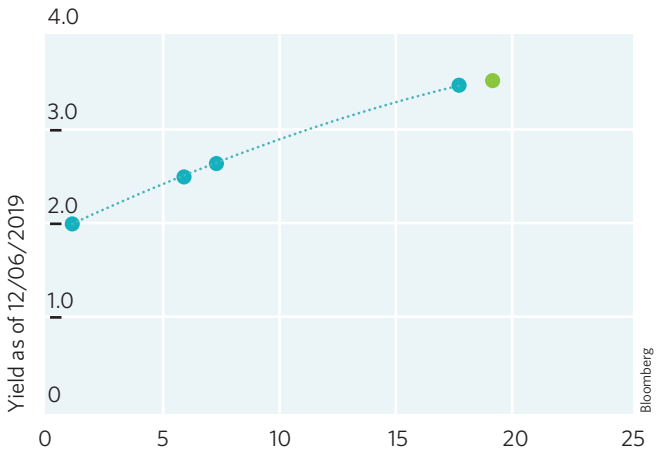
ENEL 2025 EUR - new issue premium



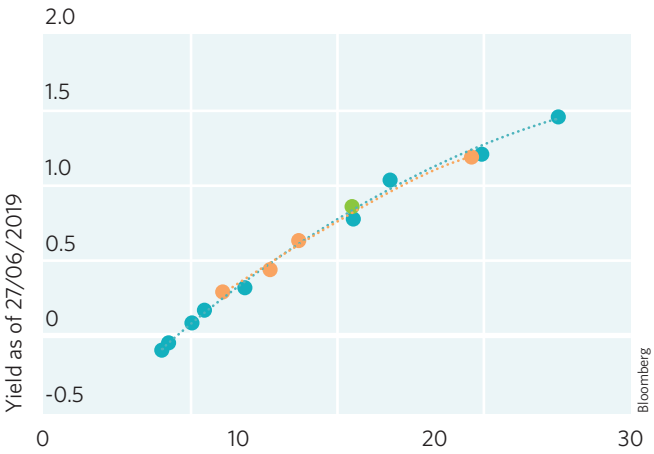
OP Bank 2024 (SU) EUR - new issue premium



Chile 2050 USD - greenium

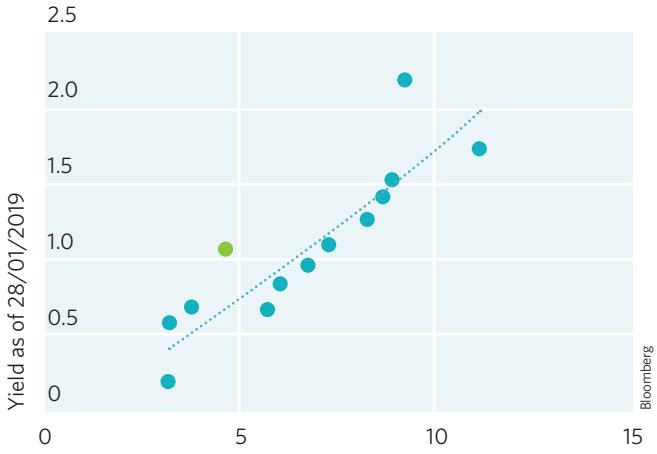


SNCF 2036 EUR - on the curve

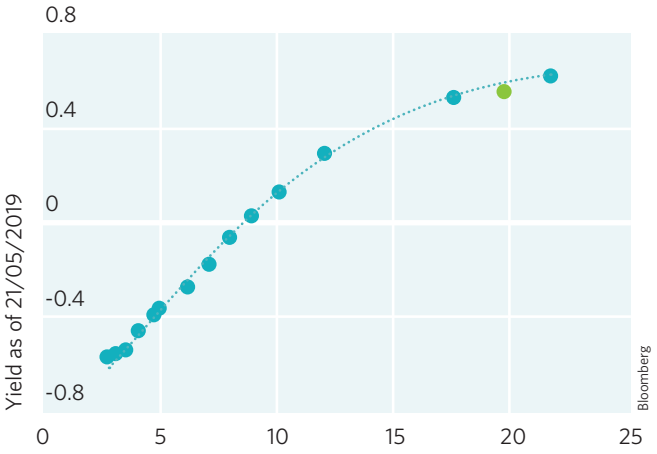


New issue green bonds Vanilla bonds Seasoned green bond Non-green bond issued on the same day as the green bonds

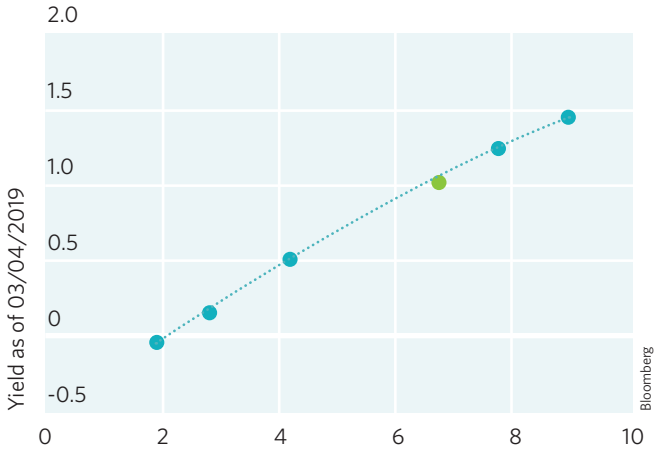
Telefonica 2024 EUR - new issue premium



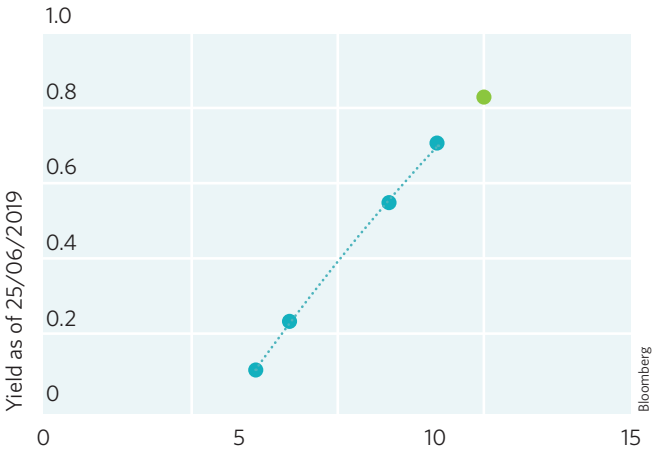
Netherlands 2040 EUR - greeenium



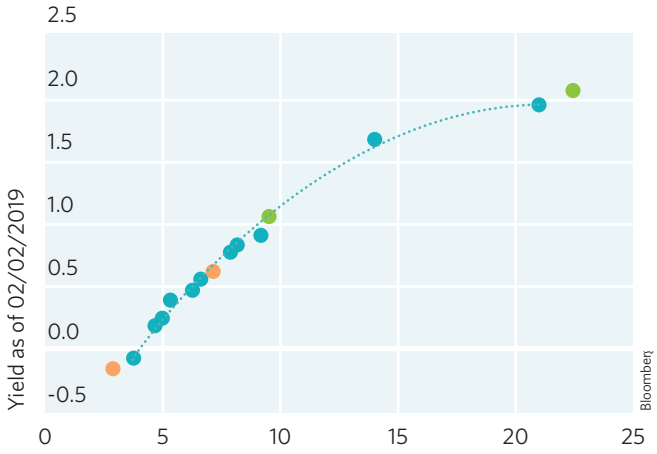
Terna 2026 EUR - greenium



Chile 2031 EUR - on the curve



Poland 2029 & 2049 EUR - on the curve (2029) & new issue premium (2049)



Methodology notes: We use yield on issue date, which reflects the price that the green bond offered on the pricing date. For comparable bonds, we use the yield-to-convention-mid.

For all bonds, we use modified duration to mid, and all the data is as of the pricing date of the green bond. The modified duration is the percentage price change of a security for a given change in yield. Modified duration increases with risk.

First, we plot seasoned vanilla bonds (blue dots) and fit a 2nd order polynomial yield curve. Next we overlay any seasoned green bonds (orange), finally, we add our subject bonds (green). We include the yield curves of bonds in our sample with a minimum of four suitable comparable bonds.

Comparable bonds used for this exercise must fit the specification for green bond selection outlined on page 24, except that the use of proceeds is not limited. Bonds must share the same credit rating and payment rank as the green bond and have been issued on or after 01/01/2010.

New issue green bonds Vanilla bonds Seasoned green bond Non-green bond issued on the same day as the green bonds

5. Green bond ETFs: Franklin Templeton brings the total to five

Franklin Templeton launched a green bond ETF in April 2019. So, at the end of June 2019 there were three EUR and two USD green bond ETFs. The rapid growth of these products confirms investor appetite for green bonds. The expansion of the green bond ETF space will give additional value to the green bond label which will be used to determine eligibility.

	Van Eck Vectors Green Bond ETF	Lyxor Green Bond ETF	iShares Global Green Bond ETF	UC MSCI European Green Bond ETF	Franklin Liberty Euro Green Bond ETF
Currency	EUR	EUR	USD	EUR	EUR
Index	Solactive Green Bond Index	Solactive Green Bond Index	Bloomberg Barclays MSCI Global Green Bond Select	Bloomberg Barclays MSCI European GB Issuer Capped EUR Index	Bloomberg Barclays MSCI Euro Green Bond Index
Launch Date	February 2017	February 2017	November 2018	November 2018	April 2019
Size at launch	EUR5m	EUR5m	USD25m	EUR20m	EUR10m
Market capitalisation June 2019	EUR63.5m	EUR63.5m	USD26.85m	EUR21.32m	EUR10.17m

6. Performance in the immediate secondary market

- **7 days after pricing,** 46% of green bonds had tightened more than comparable bonds, 59% had tightened more than their corresponding index.
- **28 days after pricing,** 61% of green bonds had tightened more than comparable bonds, and 57% had tightened against their corresponding index.

Many bonds deliver price tightening in the immediate secondary market. Investors may want to increase their position or take a position in a bond they did not get allocated. For bonds issued early in the month, this could be an opportunity for mangers to add some off-benchmark performance before bonds are added to benchmark indices at month end. We monitor what happens to bond spreads in the immediate secondary market. We don't go any further than one month since liquidity becomes patchy once bonds are added to indices.

In H1 2019, 61% of green bonds had tightened seven days after pricing, rising to 70% after 28 days. To contextualise this performance, we compare green bonds with two alternatives. Firstly, we match each bond with a basket of bonds sharing similar characteristics issued during the same quarter (see methodology notes). Secondly, we compare green bonds to matched indices to monitor their performance against the 'market'.

After seven days,

- 46% of green bonds had tightened by more than their baskets: 48% of EUR and 40% of USD green bonds.
- 59% of green bonds had tightened by more than their corresponding index: 67% of EUR and 33% of USD green bonds.

These numbers are a bit lower than what we saw in 2018, perhaps because many bonds priced quite tightly in H1 2019 and there wasn't much room left for investors to manoeuvre.

After 28 days,

- 61% of green bonds had tightened by more than their baskets: 61% of EUR and 60% of USD green bonds.
- 57% of green bonds had also tightened when compared to corresponding indices: 57% of both EUR and USD green bonds.

EUR green bonds tend to perform better than USD ones in the secondary market, but in H1 2019 there was not much difference. Demand for both EUR and USD green bond was firm 28 days after pricing.

Methodology notes:

1. Comparable baskets. Each bond is matched with a basket of comparable bonds issued in the same quarter (except where noted), fitting the parameters described on page 24. The number of bonds is each basket ranges from one to five according to what has been issued in a given quarter. Summary statistics of the baskets are on page 19-22. Bonds can behave differently according to which part of the month they are issued in. Geopolitical events can influence bond prices. We use comparable baskets because green and vanilla bonds sharing similar characteristics are rarely issued on the same day. We have created this proxy to illustrate what else an investor could have done with their money during the same quarter.
2. Indices. We compare each bond to a standard iBoxx index.[8] The indices are granulated by currency, asset class, tenor, and credit rating all of which can influence the behaviour of a bond. Each bond is therefore compared to an index sharing similar characteristics, for example, Vattenfall 2026 is matched with the iBoxx EUR Corporates BBB 7-10 Year Index.

Seven calendar days include five data observations. Twenty-eight calendar days includes 20 data observations.

		% change 1 week			% change 1 month		
Rating Group	Bond	Green Bond	Vanilla Basket	Corresponding iBoxx Index	Green Bond	Vanilla Basket	Corresponding iBoxx Index
SOV	Poland 2049	3%	-2%	2%	14%	3%	4%
	Poland 2029	11%	-25%	2%	23%	-16%	4%
	Netherlands 2040	-2%	-20%	3%	-7%	-5%	-17%
	Chile 2031	3%	-39%	2%	6%	-66%	-7%
SSA	EBRD 2024	11%	-15%	3%	19%	-31%	-9%
	SNCF 2029	4%	-53%	-10%	8%	-22%	-17%
	CCPIB Capital 2029	-21%	-53%	-7%	-33%	-22%	-15%
	NRW 2029	64%	-26%	-7%	-32%	-31%	-15%
	Societe du Grande Paris 2034	-22%	-53%	2%	-36%	-22%	5%
	ICO 2024	-12%	154%	5%	-53%	113%	27%
	EIB 2042	163%	48%	0%	-192%	0%	3%
	KfW 2027	1%	61%	1%	6%	49%	-4%
	SDGP 2050	-5%	48%	3%	-24%	0%	-10%
	RATPFP 2029	-43%	61%	-16%	-44%	49%	-36%
	SNCF 2036	-26%	59%	6%	-2%	20%	-4%
AA	OP Bank 2024	-6%	-8%	1%	-8%	22%	-4%
	Nordea 2026 (SP)	11%	-2%	18%	19%	6%	27%
A	Citigroup 2022	-9%	-21%	-4%	-7%	-31%	-22%
	BNP Paribas 2024 (SNP)	-16%	-7%	-7%	-23%	-13%	-11%
	LG Chemical 2023	-28%	-12%	-6%	-36%	-23%	-16%
	ABN Amro 2026 (SP)	0%	-5%	-7%	-14%	-24%	-17%
	ICBAS 2022	-12%	-13%	-6%	-22%	-19%	5%
	RBC 2024 (SU)	-12%	3%	-5%	13%	14%	23%
	LBBW 2024 (SNP)	-1%	-7%	8%	1%	-14%	11%
	TenneT 2030	13%	-1%	7%	19%	-3%	6%
	TenneT 2039	10%	-1%	7%	17%	-3%	6%
	SMFG 2024 (SU)	9%	3%	9%	15%	10%	-1%
	ESB 2030	-14%	-1%	-7%	-31%	-3%	-21%
	Engie 2027	-21%	-1%	-14%	-15%	-3%	-23%
	Engie 2039	-15%	-1%	-16%	-18%	-3%	-21%
	Westpac 2024 (SU)	-11%	3%	-9%	-26%	14%	-12%
	Prologis 2029	5%	3%	-2%	1%	-1%-	-13%
BBB	Digital Euro Finco 2026	-1%	-9%	3%	-20%	-18%	-9%
	ENEL 2025	-9%	-4%	-6%	-19%	-12%	-10%
	Telefonica 2024	-17%	-12%	-6%	-14%	-10%	-12%
	LeasePlan 2024 (SP)	-7%	-6%	3%	-9%	-16%	-6%
	Danske 2024 (SNP)	-7%	-7%	-9%	-9%	-13%	-14%
	Unione di Banche 2024 (SP)	0%	-8%	0%	2%	-23%	-16%
	Terna 2026	-16%	-1%	0%	-36%	-3%	-14%
	ERG 2025	-6%	3%	-2%	-15%	12%	-15%
	La Banque Postale 2029 (SNP)	-10%	1%	-2%	7%	7%	2%
	Vesteda 2027	-6%	-2%	5%	-15%	-1%	5%
	Vodafone 2026	4%	-2%	6%	-3%	-9%	1%
	BBVA 2026 (SNP)	-8%	-7%	-7%	-27%	-20%	-18%
	Vattenfall 2026	-11%	-1%	-10%	-11%	-3%	-20%
	Hera 2027	-22%	-1%	0%	-48%	-3%	-10%
SOV	Hong Kong 2024	7%	-2%	11%	8%	-8%	2%
	Chile Government 2050	-4%	-2%	-5%	-15%	-2%	-11%
SSA	FMO 2024	-1%	-1%	1%	-6%	-2%	-5%
COV	LBBW 2022	-13%	-19%	N/A	-7%	-4%	N/A
AA	MidAmerican Energy 2049	-4%	-2%	-3%	-21%	-5%	-17%
	MidAmerican Energy 2029	1%	-4%	-4%	-18%	-9%	-24%
A	DTE 2049	3%	-2%	-1%	0%	-5%	-1%
	Duke Energy 2029	6%	-4%	4%	-2%	-9%	0%
	LG Chemical 2024	0%	0%	-4%	0%	1%	-1%
	LG Chemical 2029	-3%	5%	-6%	-3%	-1%	-1%
	Rongshi 2024	3%	0%	1%	-6%	-1%	8%
	Avangrid 2029	-2%	-1%	0%	3%	-12%	3%
	Boston Properties 2029	-3%	0%	-2%	-13%	-11%	-10%
	Korea Electric 2024	16%	-4%	-10%	16%	-4%	-15%
BBB	Verizon 2029	2%	-5%	2%	-1%	-11%	-2%

7. Spotlight on Utility issuers: Half of EUR Utility bonds issued in H1 2019 were green

Eight EUR benchmark green bonds from the Utilities sector totalling USD5.3bn were issued in Q2 2019.[9] Finding comparable bonds (same characteristics including, but not limited to, a minimum size of USD500m) was challenging. There were two suitable EUR vanilla bonds issued in the Utility sector during this time: ACEA SpA 2028 and ENEXIS 2031. Each bond was EUR500m. The performance of qualifying EUR Utility green bonds issued in Q2 was compared to an average of these two bonds.

The supply of EUR benchmark-sized, green bonds in the Utility sector far exceeded that of the vanilla bonds in Q2 2019. This is a significant development in the EUR green bond market. A consequence of this lack of vanilla supply is that buyers of EUR Utility bonds in Q2 would have been more likely to have bought a green bond than not and indicates that EUR bond investors will plausibly be exposed to green bonds by default, irrespective of investment preferences.

Europe appears to be unique in this regard. For context, close to USD200bn of Utility bonds were issued globally in H1 2019, just ten percent of which had a green use of proceeds according to Bloomberg. Currencies with the largest critical mass of Utility issuance were CNY (35%) and USD (30%), with EUR in third place (10%). Country of risk is still dominated by those same three regions and hints at where most of the investment is being spent.

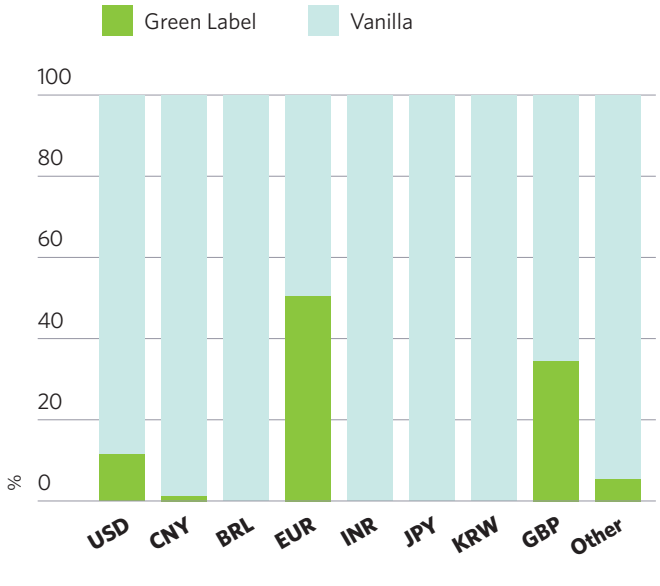
Few of the Utility bonds issued in H1 2019 in CNY (1%) or USD (12%), had a green use of proceeds while half of the debt issued in both EUR, and by organisations having a country of risk in Europe did. Except for GBP, where 35% of the few Utility bonds had a green use of proceeds, the trend for Utilities issuing green bonds has not spread to other currencies or regions, highlighting the potential for continued growth.

GBP has always been one of the smaller green bond currency categories, and in fact, a GBP900m (USD1.15bn) three-tranche deal from Dutch company Orsted issued in May 2019 provided the only GBP-denominated Utility bond of H1 2019.

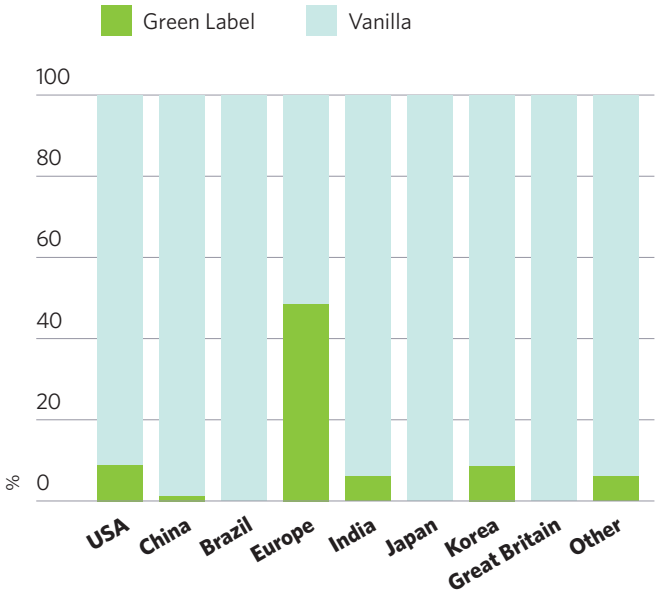
The use of proceeds of green Utility bonds in our Q2 2019 sample is more mixed than one may expect. TenneT 2030 and 2039 and Terna 2026 earmarked the entire use of proceeds to Renewable Energy, while Vattenfall 2026, Engie 2027 and 2039, ESB 2030 and Hera 2027 split the proceeds among other green infrastructure projects such as Transport, Waste, Water, Buildings, and Industry.

Methodology notes: This analysis is based on data taken from Bloomberg in mid-July 2019, using BICS categories and Use of Proceeds as defined by Bloomberg.

All utility bonds issued H1 2019 by currency



All utility bonds issued H1 2019 by country of risk



8. Conclusion

During H1 2019, almost USD118bn of green bonds were issued in 27 currencies. Almost 50% of green bonds issued were denominated in EUR, consolidating the EUR as the preferred currency for issuance. Nearly half of the total, 61 bonds with a combined face value of USD56.6bn, was suitable for inclusion in our pricing analysis. This is far higher than in previous publications, where 30% of total issuance typically qualified for our research.

The pricing story was strong in H1 with opportunities for both issuers and investors. EUR green bonds experienced good demand in the primary market with larger book cover and spread compression than vanilla equivalents on average. Slightly more USD vanilla bonds achieved larger book cover and spread compression than vanilla bonds, though green bonds including Verizon 2029 and Chile 2050 attracted high interest.

Twenty-six issuers, responsible for 32 bonds in our sample had enough data to build yield curves, and two thirds of those priced without a traditional new issue premium. TenneT now has an almost exclusively green yield curve which is encouraging. SSA issuers such as EIB and KfW have two distinct yield curves: one green and one vanilla.

With many green bonds pricing tightly, it is unsurprising to see that fewer than half had performed better than equivalents after seven days. However, after 28 days, that number had risen to 61% demonstrating that investors do benefit from further tightening in the secondary market.

Issuers are still looking for guidance to define a green investor. We have highlighted definitions published by two banks and one government and we are pleased to note some commonalities among them. A clear definition of a green investor will make this category of investor easier to identify, and issuers will be able to design products to meet their needs.

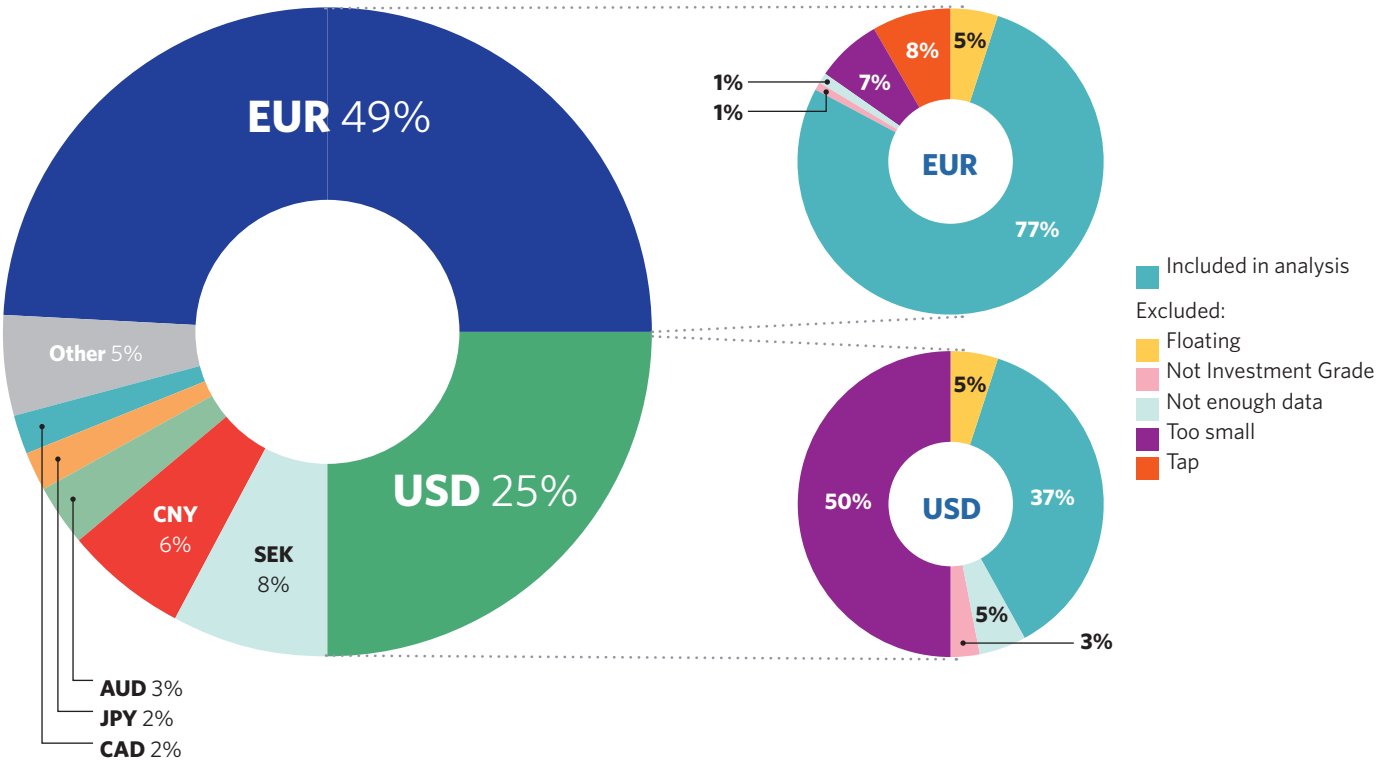
In H1 there was a notable increase in the number of benchmark-sized green bonds being issued, and the demand remained buoyant, with 53% of bonds sold to investors describing themselves as green. As we have continually highlighted, non-dedicated investors have no reason to avoid green bonds, and in some areas of the market, it may be increasingly difficult for them to do so.

The EUR Utility sector was dominated by green bonds in Q2, with four times as many green bonds than not. Consequently, EUR bond investors may be exposed to green bonds by default, irrespective of their investment preferences. It may be too optimistic to describe this as the start of a trend, but we will continue to monitor developments in this and other sectors.

The results of our analysis pertain to a limited number of green bonds, chosen according to the parameters outlined on page 24. Green bonds issued in other currencies, structures, formats, and sizes may perform differently from those discussed within this paper.

We started monitoring green bond pricing in 2016, and as of mid-2019, have looked at 248 securities. As the profile of green bonds has developed so rapidly in the intervening period, so market conditions have evolved. We will continue to monitor how green bonds behave in the primary and immediate secondary market.

Almost half of green bonds issued in H1 2019 were EUR



EUR summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q1 - Green bonds priced between January 01 and March 31 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
EBRD 0% 10/01/2024	1	0.00%	5	0.6
EIB 0.05% 24/05/2024	1	0.05%	5	3.0
NRW Bank 0.625% 02/02/2029	1	0.625%	10	0.5
AAA SSA 10 Years	4	0.69%	10	2.4
Digital Euro Finco LLC 2.5% 16/01/2026	1	2.5%	7	0.85
BBB Real Estate 4-6 Years	3	2.2%	4.7	0.6
ENEL Finance International NV 1.5% 21/07/2025	1	1.5%	6	1
BBB Utilities 5-7 Years	3	1.1%	6	0.6
SNCF Reseau EPIC 0.875% 22/01/2029	1	0.875%	10	0.75
Societe Du Grande Paris EPIC 1.125% 25/05/2034	1	1.125%	15	2
CPPIB Capital Inc 0.875% 06/02/2029	1	0.875%	10	1
AA SSA 10-15 Years	6	0.7%	11.7	1.6
Citigroup Inc 0.5% 29/01/2022	1	0.5%	3	1
A SU Banks 1-3 Years	3	0.8%	3	0.5
Telefonica Emisiones SA 1.069% 05/02/2024	1	1.069%	5	1
Deutsche Telekom AG 0.875% 25/03/2026	1	0.875%	7	0.5
OP Corporate Bank Plc 0.375% 26/02/2024	1	0.375%	5	0.5
A SU Banks 5 Years	3	0.9%	5	0.8
BNP Paribas 1.125% 28/08/2024	1	1.125%	5	0.75
Danske Bank A/S 1.625% 15/03/2024	1	1.625%	5	0.5
A-BBB SNP Fin. Corporate 5-6 Years	5	1.2%	5.2	1.2
LeasePlan Corp NV 1.375% 03/07/2024	1	1.375%	5	0.5
BBB SP Banks 5 Years	2	0.9%	5	0.5
Rep of Poland Gov. International Bond 2% 08/03/2049	1	2%	30	0.5
A Governments 30 Years	2	2.2%	30	1.1
Rep of Poland Gov. International Bond 1% 03/07/2029	1	2%	30	0.5
A Governments 10 Years	3	1.18%	30	2.3
Q2 - Green bonds priced between April 01 and June 30 2019				
Chile Government International Bond 0.83% 02/07/2031	1	0.8%	12	0.86
EM A Governments 10 Years * excludes subsequent taps	2	1%	10	0.825*
Netherlands Government Bond 0.5% 15/01/2040	1	0.5%	21	5.9
EUR Governments 31 Years* * both bonds issued Q1 2019 ** excludes subsequent taps	2	2%	31	6**

Q2 - Green bonds priced between April 01 and June 30 2019 Cont.	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
Instituto de Credito Oficial 0.2% 31/01/2024	1	0.2%	5	0.5
SSA 3-5 Years	2	0%	5	3
Kreditanstalt fuer Wiederaufbau 0.01% 05/05/2027	1	0.01%	8	3
Regie Autonome des Transports Parisiens 0.35% 20/06/2029	1	0.35%	10	0.5
SSA 7-10 Years	2	0.1%	9	0.8
SNCF Reseau 0.75% 25/05/2036	1	0.75%	17	1.6
SSA 15-18 Years	5	0.82%	16.2	1.4
European Investment Bank 1% 14/11/2042	1	1%	23	0.5
Societe Du Grand Paris EPIC 1.7% 25/05/2050	1	1.70%	31	1
SSA 16-20 Years	5	0.85%	18	1.1
Vodafone Group PLC 0.9% 24/11/2026	1	0.9%	7	0.75
BBB Wireless Communications 8 Years	2	1.3%	8	0.9
LG Chem Ltd 0.5% 15/04/2023	1	0.5%	4	0.5
BBB Materials 6 Years* * Neither of the bonds in the basket originate from EM	2	1.1875%	6	0.5
Engie SA 0.375% 21/06/2027	1	0.375%	8	0.75
Engie SA 1.375% 21/06/2039	1	1.375%	20	0.75
TenneT Holding BV 0.875% 03/06/2030	1	0.875%	11	0.5
TenneT Holding BV 1.5% 03/06/2039	1	1.5%	20	0.75
ESB Finance DAC 1.125% 11/06/2030	1	1.125%	11	0.5
Vattenfall AB 0.5% 24/06/2026	1	0.5%	7	0.5
Terna Rete Elettrica Nationale SpA 1% 10/04/2026	1	1%	7	0.5
Hera SpA 0.875% 05/07/2027	1	0.875%	8	0.5
AA-BBB Utilities 9-12 Years	2	1.25%	10.5	0.5
ERG SpA 1.875% 11/04/2025	1	1.875%	6	0.5
A- BBB Energy 6 Years	2	0.5%	6	0.5
Industrial & Com Bank of China Ltd. Singapore 0.25% 25/04/2030	1	0.25%	11	0.5
EM A SU Bank 12 Years* *One bond	1	0.25%	12	0.5
Royal Bank of Canada 0.25% 02/05/2024	1	0.25%	5	0.5
Westpac Securities NZ Ltd 0.3% 25/06/2024	1	0.3%	5	0.5
Sumitomo Mitsui Financial Group Inc 0.465% 30/05/2024	1	0.465%	5	0.5
A SU Financial 5 Years	3	0.416%	5	1.2
Unione di Banche Italiane SpA 1.5% 10/04/2024	1	1.5%	5	0.5
BBB SP Banks 5-6 Years	2	1.13%	5.5	1.3
ABN Amro Bank NV 0.5% 15/04/2026	1	0.5%	7	0.75
A SP Banks 5 Years* * One bond	1	0.625%	5	1
Nordea Bank Abp 0.375% 28/05/2026	1	0.4%	7	0.75
AA SP Banks 5 Years	2	0.15%	5	1

Q2 - Green bonds priced between April 01 and June 30 2019 Cont.	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size EURbn
La Banque Postale SA 1.375% 24/04/2029	1	1.375%	10	0.75
A SNP Banks 10-12 Years		1.27%	11	1.175
Landesbank Baden Wuerttemberg 0.375% 24/05/2024	1	0.375%	5	0.75
A SNP Banks 5 Years	3	0.53%	5	0.9
Banco Bilbao Vizcaya Argentaria SA 1% 21/06/2026	1	1%	7	1
BBB SNP Banks 5-7 Years	2	1.3%	7	0.875
Vesteda Finance BV 1.5% 24/05/2027	1	1.5%	8	0.5
BBB Real Estate 6-7 Years	3	1.58%	6.6	0.55
Prologis Imtermational Funding II SA 0.875 09/07/2029	1	0.9%	10	0.45
A-BBB Real Estate 10-11 Years	2	0.85%	10.5	0.55

USD summary statistics of bonds used for comparison

Bonds sharing similar characteristics to green bonds in our sample

Q1 - Green bonds priced between January 01 and March 31 2019	Number of bonds	Average Coupon (par weighted)	Maturity	Deal Size USDbn
Neder Financierings-Maat 2.75% 20/02/2024	1	2.750%	5	0.5
AAA Development Banks 5 Years	2	2.625%	5	1.75
MidAmerican Energy Co 4.25% 15/07/2049	1	4.25%	30	0.9
DTE Electric Co. 3.95% 01/03/2049	1	3.95%	30	0.65
A Utilities 30 Years	4	4.20%	30	0.6
MidAmerican Energy Co 3.65% 15/04/2029	1	3.65%	10	0.6
Duke Energy Progress LLC 3.45% 15/03/2029	1	3.45%	10	
A Utilities 10 Years	5	3.7%	10	0.5
Verizon Communications Inc. 3.875% 08/02/2029	1	3.875%	10	0.5
BBB Communications 10 Years	3	4.5%	10	1.8
Q2 - Green bonds priced between April 01 and June 30 2019				
Hong Kong Government International Bond 2.5% 28/05/2024	1	2.5%	5	1
EM AA Government 10 Years	1	2%	10	2
Chile Government International Bond 3.5% 25/01/2050	1	3.5%	31	1.4
EM A Government 31 Years	1	5.25%	31	4
Landesbank Baden-Wuertemberg 2.375% 31/05/2022	1	2.4%	3	0.75
AAA-AA Covered 5 Years	2	2.21%	5	0.55
Avangrid Inc 3.8% 01/06/2029	1	3.8%	10	0.75
BBB Utilities 10 Years	2	3.4%	10	1
Korea Electric Power Corp 2.5% 24/06/2024	1	2.5%	5	0.75
EM A Utilities 5 Years	2	2.9%	5	1
LG Chem Ltd 3.25% 15/10/2024	1	3.25%	5	0.5
BBB Materials 5 Years	4	3.4%	5	0.6
LG Chem Ltd 3.625% 15/10/2029	1	3.625%	5	0.5
BBB Materials 10 Years	1	3.875%	10	0.9
Rongshi International Finance Ltd 3.25% 21/05/2024	1	3.25%	5	0.5
EM A Financial Services 5 Years	2	3.92%	5	0.7
Boston Properties LP 3.4% 21/06/2029	1	3.40%	10	0.85
BBB Real Estate 10 Years	4	3.60%	10	0.9

Relative sizes of green and vanilla bonds used in yield curve construction

Rating Group		Name	Average of non-green bonds	Average of existing green bonds issued prior to 2019	Green bond issued in H1 2019
SOV	EUR	Poland 2049	1.48	0.875	0.5
		Poland 2029	1.48	0.875	1.5
		Netherlands 2040	13.9		5.98
		Chile 2031	1.23		0.86
SSA		SNCF 2029	1.635	0.88	0.5
		NRW 2029	0.73	0.5	0.5
		EIB 2042	3.48	1.39	0.5
		KfW 2027	4.09	1.3	3
		RATPFP 2029	0.53	0.5	0.5
		SNCF 2036	1.69	0.9	1.5
		OP Bank 2024 (SP)	0.625		0.5
A		Nordea 2026 (SP)	1.125	0.5	0.75
		Citigroup 2022 (SU)	1.24		1
		BNP Paribas 2024 (SNP)	1	0.5	0.75
		ABN Amro 2026 (SP)	1.17	0.625	0.75
		TenneT 2039	0.5	0.52	0.75
		TenneT 2030	0.5	0.52	0.5
		SMFG 2024 (SU)	0.7	0.5	0.5
		ESB 2030	0.525		0.5
		Engie 2027	0.67	0.875	0.75
		Engie 2039	0.67	0.875	0.75
		Westpac 2024 (SU)	0.75	0.5	0.5
BBB		ENEL 2025	0.88	1.25	1
		Telefonica 2024	1.1		1
		Terna 2026	1	1	0.5
		Vodafone 2026	0.94		0.75
SOV	USD	Chile Government 2050	1.15		1.4
A		MidAmerican Energy 2029	0.55	0.7	0.6
		MidAmerican Energy 2049	0.55	0.7	0.9
		Duke Energy 2029	0.54	0.65	0.6
		Boston Properties 2029	0.84	1	0.85
BBB		Verizon 2029	2.16		1

9. Methodology

This paper includes labelled green bonds issued during H1 2019. We have included labelled green bonds meeting the following specifications:

- Announcement date between 01/01/2019 and 30/06/2019
- Currency: EUR or USD
- Benchmark size i.e. >= USD500m
- Investment grade rated
- Minimum term to maturity of three years at issue
- Consistent with Climate Bonds taxonomy

Amortising, perpetual, floating-rate, and other non-vanilla structures are excluded. We have designed these parameters to capture the most liquid portion of the market while not limiting the diversity of data.

All historical data is based on asset swap spreads for EUR denominated bonds. USD bonds are compared to a US treasury curve. All historical data is from Refinitiv EIKON.

Four bonds qualified for our analysis but could not be included due to paucity of available data:

- Indonesia 3.9% 08/20/2024
- ADIF-Alta Velocidad 0.95% 04/30/2027
- MAF Sukuk Ltd 4.638% 14/05/2029
- Russian Railways 2.2% 23/05/2027

Comparable baskets include bonds issued in the same quarter as the subject green bond. Comparable bonds must fit the parameters described above except that the use of proceeds is not green. The resulting baskets are a proxy for how money could have been invested in the same quarter in which the green bond was issued. The number of bonds in each basket ranges from one to five bonds. We acknowledge that bonds behave differently depending on when they are issued and geopolitical events can affect bond prices from one day to the next. We have designed this proxy to circumvent the fact that vanilla bonds and green bonds with similar characteristics are rarely issued on the same day.

Endnotes:

1. https://www.climatebonds.net/standard/taxonomy
2. Bloomberg: IG Analysis Europe: Engie's Hybrid, Intesa SanPaolo lead session, Tassos Vossos 01/07/2019
3. Bloomberg, U.S. Credit Daybook, Brian Smith 29/06/2018: Pricing volume YTD $640.004b, and Credit Daybook Americas, Molly Smith, 01/07/2019: Pricing volume YTD $560.473b
4. In late May 2018, the Mexican Government announced the cancelation of Mexico City's New International Airport (NAICM), for which USD6bn had been raised via four green bonds between 2016-17. The Government has brought back USD1.8bn from investors but there is still no update re the remaining proceeds. Due to this the bonds are not currently considered green and have been removed from our database pending further information.
5. https://www.msci.com/market-classification
6. https://www.climatebonds.net/files/files/CBI_GB_Pricing_2H2018_08052019.pdf
7. https://www.enel.com/media/press/d/2018/1/green-bond-enel-eng
8. https://ihsmarkit.com/products/iboxx.html
9. Bloomberg BICS

www.climatebonds.net

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