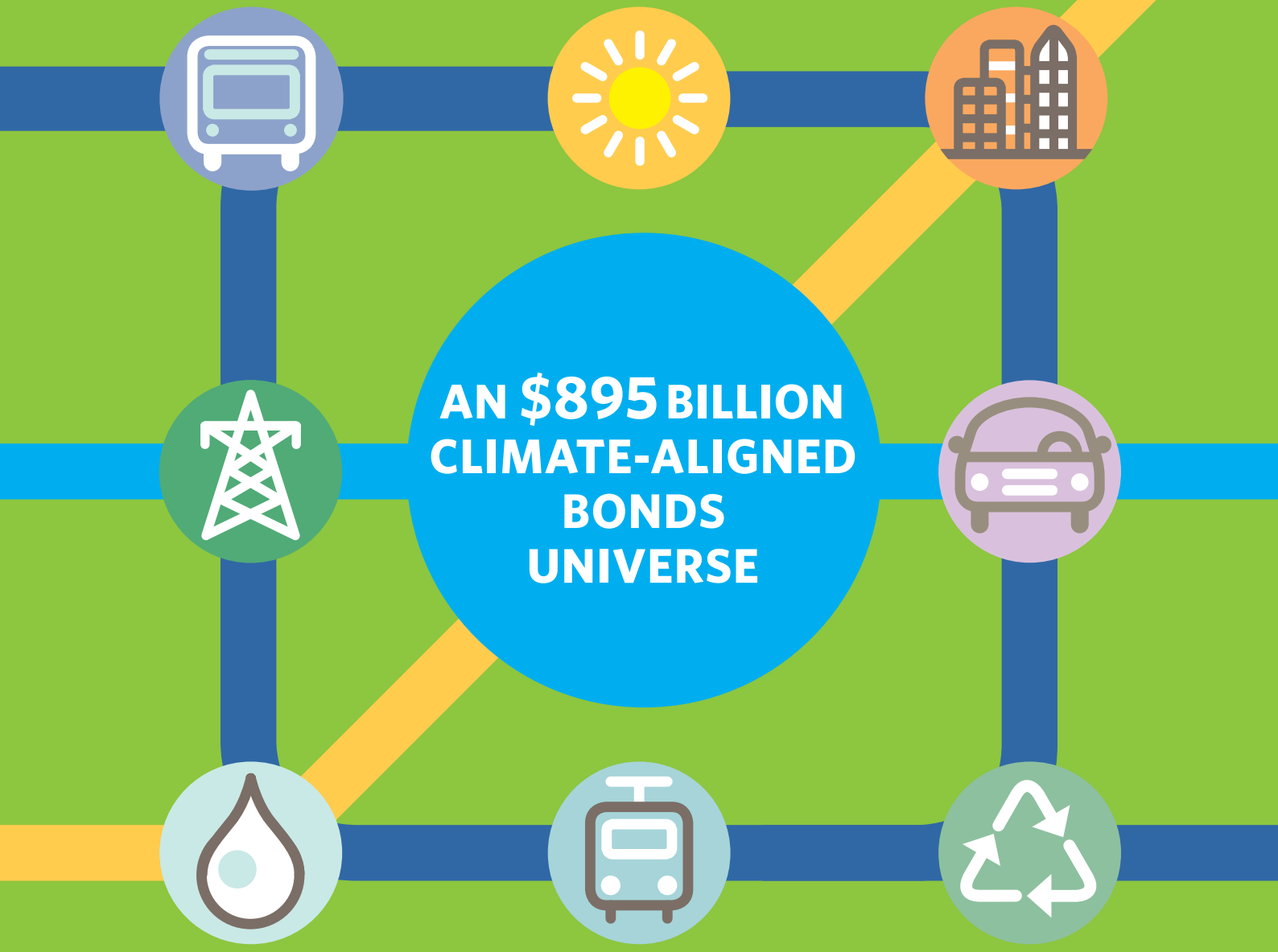
BRAZIL EDITION

BONDS AND CLIMATE CHANGE

THE STATE OF THE MARKET 2017



Climate Bonds Initiative
Prepared by Climate Bonds Initiative

HSBC
Commissioned by HSBC

IDB Inter-American Development Bank
Sponsored by IDB

SITAWI FINANCEforGOOD
Translation & 'Spotlight on Brazil' Content Partner

An $895bn climate-aligned universe

The 6th annual State of the Market Report, commissioned by HSBC, identifies an $895bn universe of 'climate-aligned bonds' financing low carbon and climate resilient assets or projects. This is an increase of $201bn on the 2016 climate-aligned bond universe.

This report reviews how bonds are being used to finance a transition to a low carbon global economy. It includes an analysis of the growing global 'green bond' market but also goes beyond the green label.

It sizes and analyses the 'climate-aligned bond' universe comprised both of labelled green bonds (use of proceeds defined and labelled as green) as well as a much larger set of bonds issued by entities enabling a low carbon economy but are not labelled green.

Summary figures

This year we found a universe of $895bn climate-aligned bonds outstanding which is made up of 3,493 bonds from 1,128 issuers across seven climate themes. It includes $221bn of labelled green bonds.

The $201bn increase on last year is from:

- $138bn new bonds from existing issuers
- Plus: $84bn from new climate-aligned issuers
- Plus: $60bn green bonds from new issuers
- Minus: $81bn matured bonds or issuers that have been removed

While $895bn provides a good picture of current climate-aligned investment in the bond market, it does not show the full potential for labelled green bond market growth. Labelled green bonds are primarily issued by diversified companies whereas the unlabelled portion of the climate-aligned universe is mostly pure-play issuers. The labelling of green bonds is therefore essential to shift fixed income investment towards climate change solutions.

"Cities today are home to about half the global population but represent almost two-thirds of global energy demand and 70% of carbon emissions from the energy sector, so they must play a leading role if COP21 commitments are to be achieved"

IEA Executive Director **Fatih Birol**

Building resilient cities

This year's report focuses on the role of cities, sovereigns and sub-sovereigns in meeting the targets outlined in the Paris Climate Agreement.

Historically, bonds have been used by sovereign and sub-sovereign entities to finance national infrastructure, energy, transport, urban water and sewer systems.In the next decade, bonds will need to be used as a tool to finance low carbon, climate resilient infrastructure.

Green bonds will be a vital tool in helping cities and sovereign authorities to raise the finance required to meet climate targets. More on pages 10-15.

Institutional investors play a crucial role

According to the International Energy Agency (IEA), cumulative investment of $53tn is required by 2035 in the energy sector alone to avoid dangerous climate change. New Climate Economy estimates that up to $93tn of investment is required across the whole economy by 2030[1]. The global bond market currently stands at approximately $90tn[2].

At the 2015 COP21 in Paris, 188 Parties presented their national plans to keep global temperature rise this century below 2 degrees Celsius. These plans will require a mixture of public and private sector capital – including the $100tn institutional investor sector. At the same COP, institutional investors representing $11.2tn committed to grow a green bond market[3]; and the insurance industry reiterated its commitment to increase climate smart investments tenfold by 2020. The Bank of England's Prudential Regulation Authority also recommended green bonds as a climate-related investment opportunity for UK insurance firms[4]. Finally, there is growing interest in climate-aligned investment from PRI signatories (>1,600 to date) and other investor groups. Green bonds have received increasing recognition at G20 level in the Green Finance Study Group (GFSG) and the EU High-Level Expert Group (HLEG).

A 2-degree Celsius lens

In this report, we uncover bonds that finance investments compatible with a 2-degree transition path rather than investments that are marginally environmentally beneficial. This takes a cue from the Paris COP21 Agreement that all investments should be in line with the steep emissions trajectory needed to achieve a rapid transition to a sub-2-degree Celsius world.

This will require wholesale economy and business model shifts – not just incremental improvements, but business planning that fundamentally addresses both the projected growth in global energy demand and emission reduction targets.

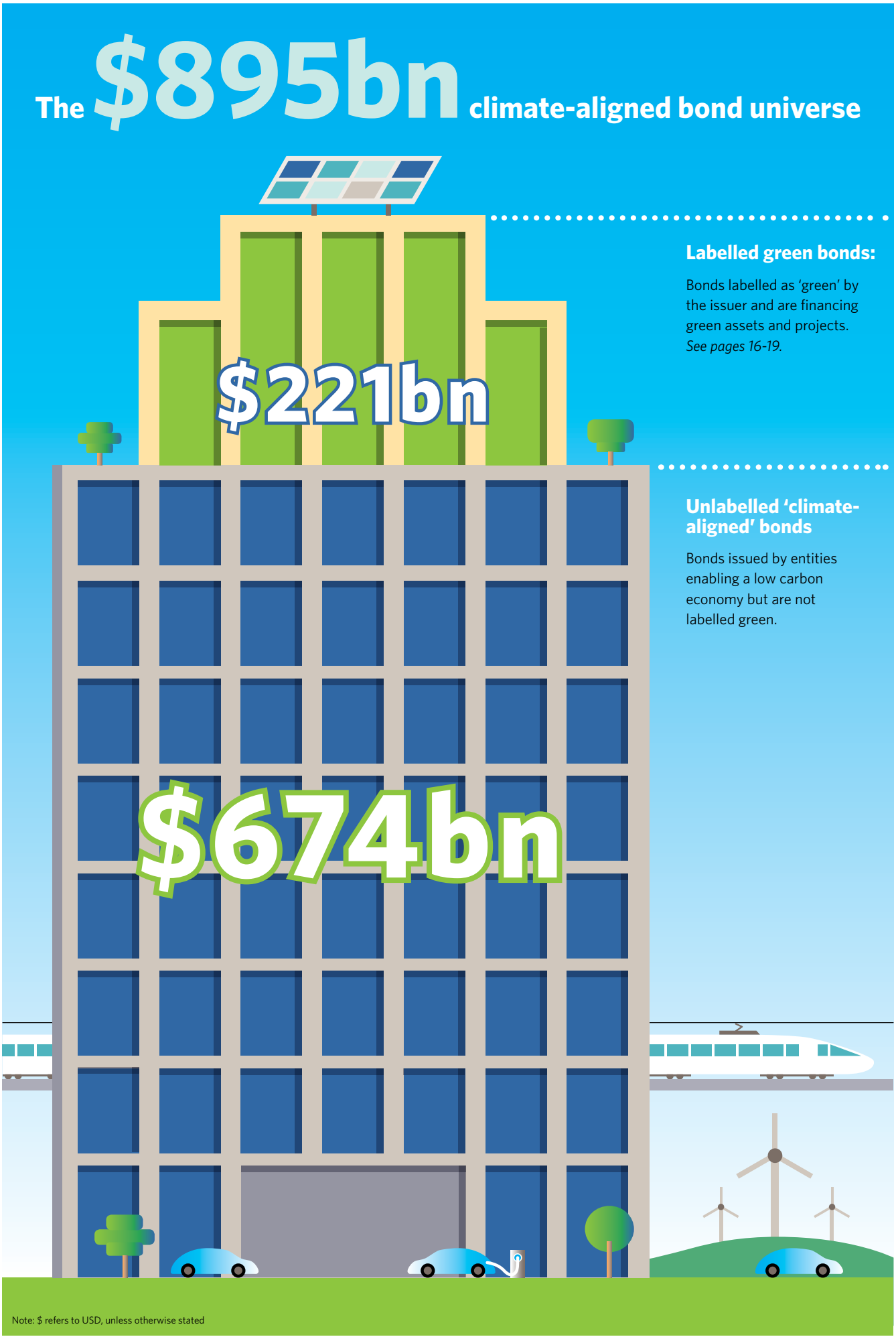
For the world to limit warming to less than 2 degrees Celsius, investment undertaken by all sectors needs to be ambitious and needs to accelerate from the current trajectory. The time for incremental improvements has passed.

Methodology

To find unlabelled climate-aligned bonds, we screened Bloomberg and Thomson Reuters issuer data and reviewed over 1,700 issuers to identify those with over 95% of revenue derived from climate-aligned assets. We also added renewable energy project bonds and domestic Chinese bonds from the ChinaBond China Climate Aligned Bond Index (an index that Climate Bonds Initiative provides data for). Thus, most of the unlabelled issuers are pure-play green companies (pure-play companies derive all of their revenue from a particular source, in this case all revenue is derived from climate solutions). We included all bonds from these issuers issued after 1 Jan 2005 (the year the Kyoto Protocol was ratified) and before 30 June 2017.

Issuer screening is based on work undertaken through the Climate Bonds Standard but the process does not always apply the full Climate Bonds Criteria due to insufficient granularity of information available. The Climate Bonds Standard is continually expanding to include new sectors and based on emerging research. This evolution means that some issuers drop out and others enter the database.

The $895bn climate-aligned bond universe



Labelled green bonds:

Bonds labelled as 'green' by the issuer and are financing green assets and projects. *See pages 16-19.*

Unlabelled 'climate-aligned' bonds

Bonds issued by entities enabling a low carbon economy but are not labelled green.

Note: $ refers to USD, unless otherwise stated

Overview of the $895bn climate-aligned bond universe

The growth in the climate-aligned universe is encouraging but there is headroom for a much larger market.

Transport is the largest theme in the universe but has decreased as a percentage of the total universe and now accounts for 61% (66% in 2016). The change is primarily due to the large increase in labelled green bond issuance - $100bn since the 2016 report.

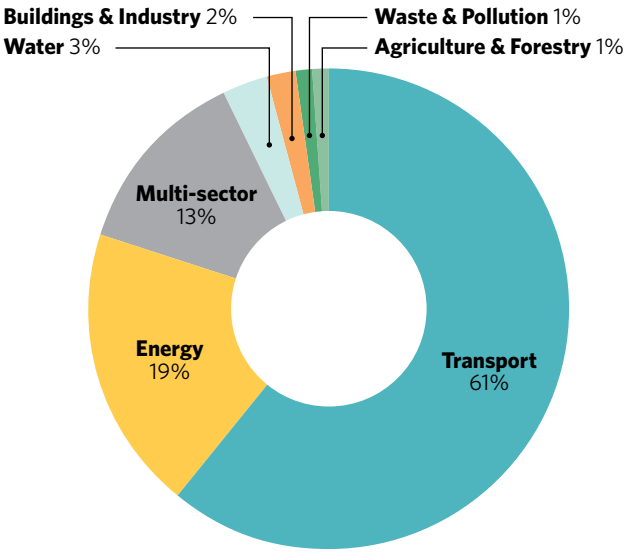
The Energy theme is the second-largest theme in the universe and is primarily renewable energy manufacturers and operators. There are few utilities in this theme due to the diverse nature of most utilities.

The Multi-sector theme now accounts for 13% of the universe – all of which is labelled green bonds. The sector captures green bond issuers such as development banks where proceeds go to a range of projects in different themes.

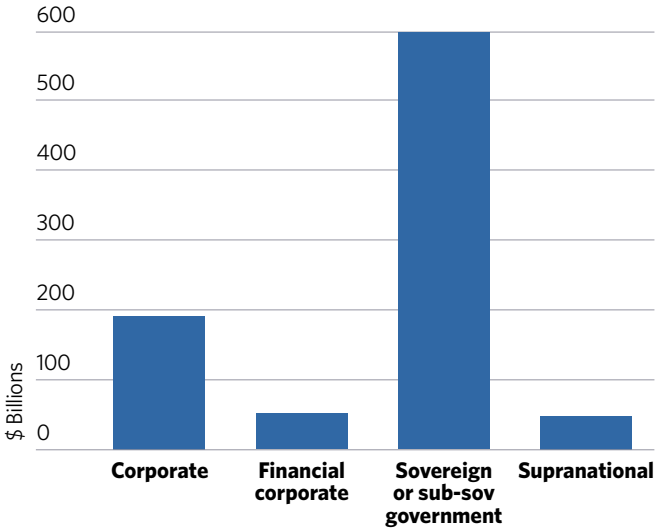
Buildings and Industry, Agriculture and Forestry, Water and Waste make up a small proportion of the overall universe, accounting for less than 7% between them. This is partly because bonds are not frequently issued by issuers in these sectors and partly because it is challenging to identify pure-plays in these themes and related sectors.

Sovereign and sub-sovereign agencies are an important part of the universe accounting for 68% of the total amount outstanding. This includes entities owned by or guaranteed by the sovereign or sub-sovereign government such as China Railway Corp and Network Rail among others.

Transport and Energy account for 80% of the universe



Sovereigns and sovereign entities make up the majority of the universe



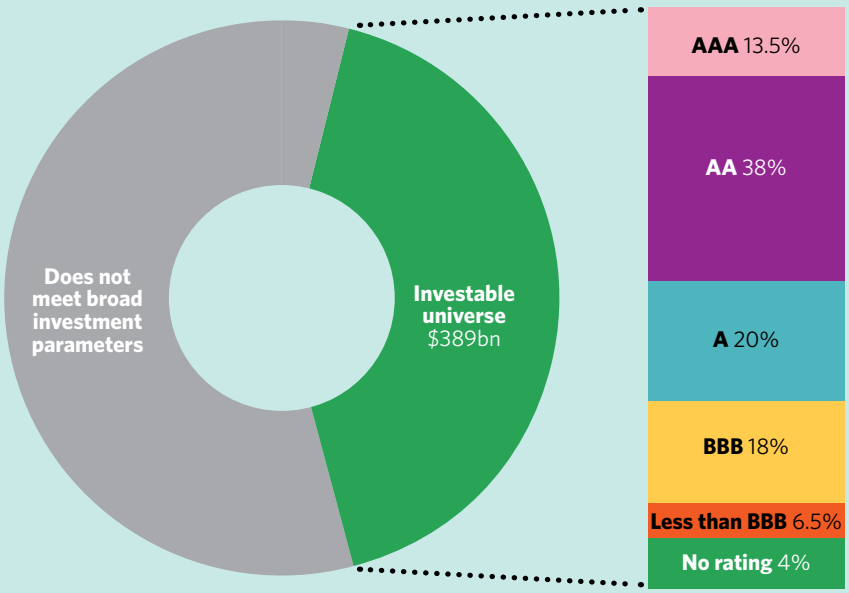
$389bn meet basic investment parameters

To track what proportion of the universe is available to most investors around the world, we screened the universe using the following indicators:

- **Size**: > $200m (85% meet filter)
- **Liquidity**: bond has a recent ask price (69% meet filter)
- **Currency**: is included in the Barclays Global Aggregate Index (63% meet filter)

43% of the universe meet all 3 parameters - a universe of $389bn outstanding. The rating distribution of that sub-set is shown right.

This provides an idea of the types of investment that many international investors are looking for although we note that the many fund managers will have their own methodology and criteria in place. For example, in the primary market, there has been large demand for labelled green bonds which are less than $200m in size.



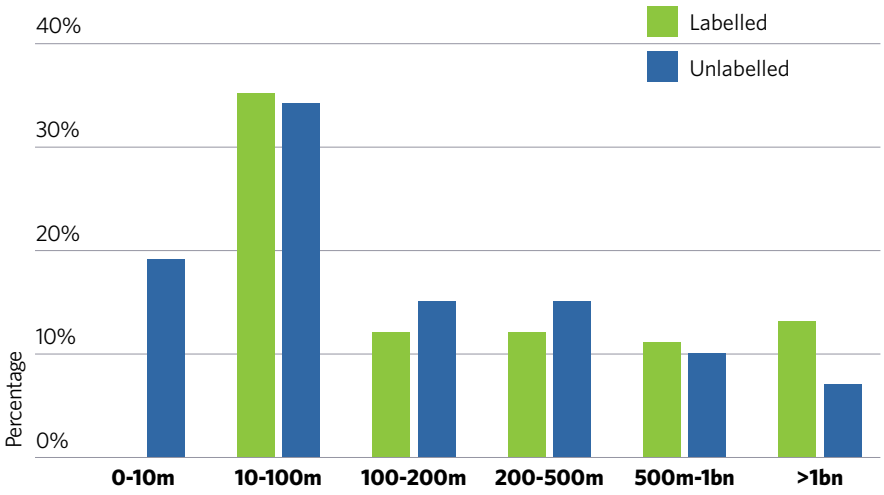
The average bond size is approximately $262m with a similar distribution of issue sizes for both green bonds and climate-aligned bonds. The largest number of bonds fall into the $10-$100m bracket – a large number of municipal bonds fall into this bracket as do corporate bonds, particularly in emerging market currencies where bond sizes of less than $100m are common.

The main currencies are broadly similar to the major bond market currencies, with USD and EUR well represented. One difference is the dominance of RMB[5] and the very limited presence of JPY. There are a few reasons for this: a) RMB figures are very large because the largest issuer in the dataset – China Railway Corp makes up 25% of the universe alone. China Railway Corp raises the finance for China's extensive and rapidly-growing rail network; b) RMB bonds have become a large proportion of the green bond market (which in turn makes up a growing percentage of the total market) while there are almost no JPY denominated green bonds.

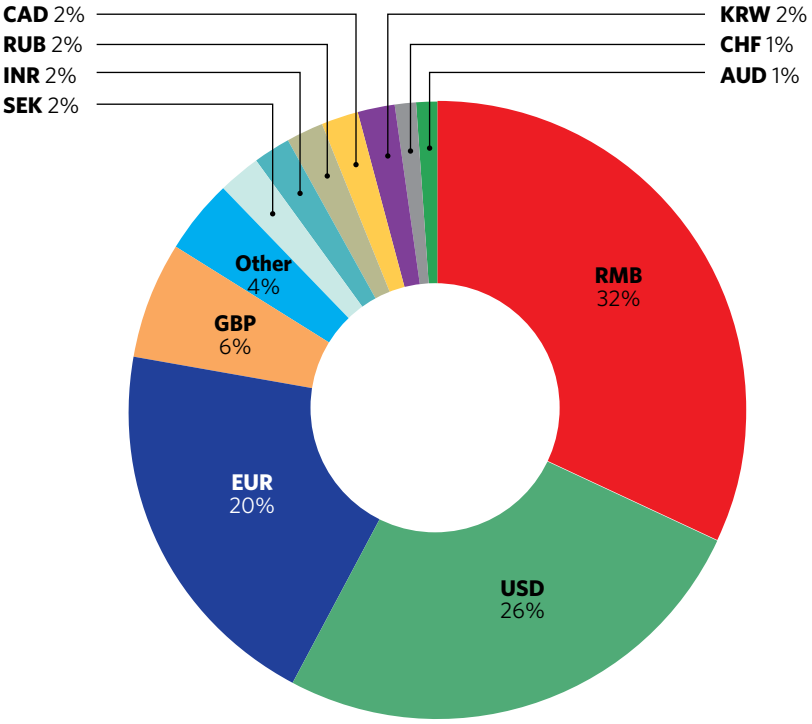
The majority of issuance has tenors in excess of 10 years, with the average tenor of climate-aligned bonds at 11.7 years. This is similar to the average global corporate bond tenor of just over 11 years. Long tenors are common in state-backed rail entities or utilities whose assets have long lifetimes and which have the credit rating to issue longer-dated debt. These bonds make up the majority of the climate-aligned bond universe.

A large proportion of bonds do not have a credit rating. Issuers such as China Rail Corp have a local credit rating but no international credit rating. For this report, only the international rating agencies were used.

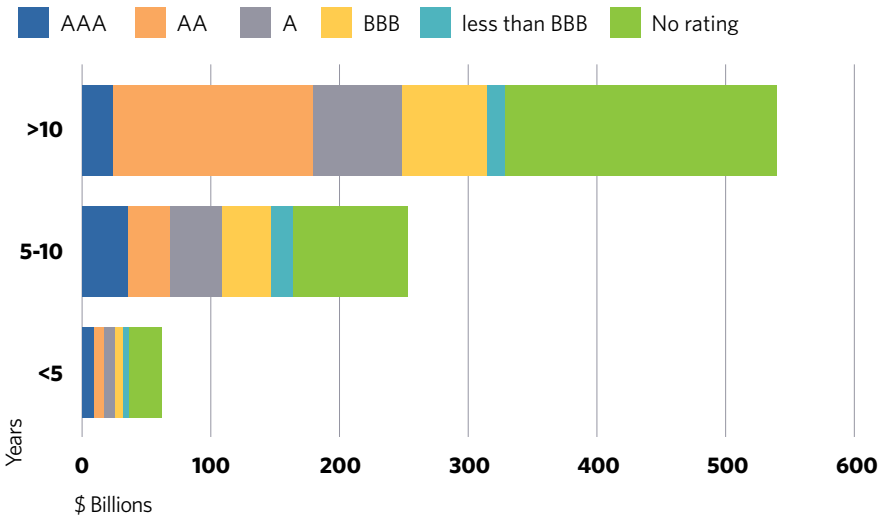
Most bonds are between $10-$100m



RMB, USD and EUR account for the majority of issuance



61% of the universe has a tenor greater than 10 years



Climate-aligned bond universe in the global bond market context

An $895bn universe is big but how big is this in the context of the global bond market?

The value of climate-aligned and green transactions in Q2 2017 amounted to just over $43bn while the value of international debt capital market transactions in the same period amounted to $1.1tn[6] putting climate-aligned transactions at just under 4% of the total volume. Growth is encouraging but also indicates that there is headroom for an even bigger climate-aligned bond universe.

Across the climate themes

The following section breaks down the data into climate 'themes' which relate to what is being financed rather than the industrial sector classification of the issuer – for example, Tesla is categorised as 'Transport' rather than Industry.

Transport

- **Size: $544bn**
- **Number of issuers: 197**
- **Number of bonds: 1242**
- **Largest issuer: China Railway Corp**

Transport remains the dominant theme in the climate-aligned universe, with $544bn outstanding made up primarily of rail infrastructure.

The transport sector is the second largest contributor to global GHG emissions – responsible for 23% of energy-related CO_2 emissions[7]. Clean transport infrastructure will be a vital part of the transition to a low carbon economy. This will require increased mass public transit systems such as rail and bus rapid transport and a move away from fossil fuel vehicles.

Global megacities are driving growth in urban transit infrastructure which makes up 12% ($64bn) of the theme. Paris' RATP Group, Transport for London, and New York MTA are the top 3 issuers. Lima Metro is one of the few Latin American issuers.

The majority of climate-aligned bonds are financing rail infrastructure. This is expected as bonds have been used to finance rail infrastructure for decades – the technology is proven, offers a steady income and is low risk - ideal for bond financing.

China Railway is the largest issuer with $222bn outstanding. China Railway is the national railway operator of China and has financed the development of the 22,000km high-speed railway network. Other large issuers include France's SNCF ($52.9bn), UK's Network Rail ($37.2bn), Burlington Northern and Santa Fe Railway ($19.1bn) and Indian Railways ($14.7bn).

Electric vehicles are niche but growing. The dataset includes Tesla which has issued $980m in bonds financing the manufacture and development of electric vehicles and components. While some large auto manufacturers have made strong commitments to electric and alternative fuel vehicles (e.g. Volvo), their bonds cannot be included as 'climate-aligned' unless they are labelled green because the majority of revenue comes from fossil fuel vehicles.

Water

- **Size: $32bn**
- **Number of issuers: 204**
- **Number of bonds: 336**
- **Largest issuer: Anglian Water**

The water theme is the 4th largest theme with $32bn outstanding. Over a third of this amount ($13.2bn) was issued as labelled green bonds.

Water infrastructure is essential from both an environmental and social perspective and yet, it is very difficult to differentiate between water infrastructure that is contributing to a transition towards a low carbon economy and that which is not.

As such, water-related bonds are not green by default. Released in 2016, the Climate Bonds Water Criteria provide specific guidance for water bonds to be certified as 'green' if they deliver GHG mitigation, promote adaptation to climate change or facilitate increased climate resilience. Adaptation and resilience infrastructure will become increasingly important, particularly for cities around the world as they adapt to temperature changes and rising sea levels. Resilience and adaptation bonds are difficult to identify unless they are labelled – over a third of this theme is labelled green bonds. Water bonds fit broadly into four categories: water treatment, flood protection and defences, conservation and restoration and general climate resilience.

U.S. municipalities are leading the way for cities globally as they look to green bonds to finance clean water and adaptation infrastructure. U.S. municipalities make up the majority of issuers in the theme and have issued green bonds for water infrastructure and flood protection. 2017 U.S. muni issuers have included New York State Environmental Facilities and the city of Asheville.

Buildings & Industry

- **Size: $19.5bn**
- **Number of issuers: 73**
- **Number of bonds: 142**
- **Largest issuer: Renovate America**

The Buildings and Industry (B&I) theme is small, accounting for 2% of the total universe. It is composed primarily of labelled green bonds financing green buildings.

The B&I theme identifies bonds financing energy efficiency investments such as low carbon buildings, energy efficient products (e.g. LED lighting) and industrial energy efficiency processes and technology.

In practice, the majority of issuance is linked to green buildings and mostly consists of labelled green bonds. This is because in the energy efficiency space, the majority of products being developed or buildings built are from large diversified issuers with a multitude of products – this means that their bonds cannot be picked up for this report unless they are labelled as green.

Many green commercial real estate companies fall into this category such as Vasakronan, Unibail-Rodamco and others – they are frequent issuers of labelled green bonds but their whole portfolios are not yet green enough for all of their bonds to be included as climate-aligned – it is therefore only their labelled green bonds that are part of this dataset.

Similarly, large producers of energy efficiency products such as Siemens or GE are not included because of the diverse nature of their revenue sources.

Energy

- **Size: $173.4bn**
- **Number of issuers: 501**
- **Number of bonds: 1197**
- **Largest issuer: Hydro-Québec**

Energy is the second largest theme in the climate-aligned universe at $173.4bn outstanding.

The energy supply sector is the largest contributor to global GHG emissions[8] and, despite energy efficiency improvements, energy demand continues to rise as global populations and income levels increase. To decarbonise, the sector needs to move away from carbon-based energy towards renewable energy generation.

The energy theme stands at $173.4bn with wind, solar and mixed renewable energy accounting for 63% of the theme and hydro accounting for 27%.

The majority of solar issuance has come out of the U.S. which includes some large project finance deals such as Topaz Solar ($1.2bn) and large pure-plays such as Tesla-owned SolarCity. European issuers lead the way in bonds financing wind energy with $23bn outstanding.

The energy theme picks up a wider range of energy generation types than is currently eligible under the Climate Bonds Standard – in particular it includes nuclear power and large-scale hydro generation in non-tropical areas. Both of these electricity generation types have the potential to provide large-scale and low carbon power that could meet baseload power demands.

However, both of these power types can be controversial and require stringent criteria and standards in place in order for them to be included. In the absence of such criteria, they have been included in this report but some may be excluded in the future as criteria are developed – between them, hydro and nuclear account for 36% of issuance from the theme.

Multi-sector

- **Size: $112.3bn**
- **Number of issuers: 131**
- **Number of bonds: 459**
- **Largest issuer: European Investment Bank**

This sector is comprised entirely of labelled green bonds with proceeds financing a range of projects in different sectors.

The majority of issuers are financial sector issuers or development banks such as the EIB, World Bank and others. The development banks were early pioneers of the concept of the labelled green bond. They continue to push the development of the market through best practice in reporting and standards (see more on pages 16-19).

While the exact allocation of proceeds to each project type is not always disclosed, we estimate, based on information available, that over half of proceeds are allocated to energy and energy efficiency projects.

Note: no bonds in this section have been included in other sections to ensure that there is no double counting.

Forestry & Agriculture

- **Size: $8.5bn**
- **Number of issuers: 26**
- **Number of bonds: 63**
- **Largest issuer: WestRock**

Forestry and Agriculture account for just 1% of the climate-aligned universe with the majority coming from certified paper and packaging.

Agriculture, deforestation and other land use account for about 25% of anthropogenic GHG emissions[9] and yet, its small presence within the climate-aligned bond universe indicates that the role that bonds will play in financing a transition in this sector is unclear.

Companies within the agriculture and forestry sector are not regular bond issuers. Those which we identified are large sustainable paper and timber companies, such as WestRock, whose paper products are fully certified by the Forest Stewardship Council.

What about forest bonds? There have been various initiatives to utilise forest bonds to decrease deforestation but these are yet to materialise at any scale. In 2016, the IFC issued a type of forest bond for $152m[10], that gave investors the choice to receive payments in either cash or in carbon credits from a forest project in Kenya.

Criteria update: In 2017, the Climate Bonds Initiative convened a technical working group to tackle criteria relating to land use. The first phase of criteria will be ready for use in late 2017.

Waste & Pollution Control

- **Size: $5.6bn**
- **Number of issuers: 33**
- **Number of bonds: 54**
- **Largest issuer: Covanta**

Waste & Pollution Control is the smallest theme in the dataset - it captures technologies and services linked to recycling, resource recovery and energy efficient waste disposal.

Its small size is largely due to the fact that the screening process filters out large waste management companies because of the diverse nature of their business which includes some waste disposal techniques which are not climate compatible such as landfilling.

From a climate-perspective, the top priority for post-consumer waste should be reduction and recycling. However, for waste that cannot be reduced or recycled, modern waste-to-energy is considered to be a cleaner alternative to some other waste disposal techniques.

The majority of bonds in this theme are issued by companies in the waste-to-energy (WTE) sector. While previously considered to be dirty, modern WTE plants have become one of the cleanest high temperature industrial processes[11].

Regional analysis: Spotlight on Brazil

Brazil: huge potential to be one of world's largest green investment landscapes

Brazil's Nationally Determined Contribution (NDC) to the Paris Agreement aims to cut GHG emissions by 37% by 2025 and 43% by 2030 compared to a 2005 baseline. Its GHG reduction strategy aims to improve efficiency by 10% in the power sector, increase bioenergy consumption to 18% and renewable energy to 45% of the energy mix, restore 12m hectares of forests, halt illegal deforestation in the Amazon and implement sustainable transport infrastructure.

The IFC estimates that the Brazilian NDC and other climate-smart investments will require $1.3tn from 2016 to 2030[B1] - higher than any other country in the region.

Amidst a severe recession and fiscal unbalance, the Federal Government[B2] has implemented a budget cap through a constitutional amendment that will last for 20 years. Crowding in private capital will therefore be essential to finance the NDC and related infrastructure. Green bonds have the potential to leverage the strengths of Brazil's key sectors and shift investment towards a low-carbon economy.

The Brazilian green bond market: an overview to date

The Brazilian green bond market is growing rapidly. The first labelled green bond from a Brazilian issuer was issued by food company BRF in June 2015. A total of 9 Brazilian green bonds have been issued[B3] amounting to $3.67bn, five of which were issued internationally.

The US dollar is the dominant currency, accounting for 74% of the total outstanding.

The prevalence of external reviews has been a positive feature of the Brazilian market with all bonds receiving an external review to date. SITAWI has reviewed all four domestic issues while Sustainalytics was the reviewer for all international issuances. Three green bonds received Climate Bonds Certification: Rio Energy, Omega Energia and CPFL Energias Renováveis SA, all directing proceeds to wind power projects.

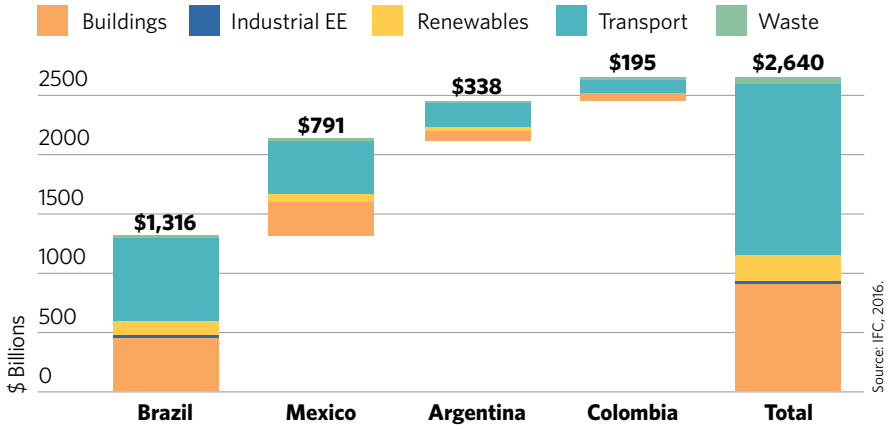
The majority of issuance has come from corporate entities (73%). The first bank deal was issued by the public Brazilian Development Bank (BNDES). The other eight corporate bonds were issued either as a note/debenture or Agribusiness Receivables Certificates (CRA).

Green bonds are financing a range of different project types with energy accounting for the largest proportion at 42%. This includes CPFL Energias Renováveis, the first company to issue a certified Climate Bond in October 2016. Agriculture and forestry projects account for the second highest proportion at 24% and will likely account for an increasing proportion of future issuance given the make-up of Brazil´s economy.[B4]

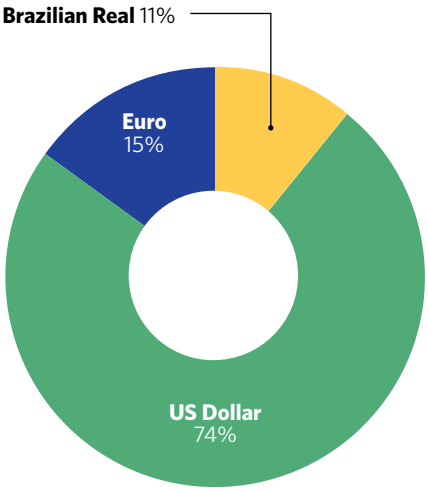
Issuance highlights include:

- **Omega Energia** (through SPV Potami Energia), a renewable energy developer, issued a BRL42.4m ($13.6m) debenture to refinance three wind farms. The final coupon of 7.38% was lower than Fitch's expectation of 9%. Fitch attributed it a local rating of AA(bra).[B5]
- **Rio Energy**'s first labelled green bond for BRL111.8m ($36m) will finance a 207MW wind complex. The interest rate was the lowest obtained by the company, indicating a strong appetite for green investments from Brazilian investors. Fitch published an expected local rating of AA(bra).[B6]

Climate-Smart Investment Potential 2016-2030

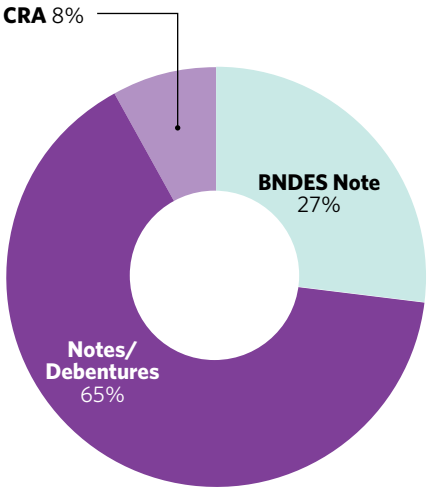


U.S. Dollar is the dominant currency



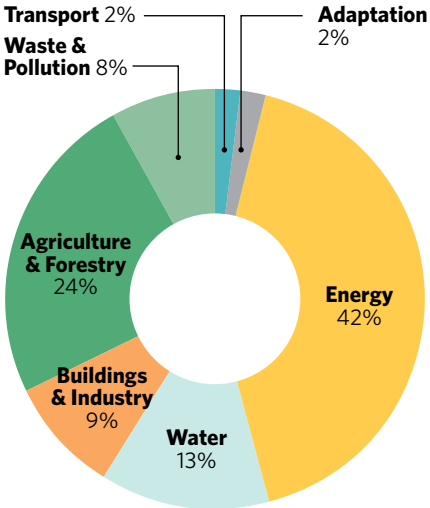
Source: Bloomberg.

Issuance types



Source: Bloomberg and CBI/SITAWI analysis.

Use of proceeds



Source: Climate Bonds Initiative.

History of issuance to date

	Issuer	Issue Date	Amount Issued	External Reviewer/verifier	Climate Bonds Certification	Proceeds
National Issuance	Rio Energy	May-17	BRL111.8m	SITAWI	Yes	Wind
	Omega Energia	Mar-17	BRL42.4m	SITAWI	Yes	Wind
	Suzano Papel e Celulose	Nov-16	BRL1bn	SITAWI		Forestry
	CPFL Energias Renováveis	Oct-16	BRL200m	SITAWI	Yes	Wind
International Issuance	Klabin	Sep-17	$500m	Sustainalytics		Mixed use: energy, energy efficiency, forestry, agriculture, transport and adaptation
	BNDES	May-17	$1bn	Sustainalytics		Wind and Solar
	Fibria	Jan-17	$700m	Sustainalytics		Mixed use: forestry, conservation, waste and water management and renewable energy
	Suzano Papel e Celulose	Jul-16	$500m*	Sustainalytics		Mixed use: forestry, conservation, water management, energy efficiency and renewable energy
	BRF SA	Jun-15	EUR500m	Sustainalytics		Mixed use: Energy efficiency, GHG emission reduction, renewable energy, water management, waste management, material usage and packaging efficiency and forestry

*The total amount of green bonds issued presented in this report does not include the recent Suzano Papel e Celulose's tapped amount of $200mi in Sep/2017.

- **BNDES** issued a $1bn green bond listed on the Luxembourg Green Exchange. It received a Ba2 Moody's rating and a 4.75% coupon, lower than the 5.25% originally estimated.[B7] Demand reached $5bn with orders from over 370 investors. Proceeds will finance wind and solar projects.[B8]

- The first-ever green CRA was issued in November 2016 by the securitization company **EcoAgro.** The BRL1bn ($295.3m) issue is backed by 100% export credit receivables from Suzano Papel e Celulose through an export credit note (NCE). The local rating from S&P was brAA+.[B11]

- **Klabin**, a pulp, paper and packaging company issued a $500m green bond to finance a wide range of forestry, energy and other projects.

Green bonds in the context of the Brazilian bond market

As of August 31 2017, the entire bond market in Brazil amounts to BRL5.8tn[B9] ($1.9tn) outstanding with over 50% of sovereign issuance.

Overall Brazilian bond issuance in Q1 and Q2 2017 amounted to $288.4bn[B10] with green bonds accounting for 0.2% - in comparison to the global bond market, green bonds made up 4% of issuance in the same period. In the short-term, we envisage the major growth opportunity for the corporate bond market and possibly long-term sovereign issuances, as long as institutional law reforms might be implemented.

The deal was seven times oversubscribed with a BB+ rating from Fitch and a coupon of 4.79%, initially estimated 5.38%.[B12]

The growth of issuance reflects, in part, the market education promoted by Climate Bonds, SITAWI, CEBDS and other local stakeholders.

Numerous developments have boosted Brazilian Green Finance

- **BNDES' BRL500m Sustainable Energy Fund managed by Vinci Partners** was launched in 2017 to invest in infrastructure tax-incentivized debentures focused on low carbon energy projects. It is expected to start disbursement in 2018 and is likely to be a key buyer of green bonds.

- **The $20bn Brazil-China Fund** was formed in June 2017 to finance infrastructure, industrial, agribusiness and other projects. China will finance three quarters of projects with the remainder from BNDES, CAIXA and private banks. The initiative could leverage green bonds related to infrastructure. There may also be opportunities to strengthen the partnership between both countries via this agenda.

- **Key industry associations** have been promoting green bonds and local instruments among their members, including UNICA (sugar and ethanol), IBÁ (forestry), ABEEólica (wind) and ABSOLAR (solar).

- **The Green Finance Council** was launched in September 2016, jointly convened by Climate Bonds and CEBDS to support market development in Brazil. It consists of executive-level stakeholders and works to address the bottlenecks to leveraging green finance in Brazil. The Green Finance Council has proven to be a valuable platform for driving market development and serves as an advisory body to promote capital market reform and financial innovation. The Council was formally endorsed under the Economic and Financial Dialogue partnership between Brazil and UK.

- **Brazil's Green Bond Guidelines** were launched by FEBRABAN and CEBDS in October 2016 to guide market participants in the process of green bond issuance.

- Also in October 2016, the **Brazil Investor Statement** was signed by six major financial institutions in Brazil. The statement was supported by Climate Bonds, PRI and SITAWI, and three more institutions signed the document in June 2017, totalling BRL1.8 trillion in AUM. Based on a global declaration from investors at the Paris COP21 in 2015, the Brazilian Statement reinforces the goal of creating a strong Brazilian green bond market and defines specific actions to achieving it.

- **A Strategic Alliance** to promote and develop green bonds in Brazil, China, India and Mexico was formed in December 2016 through an agreement between CEBDS GIZ and SEB. The partnership will interact with financial institutions, companies and investors, map barriers and provide technical support to foster the green bonds market. Three capacity building workshops have been conducted since the launch.

- **The Financial Innovation Lab,** a joint initiative to foster green finance in Brazil, convened by Brazilian Development Association (ABDE), CVM (Brazil's Securities and Exchange Commission) and Inter-American Development Bank (IDB), created three working groups in August 2017 that are discussing and proposing investment instruments and financial structures to crowd-in private sector capital and optimize the use of donor funds. The green bond working group aims to foster green bond markets in Brazil. Some of the initiatives under discussion include: improving the regulatory framework, developing self regulations, evaluating new instruments, evaluating opportunities for sovereign and public banks issuance and adopting international best practices. Climate Bonds and SITAWI are facilitators for the green bond working group.

- In 2016 and 2017, Climate Bonds also conducted **investor roadshows and forums** in both London and Brazil in order to identify large-scale low carbon investment opportunities.

Looking ahead: growth of the Brazilian green bonds market

The pipeline of labelled green bonds is expanding. According to a recent report on BNDES' Sustainable Energy Fund, over $688m in green bonds for wind energy generation are expected to be issued during the second half of 2017. The forecast is based on the Ministry of Mines and Energy Decennial Plan of Energy Expansion 2024, which has resulted in contracted wind farms producing total equivalent to 13,846 MW capacity in 2017 and a 24,000 MW target by 2024. The BNDES pipeline of wind energy projects includes 19 potential green bonds. Another four bonds are expected to fund energy projects, totalling $790m by the end of the year. Issuance from banks, transport and general corporates is harder to predict and exceeds the figures in the 2017 Forecast graph.

Research into unlabelled climate-aligned bonds, shows that in addition to the green bond market in Brazil, bonds are financing climate projects that are not labelled as green.

The size of this 'unlabelled climate-aligned' universe is at least $2.9bn outstanding – meaning that the potential green bond market in Brazil could exceed $6.5bn.

The unlabelled green bond data is made up of fourteen issuers in energy and transport sectors. Issuers include rail operator Rumo SA and renewable energy producer CPFL, also an issuer of a Certified Climate Bond (post-issuance).

One sector that we have yet to find any unlabelled climate-aligned bonds is within agriculture and forestry – a critical sector for Brazil. Definitions around what makes agriculture sustainable or 'green' are challenging given the complexity of the sector but it is likely to make up a large proportion of the green bond market in Brazil in the future (more in the next section).

Sectors for future growth

Agriculture & forestry

In 2016, Brazilian law was ammended to allow the issuance of CRAs denominated in foreign currency. This reform has the potential to attract international investors and expand sources of financing for the agricultural sector. In addition, a proposed bill is currently under discussion to allow collaterals to be denominated in foreign currency, providing additional legal safety for CRA investors. In 2016, agriculture represented 5% of Brazilian GDP[B13] and farming products represented 24% of total exports, equivalent to $13.5bn.[B14]

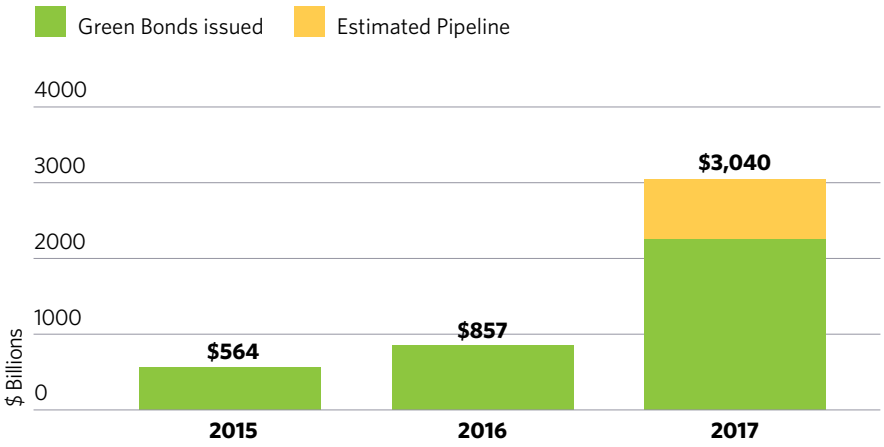
The agricultural sector plays a key role in underpinning Brazil's economy as a major contributor to the country's exports. Brazil is the world's second largest agricultural exporter, the biggest producer of sugar, orange juice and coffee and the largest supplier of soybeans.[B15] The sector is expected to make an increasing contribution to meet rising global food consumption.

The sector is also helping the country to withstand the current fiscal challenges with an increase in production, underpinned by longstanding investments in research, technological progress and efficient use of land and labour. Yet, there are significant negative environmental and climate impacts associated with agricultural production including deforestation for new farmland.

Shifting capital towards sustainable agricultural development in Brazil has huge potential to boost production using fewer resources. Given this, we expect to see an increasing number of issuers from the agriculture and forestry sectors. In particular, there is potential for "Green CRAs" and deals from commercial banks repackaging their low-carbon agricultural lending portfolios.

The Public Low Carbon Agriculture Programme (ABC programme)[B16] provides low-interest loans to fund the implementation of low carbon agricultural practices and technologies such as restoration of degraded forest areas and development of integrated crop-livestock-forestry systems. However, there are some constraints to scaling up this program such as insufficient technical capacity among small and medium farmers, and access to loans involves a substantial administrative process as rural landowners have to be registered at CAR (Brazil's Environmental Registry) for that.

2017 Forecast



Source: BNDES and SITAWI.

Agribusiness Receivables Certificate (CRA)

A CRA is a debt security exclusively issued by an agribusiness securitization company backed by agribusiness credit rights. These credit rights arise from financing operations or loans related to agricultural production, trading, processing or industrialization of products, machinery or equipment. The securitization companies structure those receivables in order to issue debt securities and distribute them to investors. CRA operations are IOF and tax income exempt for individual investors. BRL24.3 billion* ($7.8 billion) has been issued in 2017; 38% growth when compared to last year's figures (8 months' window).

*As of 31st of August 2017, Source: CETIP

The CAR is a public registry system regulating land use change, private property environmental assets and deforestation. The New Forest Code is a new mechanism that may establish a regulatory culture in Brazil and serve to attract more investors to tap the land use sector.[B17]

Renewable energy - Brazil has been successfully maintaining its renewable energy mix and it is one of the world's leaders in clean energy. Renewable energy in Brazil accounted for 39% of primary energy supply in 2014 - versus a global average of approximately 14% (see graph below).

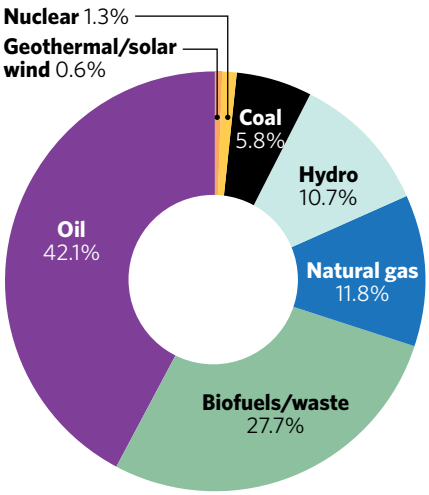
Bioenergy still holds a large share of the renewable mix, mostly supported by government efforts to increase domestic biofuels production. Brazil is the world's second largest biofuel supplier (sugarcane-based ethanol) with 22%; the U.S. is the largest at 48% (maize-crop ethanol); and Europe produces 17% of biodiesel.[B18]

Biofuels are complex when it comes to sustainability issues and policies should consider increasing mandates with sustainable requirements to strengthen standards, certification, audit schemes, capacity building and research investment in second and third generations. As an example of sustainable practice, the EU Renewable Energy Directive does not provide financial support to projects where biofuels have originated from lands with a high carbon content or with high biodiversity.[B19]

More recently, relevant public investments have been reallocated to finance alternative renewable sources - such as wind and solar. The proportion of alternative energy within Brazil's energy mix is estimated to increase from 16.2% to 27.3%[B20] by 2024.

Wind power generation is small but since 2009 has been thriving and by 2016 Brazil had 430 wind farms and a total capacity of 10.7 GW, the world's 9th-largest[B21].

Brazil: Share of total primary energy supply in 2014



Source: IEA, 2014.

It represents 7.1% of Brazil's electricity mix. Brazil's wind power's investment potential is estimated to reach $32bn by 2020[B22] supported by BNDES loans and its BRL500m Sustainable Energy Fund ($159.6m).

Solar energy capacity is expected to rise over the coming years, supported by technological progress and the downward trend in prices. Solar energy currently generates only 27MW (0.02% of the national electricity mix) but is predicted to grow to 7GW (3.3% of the electricity mix)[B23]. Solar investments are estimated to reach $8bn by 2020.[B24]

Brazil's Government has been supporting renewable energy growth through energy auctions, as well as with BNDES loans, special credit lines and its recent Sustainable Energy Fund. Another important development is the grid metering norm by Brazil's Energy Agency (ANEEL) which sets out the general conditions to micro and mini-generation from renewable sources accessing electricity distribution systems.

Additional cross-sectoral infrastructure investment potential

The majority of Brazil's population live in urban areas and will require climate-smart investment to support **urban-infrastructure development**. It has been estimated that more than $50bn will be directed to low-carbon buildings and $5bn to the waste sector by 2020. Another $209bn in green infrastructure investments will be required in rail and roads by 2020 including increasing the share of biofuels in national transport fuel consumption and increasing the use of energy efficient vehicles.[B25]

IFC estimates $6.4bn investment potential to improve **energy efficiency in Brazil's industrial sector** by 2020. A more comprehensive energy efficiency policy needs to be established as Brazil's NDCs aims to achieve 10% savings by 2030. The industrial sector has an enormous potential to implement sector-specific policies. One example is the electricity generated by combined heat and power in the industrial sector that is currently less than 1%.

Another source of potential growth lies in three expected **rail auctions** announced by the Brazilian government: North-South Railway (possibly with an extension to Mato Grosso), West-East Railway (with potential connection to the North-South railway) and Ferrogrão from the Midwest region (Mato Grosso) to the North (Pará). The North-South railway auction is expected to occur in 2018 and to raise BRL1.5bn ($479m).[B26]

In order to reduce Brazil's transport emissions, it is estimated that more than 50% of climate-smart investments will be required for transportation.[B27]

Policy and Market Guidance

Brazil has come a long way in the last three years on green finance directions despite difficult economic headwinds. A domestic green bond market is taking root, backed by guidelines and private sector initiatives.

Reaching Brazil's NDC goals will be possible by strengthening and developing new public policies and aligning Brazil's public resources with green priorities in mid-term and long-term. Specific actions:

Government:

1 **Establish a government green bond program** by the Ministry of Finance to act as demonstration issuance for potential corporate issuers and to increase liquidity in the Brazilian green bond market (i.e. via publicly owned companies, exempted partially from the fiscal budget cap).

2 **Establish a green project pipeline** and planning process through relevant ministries with clear signalling to the private sector i.e. via Investment partnership program – PPI.

3 **Harmonise selective tax breaks,** in CRAs, CRIs, LCAs, etc., to attract domestic institutional investors to the regular bond and the emerging green bond market.

Regulators:

4 **Support stronger standards and certification criteria** that define green assets and projects in Brazil. This will include better standards and definitions for energy transmission systems, bio-ethanol and in other third generation biofuel crops.

5 **Encourage more green investment** from closed and public pension funds, as well as insurers through their respective regulations.

Public institutions:

6 **Increase green bond issuance from public institutions** - locally and internationally - including the current BNDES pipeline of low carbon infrastructure and sustainable land use projects.

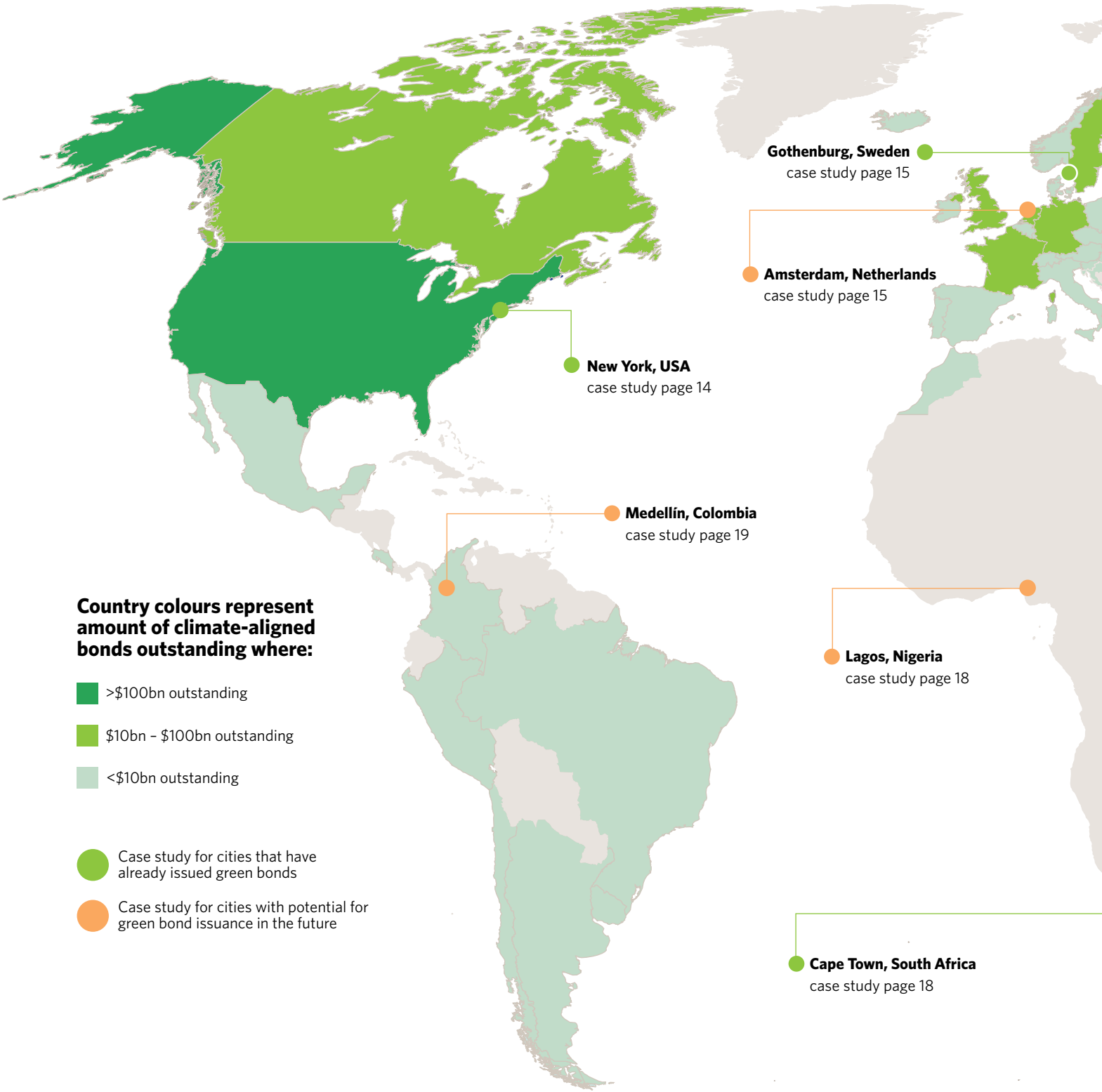
7 **Develop mechanisms to support private sector issuance** of green finance products – e.g. credit guarantees provided by BNDES.

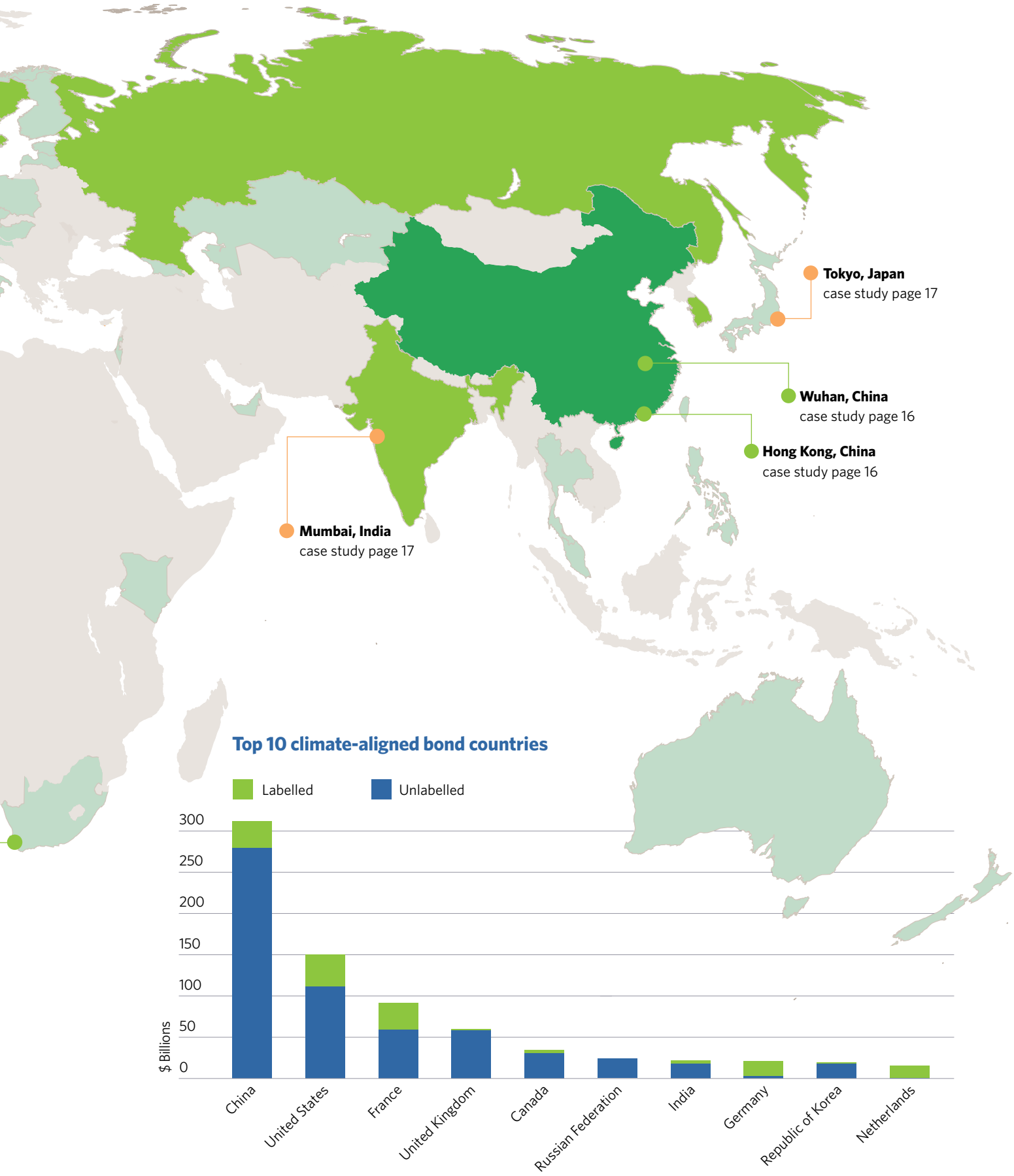
Private sector players and industry associations:

8 **Create a green bond platform** for information and negotiation to strengthen the secondary market.

9 **Promote further market education** by knowledge sharing gained from past issuances and stimulating innovative issuance from new sectors.

Climate-aligned bonds across the world





Top 10 climate-aligned bond countries

Building resilient cities: green city bond case studies

70% of global greenhouse gas emissions come from cities, and many of the world's most populated cities sit on coastlines, rivers and flood plains, they are particularly vulnerable to negative impacts from a changing climate[12].

Cities are central to building the low carbon and resilient infrastructure needed to ensure future economic growth that addresses and adapts to climate change. Cities have formed networks like C40 to exchange best practices for managing climate risks. These platforms may play a role in achieving NDCs and driving climate action.

Bonds are a key tool to finance climate infrastructure in cities. Bonds, some of which are labelled green, have been used by cities and related agencies to finance climate and other infrastructure for decades. Since the first labelled green city bond was issued in 2013, over 180 labelled green city bonds from 13 countries have come to market. This includes bonds from cities, municipalities, transport authorities, water utilities and municipal banks.

The 10 case studies below show both the precedent and opportunities for green city bonds. Opportunities for future green city bonds involve expanding on the precedent of early adopters, and bringing in new players. In this section, we examine climate-aligned bond issuance and highlight case studies of the many cities that have already issued green bonds as well as cities that may issue in the future. Cities were chosen to illustrate a wide range of geographies but are only a sample of the broader market.

The potential for scale-up varies across cities depending on the size of the local bond market and infrastructure plans. In each case study, we estimate this potential but note that this is not an empirical measure. For example, green bond potential for New York exceeds that of Lagos but both are important within their respective regions.

Green city bonds: spotlight on North America

The North American climate-aligned universe stands at $184bn making it the third largest region after Asia-Pacific and Europe. It comprises only the U.S. and Canada with the U.S. accounting for 81% of the total.

Transport and Energy themes dominate issuance in the region, accounting for 48% and 30% of total climate-aligned issuance respectively. In the transport theme, U.S. rail entities BNSF and Union Pacific are the largest while almost a third of issuance in the energy theme comes from Canada's Hydro Québec.

Current climate policy in the U.S. and Canada could not be more different. The U.S. has stated its intention to withdraw from the Paris Agreement, one of only 3 countries to do so. Canada, on the other hand, has made strong statements on climate action launching the Pan-Canadian Framework on Clean Growth and Climate Change in December 2016. National climate policy, however, is not the whole picture and, despite differing levels of government commitment, both countries are making progress on climate finance.

The U.S. continues to be a leader in muni green bonds despite the political context. Sub-sovereigns have reinforced their climate commitments with 13 states forming the United States Climate Alliance to collaborate on climate action and adhere to the original commitments of the Paris Agreement. Since 2015, labelled green muni bond issuance has increased to over $18bn as sub-sovereigns use the bond market to finance mitigation and resilience projects. The California State Treasury Department has stated that labelled green bonds are an essential tool for meeting a $359bn funding gap in public infrastructure over the next 10 years.[13]

U.S. issuers are pioneering green securitization, with nearly $7bn ABS bonds outstanding in the climate-aligned universe (all labelled green). Much of this comes from the Property Assessed Clean Energy (PACE) legislation and financing model driven by entities such as Renovate America and Ygrene Works. PACE legislation allows local governments to fund the up-front cost of energy improvements which are paid back over time by the property owners.

In Canada, government agencies and sub-sovereign issuers have played a big role in the development of the green bond market with the Province of Ontario and Export Development Canada (EDC) being early issuers. In the first half of 2017, green bond issuance ramped up with the Quebec Ministry of Finance issuing its first green bond[13] as well as regular issuers EDC and Ontario, bringing labelled green bond issuance to over $1.5bn in 6 months. Alongside national policy commitments, green bonds may play a role in the newly formed Canadian Infrastructure Bank, aiming to raise over C$21bn to support green infrastructure over the next 11 years.[14]

Green bond issuer: New York

About New York

As one of the largest sub-sovereign bond issuers in the U.S., New York has acted as a demonstration green bond issuer for municipalities, large and small, around the country. Other large cities such as San Francisco and Los Angeles have followed.

The state has shown leadership in supporting best practice with both the Metropolitan Transportation Authority and New York State Housing Finance Agency issuing certified Climate Bonds amounting to over $3.7bn and, given infrastructure plans, potential for future issuance is substantial.

While NY has demonstrated scale, other municipalities have also boosted the market and proved investor demand for smaller bonds.

C40 member: Yes

Compact of Mayors Commitment: 80% reduction in CO_2 emissions by 2050

Bond issuing powers: Yes, through the city and through state agencies like MTA

Total bond issuance last 5 years: New York is a frequent issuer with total issuance since 2012 exceeding $10bn

Planned/current climate infrastructure projects:

- $1.7bn subway expansion[15]
- $315m wastewater adaptation[16]

Country's NDC commitment: None

Estimated potential for green bond issuance: Significant (>$1bn p.a.)

Green city bonds: spotlight on Europe

Over the next 20 years, EUR180bn in additional annual investment will be required to meet the EU's 2030 climate and energy targets.[17] The biggest investment gaps relate to energy efficiency in buildings and transport, and are more substantial in Central and Eastern Europe.

26 countries are represented in the European climate-aligned bond dataset with France at $92bn, the UK at $60bn and Russia at $24bn. Of these 26 countries, 18 have also issued labelled green bonds. Within the European segment of climate-aligned data, **59% of bonds are financing low carbon transport solutions and 21% energy.**

European cities were the first to issue green labelled bonds with Nordic cities (Gothenburg) and French regions (Ile de France) leading the way. 19 separate cities and city-related entities have issued labelled green bonds in Europe. Pioneers have included Nordic municipality debt aggregators such as Kommunalbanken. They enable small municipalities to access low cost capital by issuing senior unsecured bonds backed by a highly-rated aggregator (owned by the sovereign government). The result is highly-rated bonds and low cost of capital for small cities and municipalities.

European issuers are showing the potential for a range of bond types to be utilised in financing green infrastructure – the past 18 months saw the issue of the first green Schuldschein (debt instrument), green Pfandbrief (covered bond) and green loans.

European investors are leading demand for green investment. There are over 15 dedicated green fixed income funds for the European market. Some are dedicated to labelled green bonds while others include unlabelled climate-aligned bonds.

The first European Residential Mortgage-Backed Security (RMBS) could point to growth of a European green securitization market. Dutch Obvion issued the first green RMBS, under the Climate Bonds Standard in June 2016. The European Mortgage Federation and European Covered Bond Council have since launched an Energy Efficient Mortgages Initiative[20] to develop standardised energy efficient mortgages.

In 2017, Climate Bonds teamed up with the European Covered Bonds Council to form the '**EU Green Securities Committee**'. The main goal is to promote the development of a green securities market in Europe including covered, asset-backed and senior unsecured bonds. The members will be working closely to develop the green debt market in Europe.

Green bond issuer: Gothenburg

About Gothenburg

The Swedish City of Gothenburg was one of the first cities to issue a labelled green bond. Since their initial SEK500m ($79m) green bond in 2013, four additional bonds have been issued with a combined value of over SEK5.5bn ($800m). The proceeds have financed projects in renewable energy, energy efficiency, public transportation, waste management, water treatment, and sustainable housing.

Future bonds could finance a range of planned infrastructure projects including regional high-speed train projects and electric buses planned for 2018-2020.

While the city is a frequent bond issuer and has ambitious project plans in the pipeline, the scale of green issuance is likely to be moderate given its small population size (approx. 500,000 people).

C40 member: Yes

Compact of Mayors commitment.
- 40% reduction in CO_2 emissions from 1990 levels by 2020, and
- 80% reduction by 2050
- 55% renewables in energy mix by 2030[18]

Bond issuing powers: Yes, through the City of Gothenburg

Total bond issuance last 5 years: >SEK30bn ($2.5bn)

Planned/current climate infrastructure projects
- West Link public transit project[19]
- Götaälv Bridge tram infrastructure
- Municipal bus electrification
- Regional high-speed train projects
- Bergson 2021 green urban housing

Country's NDC commitment: EU Commitment – 40% reduction over 1990 by 2030

Estimated potential for green bond issuance: Moderate ($100-500m p.a.)

Potential issuer: Amsterdam

About Amsterdam

Amsterdam has been active in innovative green finance programmes like the Amsterdam Investment Fund and Green Finance Lab. While the city itself cannot issue a bond directly, municipal banks and funding agencies in the Netherlands issue bonds collectively for certain infrastructure projects.

BNG Bank, for example, raises low cost finance for public-sector institutions. It could follow the precedent set by the Nordic municipal debt aggregators. Green bonds have been issued in this manner by Nederlandse Waterschapsbank for regional water authorities, this process could be replicated by other entities for city or municipal projects. This could help Amsterdam finance green infrastructure such as the planned North-South Metro project and meet the climate commitments of the forward-looking city.

C40 member: Yes

Climate commitment: Reduce CO_2 emissions by 40% (1990 levels) by 2025

Bond issuing powers: Not directly but through municipal funding agencies or regional banks

Total bond issuance last 5 years: None as Amsterdam

Planned/current climate infrastructure projects:
- IJ bicycle river bridge
- EUR3.1bn North-South Metro[21]

Country's NDC commitment: EU Commitment – 40% reduction over 1990 by 2030[22]

Estimated potential for green bond issuance: Moderate ($100-500m p.a.)

Green city bonds: spotlight on Asia-Pacific

Asia-Pacific is the largest region in the climate-aligned universe, primarily due to issuance from China which accounts for 82% of the total in the region.

Rail accounts for 70% of regional issuance, which includes the financing or refinancing of rail projects and related infrastructure. Much of this is from China Railway Corp which, alone, makes up over 58% of issuance from the Asia-Pacific region and a quarter of the entire global universe. Taking China Railway Corp out of the dataset puts the energy and transport themes at similar amounts outstanding – both approximately $50bn.

China dominates, accounting for 82% of issuance in the region, with India and the Republic of Korea small but growing. While China is large, the figures for the climate-aligned universe are broadly in line with that of the global debt securities market – for example, the Chinese debt securities market is approximately 12 times that of India[23]. In the climate-aligned data, China is also 12 times that of India.

Largest issuers include China Railway Corp ($222bn), Indian Railways ($14.7bn), China Three Gorges ($13.6bn) and Korea Railroad ($10.5bn). Of note, few Japanese rail issuers have been included in the dataset – this is because all of the main Japanese rail operators derive a large segment of their revenue from retail, restaurants, hotels and advertising, some of which is linked to station infrastructure.

China - 90% of climate-aligned bonds were issued by entities backed by the sovereign or sub-sovereign government. Issuance has been bolstered by the Government's commitment to a green economy in China's 13th Five Year Plan[25].

A number of regulatory developments have also taken place that are supportive of a green financial system including the roll-out of national Guidelines for Establishing the Green Financial System, and the release of green bond guidelines from various regulators such as People's Bank of China (PBoC), National Development and Reform Commission (NDRC) and China Securities Regulatory Commission (CSRC).

We expect to see the sovereign or sub-sovereign issuance to continue fuelling China's market momentum, as more green infrastructure projects are planned in line with policy imperatives.

Green bond issuer: Wuhan

About Wuhan

Wuhan is one of the largest cities in central China with a population of over 10 million. The municipality has put great emphasis on building a low carbon city. To achieve its carbon reduction goals, significant efforts have been made to expand and 'green' the mass transit system.

Wuhan Metro constructs, manages and operates the metro transit in the city, and is owned by the municipality government. It issued China's 1st metro green bond in July 2016, and has become a frequent green bond issuer with total issuance of RMB5.5bn ($8.5bn).

As of August 2017, metro lines in Wuhan reached 180 kilometres. It is scheduled to have 32 lines of 1,200 kilometres by 2049, accounting for over 55% of the city's public transportation. The city also has ambitious plans to build large scale BRT networks, introduce electric buses and cycle hire services.

C40 member: Yes

Climate plan:
- 56% GHG per unit GDP reduction by 2020

Bond issuing powers: Yes, through local government financing vehicle

Total bond issuance last 5 years: More than $5bn issued through the government financing vehicles, and more than $4bn issued through transportation groups

Planned/current climate infrastructure projects:
- Wuhan Metro expansion
- Flood protection projects
- Wuhan - Huantou Public Bicycle Service System
- Bus Rapid Transit system

Country's NDC commitment:[24]
60-65% reduction in carbon

Estimated potential for green bond issuance: Significant (>$500m p.a.)

Green bond issuer: Hong Kong

About Hong Kong

Hong Kong is home to Hong Kong MTR, a pioneer of financing public transit through real estate and the value capture model since its inception in developing Hong Kong's urban metro system in 1975.

MTR, while majority owned by the government, operates as a publicly-traded company with operations around the world. In 2016, MTR issued a $600m green bond for service enhancements and environmental performance improvements[26].

With a strong climate action plan, green bonds could play a stronger role across other municipal functions, including in the financing of the planned 3-4% increase in renewable energy sources, the expected $500m energy upgrades for municipal buildings, or the many waste to energy projects planned in the near-term[27].

C40 member: Yes

Climate plan:
- 36% absolute reduction of carbon emissions
- 65-70% reduction of carbon intensity over 2005 levels by 2030
- Reduce community-wide CO_2 emissions intensity by 55% per HK dollar GDP by 2020 from 2005[28]

Bond issuing powers: Yes

Total bond issuance last 5 years: Frequent bond issued - more than $35bn issued through Hong Kong SAR Government Bond Programme

Planned/current climate infrastructure projects:
- Municipal building upgrades
- Renewable energy
- Centralised greywater system estimated to be completed by 2024.[29]

Country's NDC commitment:[30] [China]
60-65% reduction in carbon

Estimated potential for green bond issuance: Significant (>$1bn p.a.)

India – domestic climate-aligned issuance amounts to $21bn outstanding from 21 issuers with Indian Railways accounting for 68%. Labelled green bond issuance has also grown, with $3.6bn currently outstanding - predominantly financing projects related to renewable energy. Issuers include NTPC which leveraged fossil fuel balanced sheets in order to raise capital for solar and wind energy projects. Movements are also being made to catalyse the national green bond market - the Indian Green Bonds Council was formed in late 2016 and in June 2017, the corporate regulator, Securities Exchange Board of India (SEBI), released guidelines for listing green bonds. The guidelines will bring greater transparency and certainty to the Indian green bond market.

Republic of Korea – Total climate-aligned bonds outstanding from Republic of Korea amounts to $19.4bn from 14 issuers with the largest two issuers Korea Railroad Corp ($10.5bn) and Korea Hydro and Nuclear ($6.8bn) accounting for almost 90% of the total. Two Korean issuers have issued labelled green bonds to date – Export-Import Bank of Korea and Hyundai - but no regulatory or other major developments have taken place yet. Given the strength of Korea's auto industry and electronics industry, there could be green issuance in the future from car manufacturers financing zero emissions vehicles or for manufacturers of energy efficiency technologies, such as LED lighting.

Australia – To date, there have been 15 labelled green bonds amounting to $5.5bn from 12 issuers. Though a relatively small sized market, Australia has a diverse range of green bonds, including 13 Certified Climate Bonds from the nation's four big banks: ANZ, CBA, NAB and Westpac, two state governments, a listed property company, a leading tertiary institution and several green ABS.

Australia is a best practice example of market development, driven by leadership from the banks and their support for robust standards and disclosure, the involvement of sub-sovereigns and the government-backed Clean Energy Finance Corp as well as demand from local pension funds.

Only one climate-aligned issuer (Reliance Rail) was discovered during the research process. This does not mean that bonds are not financing green assets but that issuers are too diversified to be picked up by the research process.

Australia has advanced regulations for measuring and monitoring emissions from buildings and strong growth in rooftop solar. Future labelled issuance may emerge from finance, sub-sovereigns, and the property sector given their strong presence in the green bond market to date.

Potential issuer: Mumbai

About Mumbai

With nearly $1tn needed to meet mitigation goals under India's NDC, much of the progress will be made in the dynamic, growing urban centres. Mumbai has a range of projects from waste management to public transit that could be financed through green bonds.

India's Ministry of Urban Development (MoUD) has also prioritised action on municipal bonds under its Smart City Mission launched in 2015, granting a 2% interest subsidy to incentivise municipal issuers.

The potential for green bonds from Mumbai may be significant in the long-term but in the short-term, issuance will likely be small. Mumbai's Brihanmumbai Municipal Corporation has not issued a bond in over 10 years. India plans to revive its municipal bond market and 2017 saw the first municipal bond issued since 2007 (by Pune Municipal Corp).

C40 member: Yes

Climate commitment: Commitments to adaptation made, but not mitigation

Bond issuing powers: Yes- through municipal corporations (Brihanmumbai Municipal Corporation) and Mumbai Metro

Total bond issuance last 5 years: none

Planned/current climate infrastructure projects:

- $136m Deonar Waste-to-Energy Project[31]
- $344m MSDP Stage II waste water project[32]
- $12bn Mumbai metro expansion[33]

Country's NDC commitment: Estimated at $834bn to 2030[34]

Potential for green bond issuance: Large

Estimated potential for scale: Small in short-term (<$100m p.a.)

Potential issuer: Tokyo

About Tokyo

Japan is home to the world's second largest bond market. In February 2017, the Tokyo Metropolitan Government (TMG) published a 'Green Bonds Issuance Policy' as part of a larger constellation of environmental goal setting, establishing a path to a greener city as Tokyo revamps its infrastructure for the 2020 Olympics[35].

Building on the trial run of Tokyo's Environmental Supporter Bond (AUD125m/$93m)[36], TMG is planning on doubling last year's issuance between October and December of 2017, using the established project pipeline from 2016.

Pre-allocated projects involve environmental measures for Olympic facilities, carbon neutral conversions for municipal buildings, LED street lights, and public enterprise projects, all in the service of achieving Tokyo's goal of reducing GHG by 30% below 2000 levels by 2030.

C40 member: Yes

Climate commitment[37]: Reduce community-wide CO_2 emissions by 25% from 2000 - 2020

Bond issuing powers: Yes, Tokyo Metropolitan Government

Total bond issuance last 5 years: Frequent bond issuer - over $20bn issued

Planned/current climate infrastructure projects:

- Environmental measures for the venues of the Tokyo 2020 Olympics
- Conversion of lighting in Tokyo-owned facilities and street-lighting to LED

Country's NDC commitment: 26% by fiscal year (FY) 2030 compared to FY 2013[38]

Estimated potential for green bond issuance: Significant (>$1bn p.a.)

Green city bonds: spotlight on Africa

Total climate-aligned bond issuance remains small in Africa with just under $3bn outstanding, over half of which is labelled green bond issuance.

This is not out of line with Africa's overall bond market development which is still small – only South Africa has a bond market of any substantial size (approximately $235bn outstanding[39]) while all other markets are smaller than $20bn outstanding.

There are four unlabelled climate-aligned issuers in the African dataset: two project bonds in South Africa (Touwsriver Solar Power and Elevate Wind solar), the rail operator of Morocco, and the Kenya Electricity Generating Company, which is majority hydro assets.

South Africa and Morocco - the green bond market remains largely undeveloped but small changes may be on the horizon. The City of Cape Town, City of Johannesburg, Banque Centrale Populaire, MASEN, and BMCE Bank have each issued labelled green bonds within the past 3 years, increasing awareness and acting as examples for other potential issuers.

Kenya & Nigeria Programmes: It is likely that the market for green bonds in Africa will largely be developed by sovereigns. Both Nigeria and Kenya have stated that they plan to issue sovereign or sub-sovereign green bonds. Rwanda has also shown interest in issuing a green bond in the longer term. The first African sovereign green bond is expected from Nigeria in 2017.

Market development is high on the agenda for Africa and there are numerous events that will facilitate further growth. In Nigeria, the Climate Bonds Initiative is working on a joint initiative with the Ministries of the Environment and Finance to advise on the sovereign green bond. In the longer term, the goal is to develop a domestic green bond market in Nigeria.

In Kenya, Climate Bonds Initiative, in collaboration with the Kenyan Bankers Association, and the Nairobi Securities Exchange have developed green bond guidelines in line with international best practice. These guidelines will be finalised following stakeholder consultation. There is also work ongoing to develop a pooled vehicle, allowing the aggregation of bank loans to issue green bonds.

Green bond issuer: Cape Town

About Cape Town

Cape Town issued its first green bond in July 2017, a ZAR1bn ($76m) Certified Climate Bond[40]; the first certified green bond for South Africa, and the second South African city green bond after Johannesburg in 2014. Proceeds are supporting transportation, energy efficiency, wastewater, and coastal resilience projects.

Cape Town residents are currently in the middle of a climate crisis as 3 years of low rainfall has caused the worst drought in a century[41].

Cape Town is not a frequent bond issuer (previous bond in 2010) so although this green bond is playing a part in achieving the country's NDC objective, the use of the bond market to raise capital will likely be small. With a defined green bond framework already in place, Cape Town can act as an example for other cities across the region.

C40 member: Yes, and C40 Cities Clean Bus Declaration

Compact of Mayors commitment[42]:
- 10% city-wide energy consumption from renewable sources by 2020
- 13% reduction in emissions by 2020

Bond Issuing Powers: Yes, through the City of Cape Town Metropolitan Municipality

Total bond issuance last 5 years: 1 bond ZAR1bn ($76m) labelled green

Planned/current climate infrastructure projects:
- BRT bus system extension
- Coastal protection and adaptation

Country's NDC commitment: $1.68tn in mitigation and adaptation investment economy-wide[43]

Estimated potential for green bond issuance: Small - <$100m p.a.

Potential issuer: Lagos

About Lagos

Lagos is one of the world's fastest growing megacities, and an economic powerhouse in West Africa. As a waterfront city with a unique set of planning and adaptation challenges, Lagos could benefit significantly from city green bond issuance across a number of sectors, which have been identified as priority areas in the Lagos State Development Plan[44].

As an example, wastewater management and drainage infrastructure projects in the long-term planning horizon are key elements for increasing flood resilience, and would be well-suited to green bonds. The Development Plan also outlines goals for renewable energy and public transport.

The Lagos State government issued a N85.14bn ($233m) bond in August 2017 for social and built infrastructure[45].

C40 member: Yes

Climate commitment: Lagos State Development Plan 2012-2025 - Includes sections on waste management projects, wastewater, climate adaptation, but no specific goals set.

Bond issuing powers: Yes, Lagos State issues sub-sovereign bonds

Total bond issuance last 5 years:

2 bonds N165bn ($548m)

Planned/current climate infrastructure projects:
- Wastewater management and drainage infrastructure $712m
- Renewable energy supply to 15GW
- Public transport capacity increase

Country's NDC commitment[46]: 20% unconditional reduction over BAU

Estimated potential for green bond issuance: Small - <$100m p.a.

Green city bonds: spotlight on Latin America

Total climate-aligned issuance amounts to $14.5bn with Brazil accounting for the majority ($6bn) followed by Mexico ($3.1bn). While total issuance is small, it is diverse with over 40 different climate-aligned issuers discovered.

Transport, energy and multi-sector are the largest themes accounting for 28%, 32% and 26% respectively. In the transport theme, all issuance financed rail or public transport projects with the Lima Metro ($1.2bn) being the largest issuer. In the energy theme, the majority of bonds are financing wind energy with issuers including Mexico's Nacional Financiera (NaFin) as well as La Rioja Province in Argentina. Multi-sector bonds are all labelled green bonds financing multiple projects types including the largest issuer in the region, Mexico City Airport, and Costa Rica's only issuer to date Banco Nacional de Costa Rica.

Mexico City Airport is the largest issuer ($2bn) but there are no dominant issuers in the region unlike other regions. The largest ten issuers account for only 61% of issuance. Other large issuers include the Lima Metro (Peru), BNDES (Brazil), All America Latina Logistica (Brazil) and Suzano Papel e Celulose (Brazil).

Two labelled green bonds have been issued by sub-sovereign entities to date in Latin America – the City of Mexico (MXN1bn / $49m) and La Rioja Province in Argentina ($200m).

Labelled green bond issuance has increased to $7.5bn with $5.8bn of that issued in the past year alone. $4.9bn was issued by corporate entities and $2.1bn by development banks. Mexico City Airport is the largest green bond issuer in the region to date following their $2bn green deal financing green airport infrastructure. Green bonds have predominantly been issued for renewable energy projects while climate-aligned bonds have predominantly been issued for transport and renewable energy projects.

Who will lead the region - Mexico or Brazil? Brazil and Mexico lead Latin America in terms of population and GDP, and their local green bond markets are at similar development stages, offering a contemporary comparison of green finance in the region.

Brazil ranks 5th in terms of global population (205 million), and São Paulo its largest city, was in the top 5 of the world's megacities in 2016, and is set to remain in the top 15 by 2030, with an estimated population of almost 24 million. Mexico has a population of over 120 million, and Mexico City is projected to be in the top ten of global megacities by 2030 with a population of over 23 million.

Both countries have created local green bond market development councils - the Brazil Green Finance Council and Mexico's Advisory Council on Climate Finance. In addition, local institutional investors have committed to support the growth of long term, sustainable global markets in green bonds. Investors with over BRL1.80tn ($575bn) of assets under management (AUM) signed the 'Brazil Green Bonds Statement' in 2016. In 2017, 57 Mexican investors with MXN4tn ($225bn) AUM signed a similar statement at the Mexican Stock Exchange.

There has been a sharp increase in labelled green bonds from Brazil in 2017 partly due to the 2016 release of green bond guidelines[47] by the Brazilian Business Council on Sustainable Development (CEBDS) and the Brazilian Bank Federation (FEBRABAN). Brazil's giant development bank BNDES announced in late 2016 the creation of a BRL500m ($144m) green bond fund, to buy renewable energy bonds issued domestically. A $1bn green bond followed in May 2017.

In contrast, issuance in Mexico has emerged from supranationals and sub-sovereigns, including NaFin, Mexico City and the City's Airport Group. Due to the lack of participation of the private sector, there have been calls for the development of guidelines and national standards to support corporate issuers and give confidence to investors, that are often wary of the credibility of 'green' projects[52].

International development banks are also encouraging issuance in the region. In Colombia, the IDB and IFC have supported local banks coming to market. In Mexico, the IDB along with the Clean Technology Fund have been working on unlocking finance for energy efficiency projects through securitisation for green bond issuance.

According to the IFC's Climate Investment Opportunities in Emerging Markets report, Brazil's climate smart investment potential for 2016–2030 stands at $1.3tn and Mexico's at $791bn. Opportunities exist for green finance development in Latin America, however the right conditions must be nurtured. Institutional investors have called for 'strong action on climate change' and stand ready to invest in green bonds from the region.

Potential issuer: Medellín

About Medellín

Medellín has progressive urban transport systems and the power to issue bonds. It has a 2006-2030 plan for the Medellín Metro which includes extensions to existing lines as well as new lines[48].

The city's 2016-2019 development plan has a sustainable transport programme which includes upgrades, extensions and modernisation to metro, rail and other mass transport systems. It also includes a vision for a green city which includes integrated climate mitigation and adaptation planning and waste management.

The Colombian Government has also published a Roadmap for green bonds[49], which highlights the potential for municipal bond issuance. The Roadmap identified a portfolio of green city projects which amounts to $24.7bn across the major cities.

Medellín's integrated urban renewal project with light rail and metro cable was funded, in part, through a green bond issued by Agence Française de Développement.[50]

C40 member: Yes

Climate commitment: Commitments to adaptation made, but not mitigation

Bond issuing powers: Yes, through entities such as public utility Empresas Públicas de Medellín (EPM) owned by Medellín can issue bonds

Total bond issuance last 5 years: 14 deals amounting to approx. $1bn

Planned/current climate infrastructure projects:
- Medellin Metro expansion
- Medellin rail upgrades

Country's NDC commitment: COP57.8bn will be required by 2030 to mitigate GHG effects, accounting for an investment of near COP3.18bn per year.[51]

Estimated potential for green bond issuance: Small - <$100m p.a.

Labelled green bonds

2016 was another record breaking year in the labelled green bond market with labelled green bonds amounting to $81.4bn*, an increase of almost 100% from 2015. 2017 looks set to continue this trend.

The green label is a tool to meet climate targets by closing the gap between funding needs and investor demand. It is a signalling mechanism to investors – an easy way to identify that investments are green. In this way, the label reduces friction in the market and enables the flow of finance from investors to green investments.

Green bond issuance in 2017 is likely to break new records with $57bn issued by the end of Q2. 2017 may be the year that the market exceeds the $100bn mark.

25% of the climate-aligned universe is now made up of labelled green bonds. This is a marked difference to the first report in 2012 where there were just $7.2bn of labelled green bonds - less than 5% of the universe.

This is encouraging – our view has always been that this report should showcase opportunities for labelling and demonstrate just how big the market could become. But for investors, there is a value in labelling.

Since the original State of the Market report in 2012, one primary aim has been to demonstrate to the market that the green label is a concept with enormous market potential. Looking back, it's remarkable how the labelled universe has grown in a relatively short period. Just four years ago, in our second report, there were only $7.4bn of labelled green bonds outstanding. The labelled universe is much larger now, and growth remains strong.

*Only bonds labelled as green and that meet Climate Bonds definitions are included in green bond data.

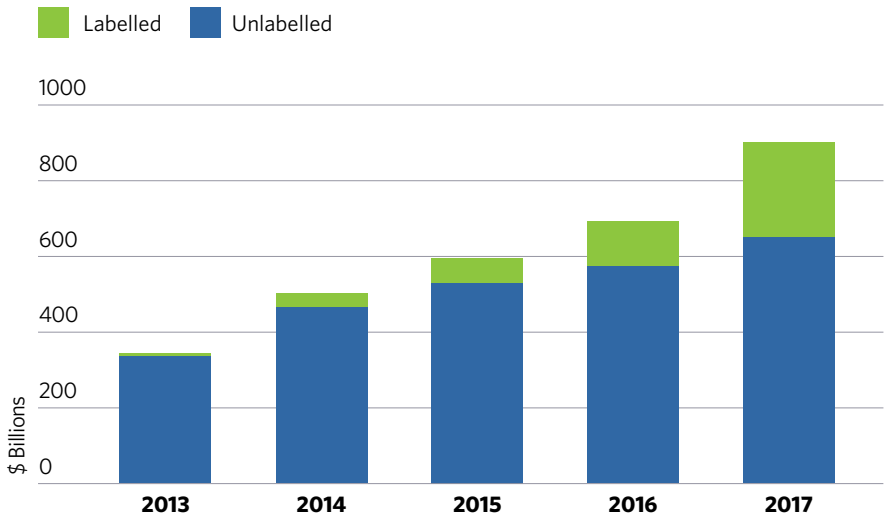
Green bond market developments

The first sovereign green bond was issued in late 2016 making sovereign green bonds the talk of 2017. Europe has been at the forefront of this development with Poland being the first sovereign to issue a green bond last December. This benchmark-sized bond raised EUR750m and was quickly followed in January of 2017 by France who issued the largest green bond to date at EUR7bn. We expect more sovereigns to issue in the coming months and year with Nigeria, Sweden, and Kenya all likely contenders.

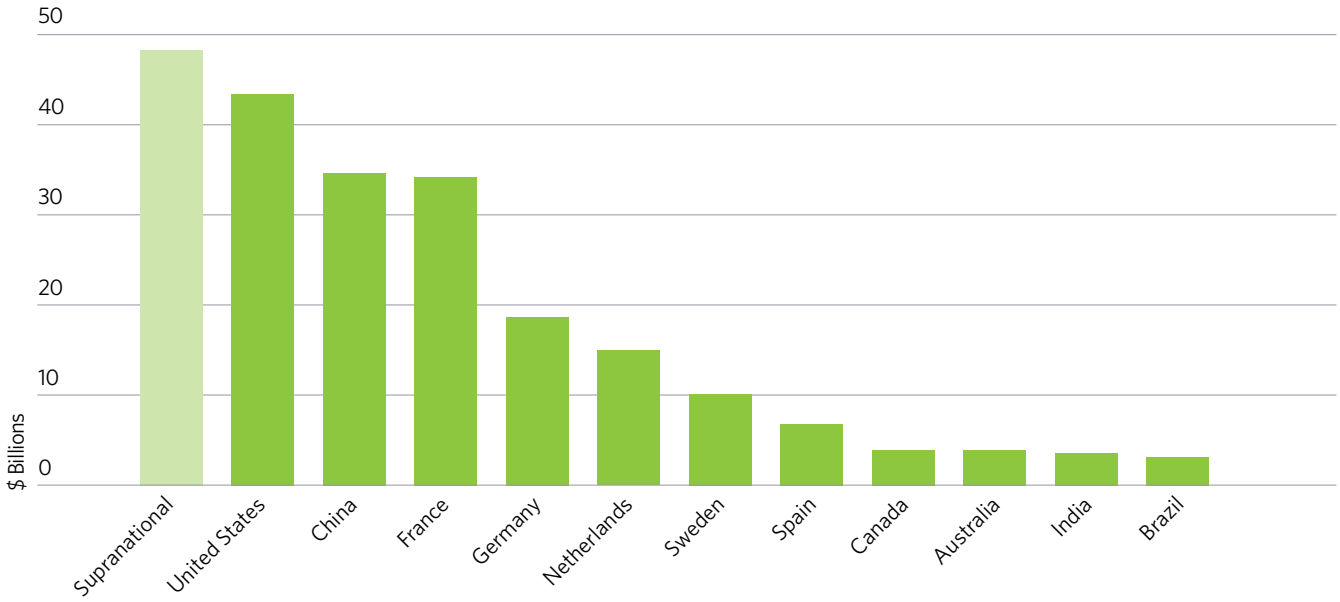
City bond issuance is taking off with cities and sub-sovereigns increasingly turning to the green bond market to raise finance for climate-related projects. This has sometimes been due to national climate policies and targets but often in the absence of national climate policies.

The dominance of U.S. municipalities in this space is particularly noteworthy given a lack of policy at the federal level. By the end of June 2017, 101 municipalities, cities and states had issued green bonds, the majority of these from U.S. issuers. See a more detailed analysis of city bonds on pages 10-15.

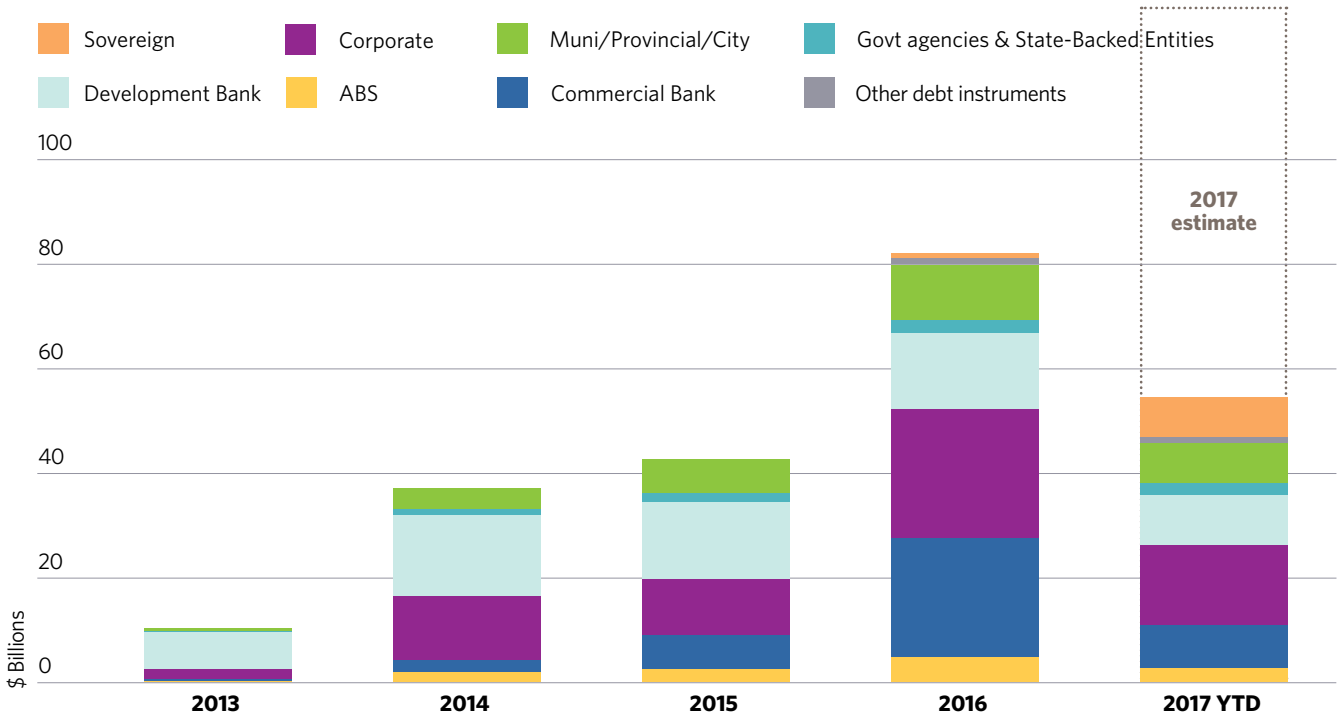
Labelled green bonds account for a growing proportion of the climate-aligned universe



Top 11 countries for labelled green bond issuance



The labelled green bond market is growing rapidly



There has been an increasing diversity of structures within the last 2 years, with the first covered bonds (Pfandbrief), the first green Schuldschein, and the first green residential mortgage-backed securities (RMBS) coming to market.

Country issuance continues to be driven by China and the major North American and European markets, but there has been issuance from emerging and new markets including India, Brazil and South Africa. In comparison with the global bond markets, the main missing market is Japan with less than $3bn outstanding. With new green bond guidelines having now been issued by the Ministry of the Environment of Japan in March 2017, we expect this to change.

China was the largest source of issuance in 2016, and 2017 is expected to exceed that of 2016. In H1 of 2017, France was the leader of the country table on the back of the EUR7bn ($7.5bn) sovereign bond. Green bonds have been issued in 40 different countries and from all habitable continents.

Strong demand continues to drive the market with oversubscription being the norm. The French sovereign bond was a particular highlight with the sovereign initially going to market for EUR3bn and upsizing to EUR7bn, after receiving orders in excess of EUR20bn. While it is difficult to know whether there is an upper limit on the demand for green product, two features are notable: 1) numerous green bond-specific funds and indices have been launched in the past year which is both indicative of strong demand and may lead to further demand; 2) while demand from investors with a green mandate has been a driving force behind market growth, a key success has been that green bonds are identical in structure to vanilla bonds making them equally attractive to investors without a green mandate.

Development banks have maintained a strong presence and leadership role in the market despite the fact that they have been outgrown by corporate and sub-sovereign issuers. The EIB, KfW and World Bank take the top three spots in terms of total issuance to date. All three have been involved in pushing best practice in the market through the Working Towards a Harmonized Framework for Impact reporting[53] launched in 2015. Several new players have entered this market in the past year, including the China Development Bank and Brazil's BNDES.

Issuance from corporates and commercial banks has grown but there's plenty of headroom for more. In some countries, corporates and commercial banks make up a large proportion of issuance – e.g. the Netherlands (69% by value) and France (65% by value). In other countries, it is lower – in the U.S., corporates and commercial banks account for 56% and Germany just 20%.

External reviews in the form of second opinions and third-party certification are vital for maintaining transparency and credibility in a market and are recommended by the Green Bond Principles. Over the past few years there has been an increase in the percentage of bonds that have had external reviews. By value, the percentage of green bond issuance which has received an external review has been steadily increasing from 65% in 2015, to 77% in 2016 and to 82% so far in 2017.

Largest issuers to date	Amount	Issuer type	Country
EIB	$22.6bn	Development Bank	Supranational
KfW	$12.8bn	Development Bank	Supranational
World Bank	$10.6bn	Development Bank	Supranational
SPD Bank	$7.6bn	Commercial Bank	China
Republic of France	$7.6bn	Sovereign	France
Iberdrola	$5.6bn	Corporate	Spain
TenneT Holdings	$5.5bn	Corporate	Netherlands
EDF	$5.3bn	Corporate	France
IFC	$5.3bn	Development Bank	Supranational
Engie	$5.1bn	Corporate	France

Of the bonds that have received an external review, **Climate Bonds certification is gaining increasing traction** with Certified issuance increasing from just 4% of total issuance in 2015 to 9% in 2016 and 11% in 2017 year to date.

U.S. Dollar and Euro currencies continue to dominate the green bond market with the dollar accounting for 36% and the Euro at 38% of the outstanding amount. In 2017, the Euro has been the largest currency, accounting for 47% of issuance in Q1 and Q2 due in large part to the EUR7bn French sovereign bond issued in January 2017.

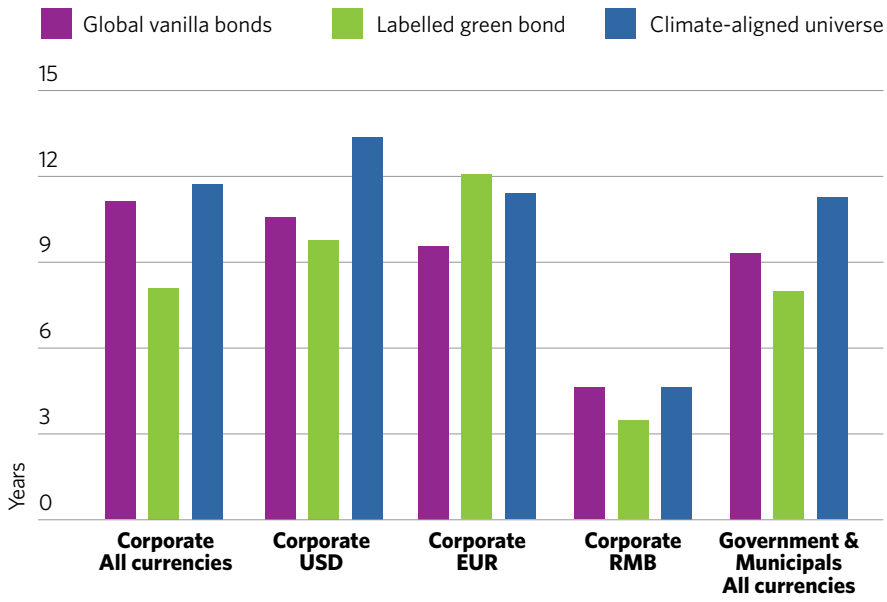
2016 saw Chinese green bonds take off with issuance in RMB rising from $994m in 2015 to over $23bn*. Overall, green bonds have been issued in 27 different currencies.

Proceeds have been funding an increasing range of projects, a shift from the focus on renewable energy seen in the early stages of the market. As the market has expanded, there has been a growth in issuance financing transport, buildings and water projects.

The majority of the green bond proceeds have been allocated to renewable energy and green buildings projects that, combined, amount to 64% of the total. They are then followed by transport and water which account for 14% and 10% respectively. Waste management, adaptation, and land use each account for 3-5% of use of proceeds. Transport and Water have seen the largest percentage increase from last year's report. One reason for this is the rising number of rail bonds this year in Europe as well as from numerous U.S. transit authorities.

Volvofinans Bank issued a green bond and simultaneously declared a direction of travel away from combustion engine vehicles, possibly indicating the start of a larger overall shift in the automotive sector. The emergence of hybrid, fuel cell, and electric vehicles may lead to more green issuance in this sector.

Tenor: Green bonds have shorter tenors except in EUR



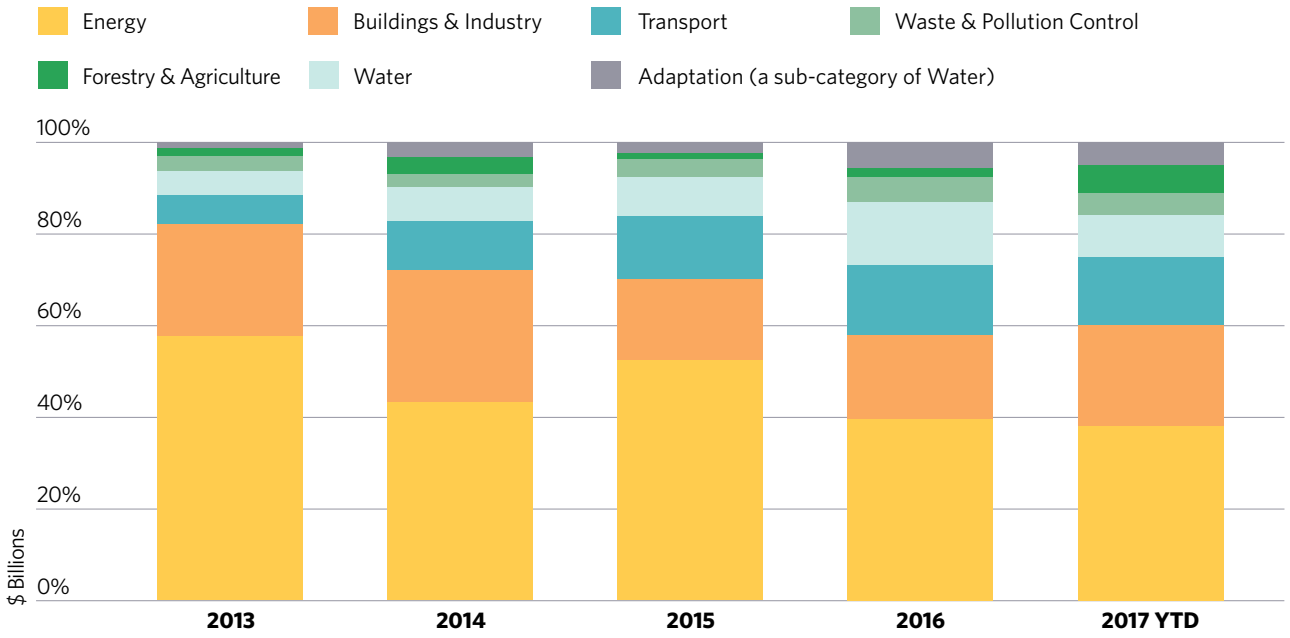
Tenors are shorter than the vanilla bond market but there are differences across currencies. The average tenor for corporate green bonds is 8 years compared to the vanilla bond market of approximately 11 years. There are differences across currencies - e.g. in USD, the average green bond tenor is 1 year shorter than the average vanilla bond but in EUR green bonds have longer tenors than vanilla bonds.

Post-issuance reporting is improving but comparison remains challenging. For bonds issued before April 2016, 74% have post-issuance reporting publicly available. The quality of reporting is varied with more prolific issuers likely to have better reporting standards in place.[54]

Climate Bonds research has shown that there is a lack of uniformity in post-issuance reporting which makes comparison difficult. It has also shown that impact reporting is becoming more commonplace. While impact reporting may be useful to investors, complex reporting expectations may also shy issuers away from the market. A balance, therefore needs to be struck between pertinent information and over burdensome reporting expectations.

* If Chinese labelled green bonds that do not meet Climate Bonds definitions are included, the 2016 total is $36bn.

Green bonds use of proceeds - project types are diversifying



How big could the green bond market become?

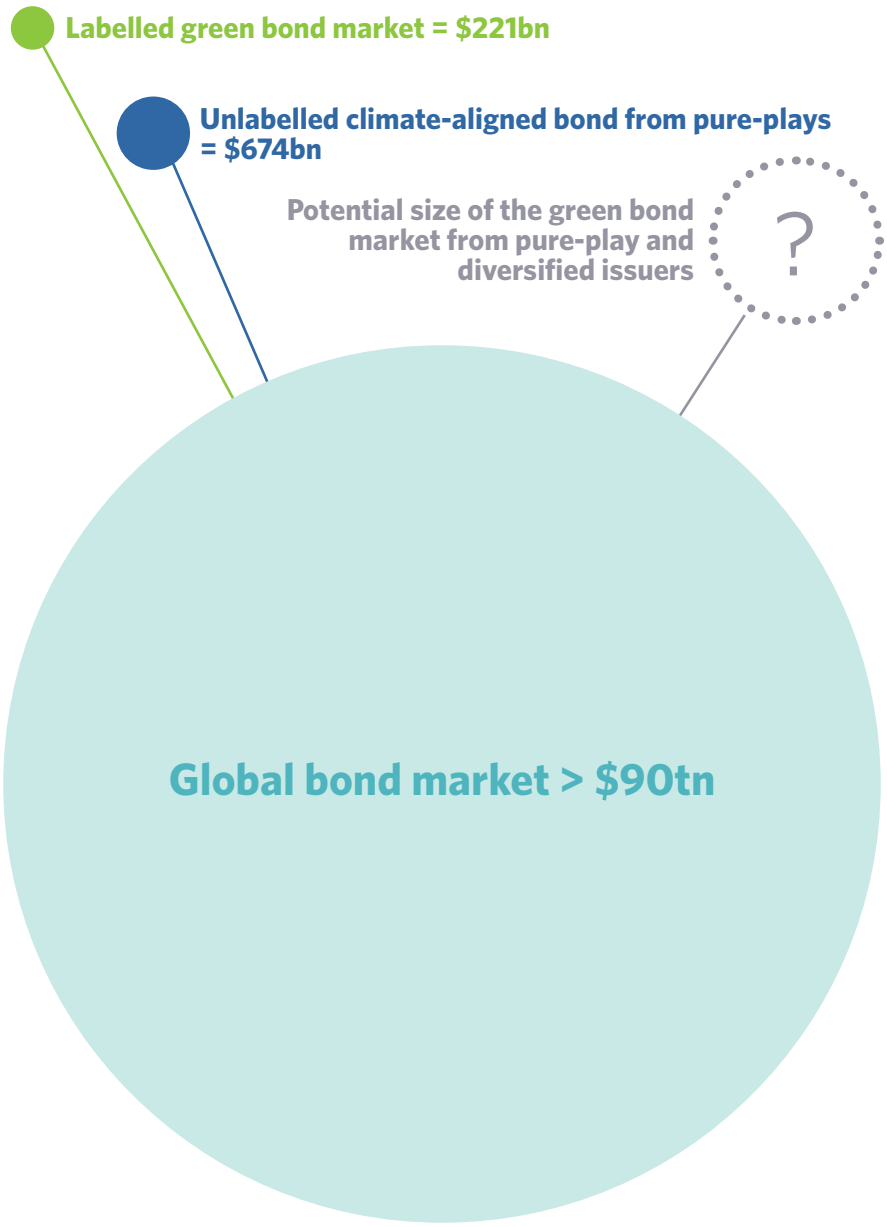
The climate-aligned bond universe detailed in this report gives one indication that the green bond market could become much larger. But, the climate-aligned bond universe only shows some of the potential for growth of the green bond market.

90% of the climate-aligned bond universe was issued by pure-play issuers, whereas in the labelled green bond universe only 5% of issuance is made up of pure-play issuers. The vast majority of issuance comes from diversified corporates, commercial banks, development banks or from cities and sub-sovereigns.

This means that the actual potential for growth is much larger than the $895bn already identified. For example, certain sectors will play an important role in the transition to a low carbon economy but are under-represented in the climate-aligned universe because of their diversified nature. This includes but is not limited to:

- **Electricity utilities**: will build and operate renewable energy
- **Banks:** will provide finance for low carbon infrastructure
- **Industrial sector:** will manufacture the technology required such as wind turbines, LED lighting etc.
- **Auto manufacturers:** will develop electric vehicles for the mass market as well as charging infrastructure
- **Cities/sub-sovereigns:** will plan and develop the infrastructure required for a transition to a low carbon economy.

The potential for growth is much larger than the $895bn universe



First Green Sukuk issued in Malaysia

In late July 2017, the first green sukuk came to market issued by Malaysian Tadau Energy

Sukuk are "tradable Islamic finance instruments", consistent with the principles of Shari'ah. Sukuk represent an ownership in underlying assets or earnings from those assets.

This first green sukuk follows on from a number of incentives put in place by the Securities Commission Malaysia (SC) through the SRI Sukuk framework to promote greater utilisation of green sukuk.

These include:

- **Tax deduction** on the issuance costs of green sukuk that have been approved by SC;
- **Tax incentives** for green technology activities in energy, transportation, building, waste management and supporting services activities; and
- **Financing incentives** under the Green Technology Financing Scheme with total allocation of MYR5bn ($1.2bn) until 2022.

To be eligible for these tax deductions, issuers must ensure that proceeds raised are used to fund eligible projects in: natural resources, renewable energy and/or energy efficiency sectors. Issuers are also encouraged to follow international best practice by appointing independent experts to undertake an external review prior to issuance.

This first green sukuk is the result of collaboration between SC, Bank Negara Malaysia and the World Bank, in an effort to facilitate the growth of green sukuk and to introduce innovative financial instruments to tackle global infrastructure needs and green financing.[55]

This form of Islamic finance has tremendous potential as a climate finance tool, because it simultaneously taps into two fast-growing segments of global financial markets: sukuk and green bonds.

The road ahead - $1 trillion by 2020

2017 has seen encouraging developments in the green bond market, now more needs to be done

The green bond market has grown at record levels in 2016 and 2017 but to meet global objectives for emissions reduction and climate-aligned infrastructure, acceleration is required. In mid-2017 global climate leaders, including Christiana Figueres, have advocated that the green bond market needs to reach $1tn of issuance by 2020 (a more than 10x increase on the $81bn issuance of 2016, but still a small proportion of the global bond market) as part of six milestones for urgent action by 2020.

A global green finance market size of around $1trillion, would significantly boost progress on NDCs and implementation of country climate plans.

The latest climate science concerns around permafrost, the albedo effect and temperature trajectories reflect this urgency. Rapid growth in green finance is needed now.

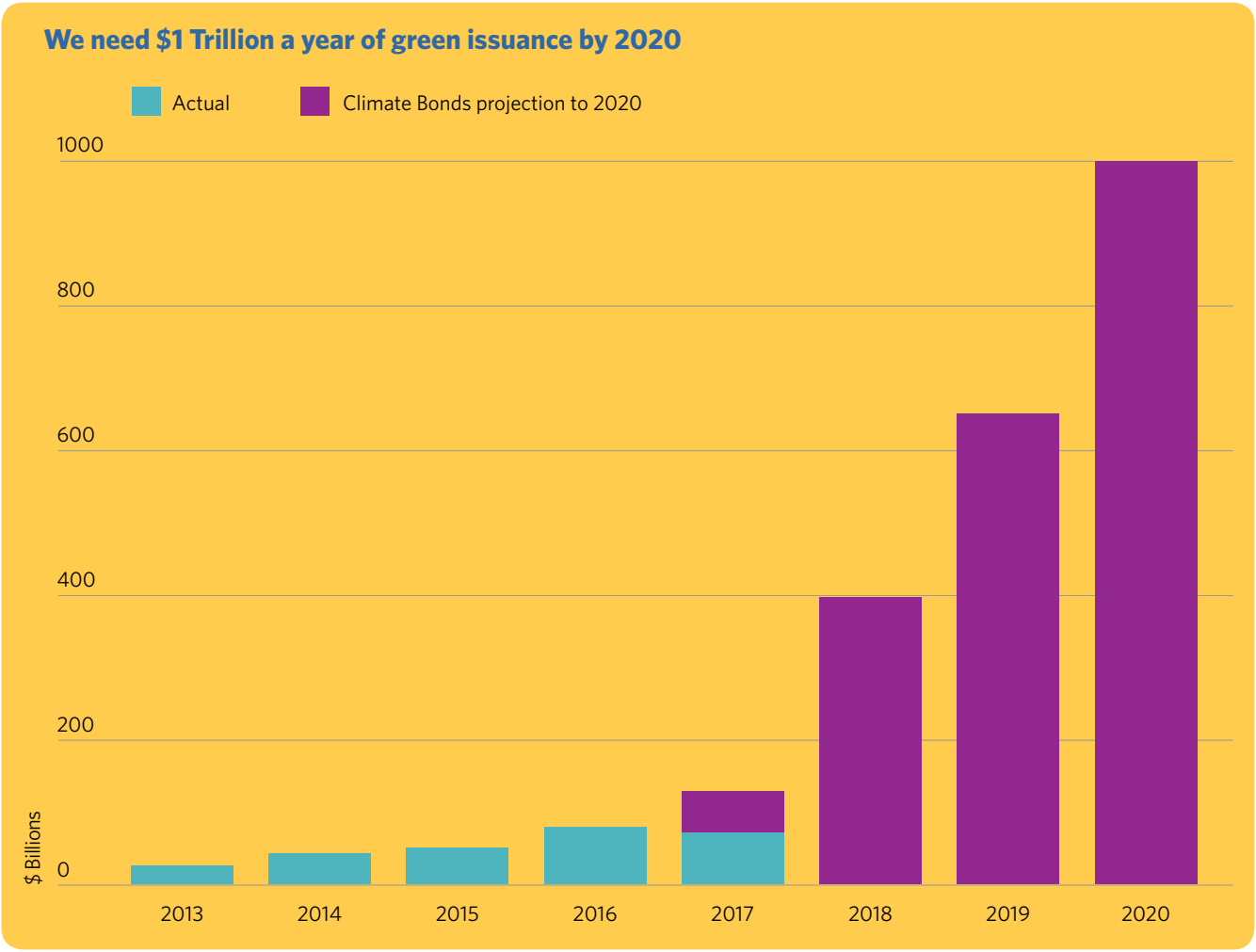
The Nationally Determined Contributions (NDCs) set in the Paris Agreement are a first step for countries to benchmark their progress towards sustainable economic growth that is aligned with global climate targets. The public sector is central to enabling and scaling up green bond issuance and investment through capital raising plans for NDC financing that use instruments such as green bonds. Governments all over the world are looking for opportunities to stimulate economic growth and employment after a decade of stagnant growth.

There is also increasing pressure on global financial markets and institutional investors to act on investor statements and COP assurances by connecting capital flows to real economy outcomes: sustainable development, low carbon infrastructure, green technology, jobs and prosperity.

In developing countries, governments see the chance to build more resilient and diversified economies that support poverty alleviation, public health improvements and sustainable urbanisation.

Low interest rates in the U.S., Europe and Japan mean that investors are, where permitted, looking to increase their portfolio allocation to higher yielding assets, some of which will be in emerging market economies, to ensure liabilities can be met. In developing countries, green bond markets, with their added transparency, can attract foreign investors to support the development of a domestic green economy. Green finance is also increasingly associated with financial stability and climate-related risk strategies. It is encouraging that in countries that have embraced this agenda, green bond policy is now being led by financial policymakers with the support of environmental policymakers – this is real progress.

The green bond market has been highlighted as the green finance tool to steer financial sector capital towards the investments needed to drive steep emissions cuts, curb pollution levels and support sustainable development goals. The good news is that this is not new - governments have, throughout history, used bonds to shift investment into areas of urgent policy priority and fund highways, railways, water, sewers and wars.



Top 3 actions the public sector is taking in 2017

1. Sovereign green bonds

Green sovereign bonds are increasingly seen as a key tool for governments to raise capital to implement infrastructure plans in line with NDCs. Determining how to finance NDC implementation strategies and laying out capital raising plans are the next steps towards meeting the targets.

Besides raising capital, a sovereign green bond can attract new investors, improve collaboration between finance ministries and, most importantly, provide policy certainty within the country.

Poland and France issued the first sovereign bonds in late 2016 and early 2017. Other countries have stated their intention to issue sovereign green bonds including Nigeria, Sweden and Kenya.

Markets are usually kickstarted with higher grade issuance and then diversification. The sovereign is often the highest-rated institution in the country, especially in developing countries with limited high-quality issuers. In this way, sovereign green bonds can kickstart a market by acting as demonstration issuance.

They also help to provide liquidity and scale to a market and attract other corporate issuers as well as new investors.

2. Country-level Green Bond Guidelines

In 2016, China was a clear example of how national green bond guidelines can propel a market forward.

Here are the latest developments:

- **Japan's Ministry of Environment** released green bond guidelines in March 2017 which form a foundation for future guidelines from financial regulators.
- **Taiwan**, the Taipei Exchange, with oversight from the Financial Supervisory Commission issued guidelines endorsing the Climate Bonds Standard and Green Bond Principles (GBP) to identify green bonds.
- **Luxembourg's Ministry of Finance** has endorsed a new green bond label scheme launched by the independent non-profit Luxembourg Finance Labelling Agency (LuxFLAG).
- **The Johannesburg Stock Exchange in South Africa and the Nairobi Securities Exchange in Kenya** are undergoing stakeholder consultations for national guidelines.
- **India's Security and Exchange Board** (SEBI) released new green bond guidelines in May 2017.

Brazil, Colombia, Mexico, Nigeria and Kenya all continue to build market capacity through green bond market councils and programmes.

3. International and regional collaboration

The EU has put finance and sustainability high on the EU policy agenda. Sustainability is now part of the financial stability and climate agenda. The EU High-Level Expert Group on Sustainable Finance has made preliminary recommendations that include establishing a standard and label for green bonds, and developing capital raising plans for sustainable infrastructure. Through the Expert Group, the European Investment Bank (EIB) is also leading efforts together with Climate Bonds to develop a common EU taxonomy.

The EIB and People's Bank of China (PBoC) – the regulator of 97% of the Chinese bond market – have launched a partnership committed to looking at harmonising the banks green bond guidelines.

The ASEAN Capital Markets Forum is developing green bond guidelines that will be applicable to all member countries.[56]

In July 2017, the UK Chancellor of the Exchequer and the Finance Minister of Brazil launched the UK-Brazil Green Finance Partnership at the 2nd UK-Brazil Economic and Financial Dialogue.[57] London's Green Finance Initiative will work with the Brazilian Green Finance Council, co-convened by Climate Bonds, to deliver the Partnership's aim of environmentally sustainable economic growth in Brazil and the UK through green finance.[58] This is a great example of how the finance ministries of two countries can collaborate to use green finance to simultaneously meet economic growth and NDC targets.

Additional support tools

Apart from green bond guidelines and increased investment and issuance of green bonds from public sector actors (development banks, states, provinces and municipalities, public utilities and sovereigns), more policy tools are starting to be implemented.

Central Banks are becoming increasingly concerned with the evaluation of climate-related risks and their impact on financial stability. For example, the Bank of England has announced a major review of banks' exposure to climate risks.

In China, the PBoC is exploring including exposure to green lending in banks' macro-prudential assessment frameworks and allowing green bonds as collateral to access cheap financing from the central bank.

The Singapore Monetary Authority is providing financial support to new issuers through its Green Bond Grant Scheme, absorbing the full cost of external reviews in an effort to scale up a consistent and attractive market in Singapore.

Financial support in the form of tax incentives, widely used in other policy areas such as energy, are finally appearing on the scene for green specific infrastructure. For more details, see the page 19 box on the first green sukuk issued in Malaysia.

Look out for our briefing due out later this year for more on how Central Banks can support the development of green bond markets.

Greenium Update

In last year's report, we published some taster results from a wider study we were working on green bond pricing. The wider study was published in July 2017 and analysed 62 investment grade green bonds issued in EUR or USD from January 2016 - March 2017.

As the market is still immature with a relatively small pool of bonds being compared, the results are mixed: some indicators show that there are differences between green and vanilla bonds while others point out no discrepancy.

Overall, there is evidence to suggest that many green bonds are under-priced at issuance. We are not able to say whether this market behaviour will persist, but this could point towards tighter pricing in the future. For the time being, this data should allay concerns among investors about longer term underperformance by green bonds.

Green bonds behaved differently:

- **Spread performance** compared to a corresponding broad market bond index: seven days after announcement date, 70% of green bonds had tightened more than their corresponding index, 71% after 28 days. This suggests that green bonds within our sample perform better than the market within the first 28 calendar days.
- **USD corporate green bonds** priced on average 22.2bps tighter than Initial Price Talk (IPT) when compared to corporate vanilla bonds (16 to 17bps) issued during the same period.
- **Green bonds tend to attract a broader range of investors** including those with green or ESG-focused mandates.

Green bonds behaved in line:

- **Average oversubscription** of green bonds is 3 times. Oversubscription of 3-4 times is not unusual in the corporate bond market.
- **EUR corporate green bonds** in our sample price on average 13.4bps tighter than IPT. This is within the normal range of 13-14bps for vanilla bonds over the same period.
- **Spread performance**: 70% of green bonds had tighter spreads 7 days after announcement date, 63% 28 days after. Bonds often tighten in the immediate secondary market.
- Some green bonds in the sample priced inside their own credit curves, some priced on their own credit curves, and some priced outside their own credit curves. This is broadly comparable to vanilla bonds.

Want to know more?

Check out our latest reports:

Green Bond Pricing in the Primary Market - Is There a Greenium?

Anecdotal evidence has suggested that green bonds are heavily oversubscribed and may price tighter than expected. This report explores the data to discover whether or not this is happening.

Post-issuance Reporting in the Green Bond Market

This is Climate Bonds Initiative's first study on post-issuance reporting of green bonds.

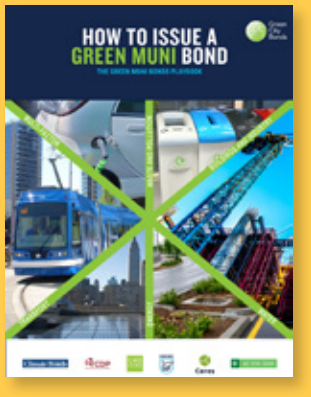
To date, there has been very little collated information on whether or not reporting is happening and the quality of information that is being provided. This report attempts to fill this gap.

Want to know more about green city bonds?

Check out our guides:

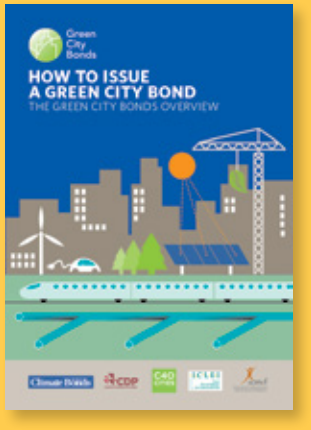
How to Issue a Green Muni Bond provides guidance specific to U.S. cities and other public entities that issue municipal bonds.

It describes the state of the market, the benefits of issuing green bonds, how the market defines what is green and the steps cities need to take to access this growing market.



How to Issue a Green City Bond is relevant to issuers in all part of the world.

Published on behalf of the International Green City Bonds Coalition, this 4-page document provides an overview of how green bonds can be issued to finance climate-aligned urban infrastructure. It includes a summary of Green City Bonds issued, what types of projects can be financed and a step-by-step guide for issuers.



References

1. New Climate Economy. (2014). *A New Pathway for Growth.* [online] Available at http://newclimateeconomy.report/2014/finance/
2. Bank for International Settlements
3. Climate Bonds Initiative. (2015). The Paris Investor Statement. [online] Available at https://www.climatebonds.net/files/files/Paris_Investor_Statement_9Dec15.pdf
4. Bank of England. (2015). *The Impact of Climate Change on the UK Insurance Sector.* [online] Available at http://www.bankofengland.co.uk/pra/Documents/supervision/activities/pradefra0915.pdf
5. Note that Chinese Reminbi can be shows as 'CNY' indicating bonds for the domestic market or 'CNH' indicating bonds for the international market. For this report, RMB is used which is the sum of both of these figures.
6. Dealogic. (2017). International Debt Capital Markets Volume. *ICMA*. [online] Available at https://www.icmagroup.org/resources/market-data/Market-Data-Dealogic/#1
7. IPCC. (2014). *Fifth Assessment Report.* [online] Available at https://www.ipcc.ch/report/ar5/
8. Ibid.
09. Ibid.
10. IFC. (2016). IFC Marks the Listing of World's First Forests Bond on the London Stock Exchange. [online]. Available at http://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/first-forests-bond-on-the-lse
11. IPCC. (2014). *Fifth Assessment Report.* [online] Available at https://www.ipcc.ch/report/ar5/
12. UN-HABITAT. (2011). *Cities and Climate Change: Global Report on Human Settlements 2011.* [online] Available at http://mirror.unhabitat.org/downloads/docs/E_Hot_Cities.pdf
13. Ministère des Finances. (2017). *Green Bond Program.* Finances Québec. [online] Available at http://www.finances.gouv.qc.ca/documents/Autres/en/AUTEN_GreenBondPPT.pdf
14. RBC Capital Markets. (2017). *Green Bonds – Green Is the New Black*. [online] Available at https://www.rbccm.com/assets/rbccm/docs/news/2017/green-is-the-new-black.pdf.
15. MTA. (2017). *MTA Capital Program Amendments.* [online] Available at http://web.mta.info/mta/news/books/docs/May%20Board%20Presentation_Board.pdf
16. NYC Department of Environmental Protection. (2013). NYC Wastewater Resiliency Plan. [online] Available at http://www1.nyc.gov
17. EU High-Level Expert Group on Sustainable Finance. (2017). *Financing a Sustainable European Economy.* [online] Available at https://ec.europa.eu/info/sites/info/files/170713-sustainable-finance-report_en.pdf
18. Global Climate Action. (n.d.). NAZCA: Gothenburg. [online] Available at http://climateaction.unfccc.int/city/gothenburg/sweden
19. Brunbäck, L. (2014). *Procurement Strategy, West Link Project.* Trafikverket. [online] Available at http://www.trafikverket.se/contentassets/dfec181c461243078b0c47830be60c1c/procurement-strategy-contract-works-west-link-141114.pdf
20. EU High-Level Expert Group on Sustainable Finance. (2017). *Financing a Sustainable European Economy.* [online] Available at https://ec.europa.eu/info/sites/info/files/170713-sustainable-finance-report_en.pdf
21. Gemeente Amsterdam. (2017). Noord/Zuidlijn. [online] Available at http://wijnemenjemee.nl/noordzuidlijn
22. Government of the Netherlands. (n.d.). Dutch goals within the EU. [online] Available at https://www.government.nl/topics/climate-change/eu-policy
23. Bank for International Settlements. (2016). BIS Statistics: Charts. *BIS Quarterly Review,* June. [online] Available at http://www.bis.org/publ/qtrpdf/r_qt1606_charts.pdf
24. Climate Policy Team & World Bank Group. (2016). *China (Intended) Nationally Determined Contribution – (I) NDC.* World Bank. [online] Available at http://spappssecext.worldbank.org/sites/indc/PDF_Library/CN.pdf
25. China Daily. (2015). Highlights of proposals for China's 13th Five-Year Plan. *xinhuanet.* [online] Available at http://news.xinhuanet.com/english/photo/2015-11/04/c_134783513.htm
26. Climate Bonds Initiative. (2016). *Green Bonds on track in France & China: October: 4th biggest month in 2016: Nordics & American issuers, market activity, Stern +10 & lots of gossip!.* [online] Available at https://www.climatebonds.net/2016/11/green-bonds-track-france-china-october-4th-biggest-month-2016-nordics-american-issuers
27. Hong Kong Environment. (2017). *Hong Kong's Climate Action Plan 2030+.* Environment Bureau. http://www.enb.gov.hk/sites/default/files/pdf/ClimateActionPlanEng.pdf
28. Global Climate Action. (n.d.). NAZCA: Hong Kong. [online] Available at http://climateaction.unfccc.int/city/hong-kong/hong-kong.-china
29. Civil Engineering and Development Department. (n.d.). Development of Anderson Road Quarry Site. Hong Kong. [online] Available at http://www.arqs.hk/about.php#background
30. Climate Policy Team & World Bank Group. (2016). *China (Intended) Nationally Determined Contribution – (I) NDC.* World Bank. [online] Available at http://spappssecext.worldbank.org/sites/indc/PDF_Library/CN.pdf
31. Municipal Corporation of Greater Mumbai. (n.d.). *Development of 3000 TPD Waste to Energy Project at Deonar, Mumbai on DBO basis: Volume 2D – General I&C Specification.* [online] Available at http://www.mcgm.gov.in/irj/go/km/docs/documents/Tenders/ETH/ETH_241016411_8_050117.pdf
32. Municipal Corporation of Greater Mumbai. (n.d.). *Mumbai Sewerage Disposal Project – Right to Informational Act Section Clause (4) (b) (i) Chapter II: Year 2016-2017: Manual No.1: Introduction.* [online] Available at http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/Mumbai%20Sewerage%20Disposal%20Project/RTI%20Manuals/MumbaiSewerageDisposalProject_RTI_E01.pdf
33. Jog, S. (2017). Despite loan waiver, major projects not funded by govt to be on track. *DNA - Daily News & Analysis,* 27 June. [online] Available at http://www.dnaindia.com/mumbai/report-despite-loan-waiver-major-projects-not-funded-by-govt-to-be-on-track-2484633
34. India. (2015). *India's Intended Nationally Determined Contribution: Working Towards Climate Justice.* UNFCC. [online] Available at http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf
35. Tokyo Metropolitan Government. (2017). *Green Bond Issuance Policy.* [online] Available at http://www.zaimu.metro.tokyo.jp/bond/en/tosai_news_topics/news_topics/greenbond_290222_2.pdf
36. Climate Bonds Initiative. (2016). *Jingle all the way... Our Christmas Market Blog! Xmas presents from Poland & Sweden. China BoC: BIGGEST green bond ever! Plenty of certified deals; Firsts from Australia, Brazil, Colombia, México, Morocco; and a sneak peek at gossip for 2017!* [online] Available at https://www.climatebonds.net/2017/01/jingle-all-way%E2%80%A6-our-christmas-market-blog-xmas-presents-poland-sweden-china-boc-biggest
37. Global Climate Action. (n.d.). NAZCA: Tokyo. [online] Available at http://climateaction.unfccc.int/city/tokyo/japan
38. Japan. (2015). *Submission of Japan's Intended Nationally Determined Contribution (INDC).* UNFCC. [online] Available at http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Japan/1/20150717_Japan's%20INDC.pdf
39. Bank for International Settlements. (n.d.). Summary of Debt Securities Outstanding - By Residence and Sector of Issuer, Amounts Outstanding at End-December 2016, in Billions of U.S. Dollars. [online] Available at http://stats.bis.org/statx/srs/table/c1
40. Climate Bonds Initiative. (n.d.). City of Cape Town. [online] Available at https://www.climatebonds.net/city-cape-town
41. Cape Town Lately (n.d.). *CNN: "Worst Cape Town drought in over a century".* [online] Available at http://www.capetownlately.co.za/cnn-worst-cape-town-drought-in-over-a-century/
42. Compact of Mayors. (n.d.). Cape Town. [online] Available at https://www.compactofmayors.org/cities/cape-town/#profile
43. South Africa. (2016). *South Africa's Intended Nationally Determined Contribution (INDC).* UNFCC. [online] Available at http://www4.unfccc.int/ndcregistry/PublishedDocuments/South%20Africa%20First/South%20Africa.pdf
44. Ministry of Economic Planning & Budget. (2013). *Lagos State Development Plan 2012-2025.* Lagos State Government. [online] Available at https://www.scribd.com/document/271150413/LAGOS-STATE-DEVELOPMENT-PLAN-2012-2025.
45. Ibid.
46. Nigeria. (2015). *Nigeria's Intended Nationally Determined Contribution.* UNFCC. [online] Available at http://www4.unfccc.int/ndcregistry/PublishedDocuments/Nigeria%20First/Approved%20Nigeria%27s%20INDC_271115.pdf
47. CEBDS & FEBRABAN. (2016). *Guidelines for Issuing Green Bonds in Brazil 2016.* [online] Available at http://cebds.org/en/publicacoes/guidelines-for-issuing-green-bonds-in-brazil-2016/#.WZqlfenadPY
48. Empresa de Transporte Masivo del Valle de Aburrá Limitada. (n.d.) *PLAN MAESTRO 2006-2030: "Confianza en el futuro".* Metro de Medellín. [online] Available at https://www.metrodemedellin.gov.co/portals/1/archivos_metro/proyectos/plan_maestro_metro_2006-2030.pdf
49. Fadul, Y., Jones, A., Kidney, S., Melguizo, J.H., Torres, M.G., & Zuleta, C.M. (2017). *Road Map: Actions for Setting a Green Bond Market in Colombia.* E3-Ecología, Economía y Ética, Metrix Finanzas, PwC-UK & Climate Bonds Initiative. [online] Available at https://cdkn.org/wp-content/uploads/2017/07/Roadmap-actions-for-setting-a-green-bond-market-in-Colombia.pdf
50. Vigeo Enterprise. (2017). *Second Party* Opinion on Sustainability of AFD's "Climate Bond".* [online] Available at http://www.afd.fr/sites/afd/files/2017-08/Vigeo-climate-bond-2014-EN.PDF
51. Estimates produced in the framework of the '2016 Finanzas del Clima' event. Such estimates are not yet official.
52. Bonds & Loans. (2017). *Lack of Information, Regulation, Peso Volatility Holding Green Bonds Back in Mexico.* 15 March. [online] Available at http://www.bondsloans.com/news/article/1295/lack-of-information-regulation-peso-volatilit
53. African Development Bank, Agence Française de Développement, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, International Bank for Reconstruction and Development, International Finance Corporation, Kreditanstalt für Wiederaufbau, Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden, Nordic Investment Bank. (2015). *Green Bonds – Working Towards a Harmonized Framework for Impact Reporting.* IFC. [online] Available at https://www.ifc.org/wps/wcm/connect/f932dc004ad996538a1fea4fb4720a61/Updated+logo+-FINALPROPOSALIRH+CLEAN.pdf?MOD=AJPERES
54. Boulle, B., Camille Frandon-Martinez, C., & Meng, A.X. (2017). *Post-issuance Reporting in the Green Bond Market.* Climate Bonds Initiative. [online] Available at https://www.climatebonds.net/files/files/UoP_FINAL_120717.pdf
55. Securities Commission Malaysia & Malaysia Islamic Finance Marketplace. (2017). Malaysia's First Green Sukuk under SC's Sustainable Responsible Investment Sukuk Framework. *Securities Commission Malaysia* [online] Available at https://www.sc.com.my/post_archive/malaysias-first-green-sukuk-under-scs-sustainable-responsible-investment-sukuk-framework/
56. SEC Malaysia & ACMF. (2017). *The ASEAN Capital Markets Forum Collaborates with International Capital Markets Association to Introduce ASEAN Green Bond Standards.* ACMF. [online] Available at http://www.theacmf.org/ACMF/upload/13march2017.pdf.
57. Finance Minister of Brazil & Chancellor of the Exchequer. (2017). *Joint Statement by the Finance Minister of Brazil and the Chancellor of the Exchequer at the 2nd UK-Brazil Economic and Financial Dialogue held in Brasília on 31 July 2017.* Ministério da Fazenda [online] Available at http://www.fazenda.gov.br/noticias/2017/julho/brasil-e-reino-unido-realizam-dialogo-sobre-economia-e-investimentos/joint-statement-by-the-finance-minister-of-brazil-and-the-chancellor-of-the-exchequer
58. Climate Bonds Initiative. (2017). *Chancellor of the Exchequer launches UK – Brazil Green Finance Partnership in São Paulo.* [online] Available at https://www.climatebonds.net/2017/08/chancellor-exchequer-launches-uk%E2%80%93brazil-green-finance-partnership-s%C3%A3o-paulo.
59. Figueres, C., Schellnhuber, H.J., Whiteman, G., Rockström, J., Hobley, A., & Rahmstorf, S. (2017). Three Years to Safeguard Our Climate. *Nature,* 28 June. [online] Available at https://www.nature.com/news/three-years-to-safeguard-our-climate-1.22201

B1. IFC (2016). Climate Investment Opportunities in Emerging Markets. An IFC Analysis
B2. Brazil Federal Government (2016) Available at http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc95.htm
B3. This report only includes labelled green bonds issued until 15/09/2017
B4. Bloomberg
B5. Fitch Ratings
B6. Fitch Ratings
B7. Bloomberg, LGX & Valor International (2017) BNDES returns to market with $1bn issue of green bonds Available at www.valor.com.br/international/news/4955130/bndes-returns-market-1bn-issue-green-bonds
B8. BNDES (2017) BNDES capta US$ 1 bi em green bonds no mercado internacional. Available at www.bndes.gov.br/wps/portal/site/home/imprensa/noticias/conteudo/bndes%20capta%20us$%201%20bi%20em%20green%20bonds%20no%20mercado%20internacional
B9. Anbima (2017) Available at http://www.anbima.com.br
B10. Suzano Papel & Celulose (2017)
B11. Anbima (2017) Available at http://www.anbima.com.br
B12. Klabin & Valor Econômico (2017). Klabin capta com bônus 'verde' US$ 500 milhões. Available at www.valor.com.br/financas/5116772/klabin-capta-com-bonus-verde-us-500-milhoes
B13. The 'Spotlight on Brazil' section includes all bonds in the climate-aligned universe until 15/09/2017. The rest of the report only includes issuances until 31/07/2017.
B14. World Bank (2017) Available at http://www.worldbank.org
B15. MDIC (2017) Available at http://www.mdic.gov.br
B16. OCDE-FAO (2015)
B17. MAPA (2016). The scheme was launched in 2010, and since then around BRL13bn in 28,500 loans to rural producers have been given
B18. Baffes. J. (2013). A Framework for Analyzing the Interplay Among Food, Fuels, and Biofuels
B19. FAO (2012). Policy Instruments to Promote Good Practices in Bioenergy Feedstock Production
B20. MME/EPE (2016) Available at http://www.mme.gov.br
B21. Abeeolica, Aneel, GWEC (2016) Available at http://www.abeeolica.org.br
B22. IFC (2016). Climate Investment Opportunities in Emerging Markets. An IFC Analysis
B23. MME/EPE (2016) Available at http://www.mme.gov.br
B24. IFC (2016). Climate Investment Opportunities in Emerging Markets. An IFC Analysis
B25. ibid
B26. Reuters (2017) Leilão de concessão da ferrovia Norte-Sul deve acontecer em fevereiro de 2018. Available at http://br.reuters.com/article/domesticNews/idBRKBN1942JN-OBRDN
B27. IFC (2016). Climate Investment Opportunities in Emerging Markets. An IFC Analysis+

This report was prepared by the Climate Bonds Initiative.

Lead Author: Bridget Boulle
Co-Authors: Alan Meng, Camille Frandon-Martinez, Rory McAvinue, Aneil Triparthy, Diletta Giuliani and Christian Elliott.
Input from the Climate Bonds Team.

Portuguese translation by SITAWI (Beatriz Ferrari e Beatriz Maciel, with supervision of Gustavo Pimentel).
'Spotlight on Brazil' section co-authored by Ana Lygia Monferrario (Climate Bonds Iniiative) and Débora Masulo (SITAWI), with supervision of Bridget Boulle (Climate Bonds Iniiative) and Gustavo Pimentel (SITAWI).

Design: Godfrey Design

The $1 Trillion by 2020 Target

Green bonds for climate solutions

"Governments, private banks and lenders such as the World Bank need to issue many more 'green bonds' to finance climate-mitigation efforts. This would create an annual market that, by 2020, processes more than 10 times the $81 billion of bonds issued in 2016."

Christiana Figueres
28 June 2017, Nature Magazine[59]

Climate Bonds INITIATIVE

Prepared by Climate Bonds Initiative.

www.climatebonds.net

HSBC

Commissioned by HSBC.

IDB Inter-American Development Bank

Sponsored by IDB

SITAWI FINANCEforGOOD

Content Partner & Translation SITAWI