CLIMATE INVESTMENT OPPORTUNITIES:

CLIMATE-ALIGNED BONDS & ISSUERS 2020

Climate Bonds INITIATIVE

DBS

Prepared by Climate Bonds Initiative.

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1. Introduction

About this report

The Climate Bonds Initiative (Climate Bonds) has been researching investment opportunities in bonds financing climate-aligned assets since 2012. This is the eighth edition of the Climate Investment Opportunities: Climate-Aligned Bonds & Issuers report which is a Climate Bonds flagship publication.

The research presented in this report identifies unlabelled climate-aligned bonds ('climate-aligned bonds') – these are bonds that are *not* explicitly labelled as green or any other thematic label by the issuer, but that finance climate-related activities or projects.

The report presents an overview of the global climate-aligned universe (Chapter 2), which is followed by separate sections on developed markets (DM) (Chapter 3) and emerging markets (EM) (Chapter 5).[1] China is analysed separately in Chapter 4 as it is the source of considerable climate-aligned issuance. Spotlight sections on low-carbon transport (page 21), green hydrogen (page 22) and real estate companies (page 24) are also included. The latter is based on a proprietary framework developed by Climate Bonds which identifies the top performing property companies from a disclosure and transparency perspective.

Climate Bonds is also launching a climate-aligned dataset which contains detailed information at the bond level. Together, the report and dataset aim to help investors and other stakeholders understand and discover additional opportunities for climate-aligned investments which are not as visible as labelled green bonds.

Summary figures

- **420** climate-aligned issuers
  - **311** fully-aligned issuers
  - **109** strongly-aligned issuers
- **45** countries, **33** currencies
- **USD913.2bn** of outstanding climate-aligned bonds, USD >1tn of climate-aligned bonds issued
- **Top three issuers:** China Railway Corp (USD230bn), SNCF (USD53.7bn), EDF (USD52.1bn)
- **Top climate themes:** Transport (USD502.3bn), Energy (USD219.3bn) and Water (USD91.2bn)

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Context

Good reporting practice is crucial as investors are increasingly moving towards decarbonising their investment portfolios. This has, in part, encouraged some entities to increase disclosure on their environmental impacts. However, many are still not incorporating clear climate-related metrics in their annual and/or financial reports, thus making it challenging for investors to effectively identify unlabelled climate investment opportunities.

Labelled bonds, including green bonds, benefit from a greater degree of transparency, as disclosure on the green credentials of the funding is often provided alongside financial information. This is due to well-established green definitions and market guidelines, which provide investors additional transparency on the use of proceeds – thereby minimising the risk of greenwashing. Findings from the Climate Bonds Green Bond European Investor Survey, published in November 2019, confirm that investors value deals with high climate impact and clear green credentials, also highlighting a gap in the market for green bonds issued by corporates – especially those in the real economy.[2]

The identification of a wider range of climate instruments is therefore crucial to shed light on capital flows financing climate-aligned activities which may not be as visible and transparent as labelled bonds, as well as to identify opportunities to scale up the labelled green bond market. In 2018, Climate Bonds identified more than USD1tn of climate-aligned bonds, with an additional USD389bn of labelled green bonds. To date, the *labelled* green bond market has more than doubled, having reached more than USD1tn.

Persistent low interest rates and central bank quantitative easing policies have contributed to increased demand for all types of bonds. Appetite for green bonds is increasing as the number of dedicated funds is rising rapidly. The European Central Bank (ECB) has stated that green bond purchases under its EUR3.7tn purchase asset programme (APP) constitute around 20% of the eligible universe, which exacerbates the shortage of labelled bonds in the market. Climate Bonds expects policy initiatives to increase the emphasis on sustainable investment, for example via the implementation of the European Union's Sustainable Finance Action Plan. These demand factors provide a substantial incentive for climate-aligned issuers identified in our research to come to the market with labelled green bonds. The availability of more green bonds will contribute to the cycle of more dedicated investment, and issuers will have further incentive to prioritise climate friendly expenditures and investment.

Glossary

- **Climate-aligned issuers**: issuers that derive at least 75% of their revenues from climate-aligned business activities. These comprise:
  - Fully-aligned issuers: issuers that derive ≥ 95% of revenue from climate-aligned activities
  - Strongly-aligned issuers: issuers that derive ≥ 75% of revenue from climate-aligned activities
- **Unlabelled climate-aligned bonds**: bonds that finance climate-aligned activities but are not labelled by the issuer.
- **Labelled bonds**: bonds issued to finance or refinance projects with green and/or social purposes- e.g. green bonds. These bonds are not included in this analysis.
- **Labelled bonds from climate-aligned issuers**: green bonds issued by either fully-aligned or strongly-aligned issuers. These bonds are not included in this analysis.
- **Other labelled bond issuers**: issuers who have issued labelled bonds but who derive <75% of revenue from climate-aligned activities. These are not included in this analysis.
- **Climate-aligned bond universe or climate-aligned bonds**: terms to describe the full universe of climate-aligned outstanding bonds, i.e., unlabelled outstanding bonds from fully- and strongly-aligned issuers.[3]
- **Certified Climate Bonds**: issuers can certify debt instruments under the Climate Bonds Standard. Certification confirms that the bond is aligned to the Paris Agreement and to keeping global warming well below 2°C. Many bonds in this report may be eligible for certification but have not yet been certified.

2. Research methodology

This research identifies climate-aligned bonds. These bonds are not labelled as green bonds by the issuer, but finance climate-aligned activities/assets. Climate-aligned bonds are identified via two research phases: the 'issuer screening' and the subsequent 'identification of climate-aligned bonds':

Issuer screening

Climate-aligned bonds are identified at the issuer level, via analysis of the revenue streams for a global pool of public and private companies.[4] Only companies/entities (or their subsidiaries and/or financing arms) with outstanding debt are eligible for inclusion.

- Entities that derive at least 75% of their revenue streams from climate-aligned activities are classified as strongly-aligned issuers
- Entities that derive at least 95% of their revenue streams from climate-aligned activities are classified as fully-aligned issuers

Both of the above are classified as climate-aligned issuers.

Issuers are excluded from the analysis if:

- They derive less than 75% of their revenues from climate-aligned activities
- They have no debt outstanding
- There is insufficient information to determine their climate-alignment

N.B: The issuer screening phase was based on publicly available sources of information, such as annual reports, sustainability reports, and company websites. Occasionally, issuers provided direct information which helped clarify the climate-aligned nature of their business activities. Such information was treated confidentially, and only presented at an aggregate level.

Identification of climate-aligned bonds

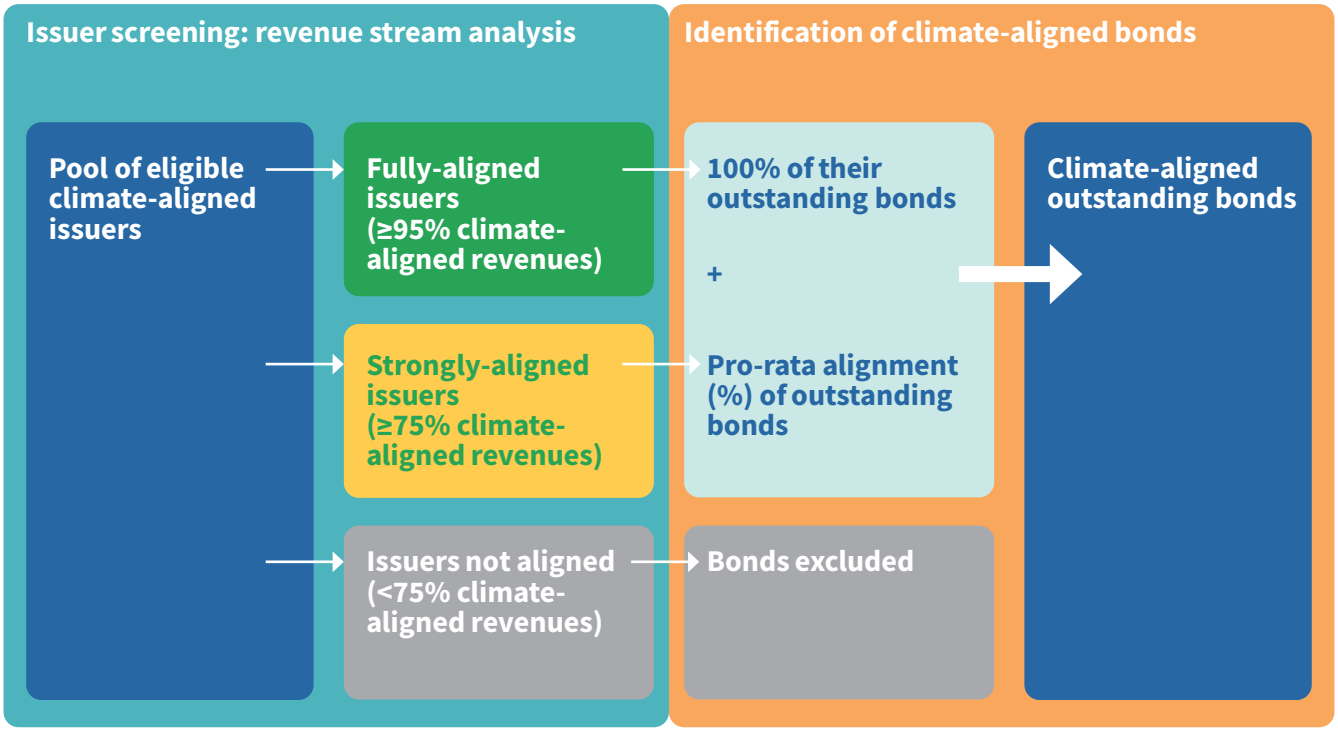
Bonds issued by climate-aligned issuers are defined as climate-aligned bonds as they finance and/or refinance operating activities that have been identified as climate-aligned. The total climate-aligned outstanding debt is calculated as follows:

- For fully-aligned issuers: 100% of outstanding debt is considered climate-aligned.
- For strongly-aligned issuers: a pro-rata amount based on the issuers' percentage alignment is considered climate-aligned. For example, if an issuer is 80% aligned, then 80% of its outstanding debt is considered climate-aligned.
- The combination of climate-aligned outstanding volume issued by fully- and strongly-aligned issuers is defined as '**climate-aligned outstanding debt**'.[5] The latter represents the underlying data for our charts and market analysis below.[6]

N.B: All green, social, and sustainability (GSS) labelled bonds issued by climate-aligned issuers are **excluded** from the current analysis. For more information on the labelled bond universe, please refer to the Climate Bonds 'State of the Market' series.[7]

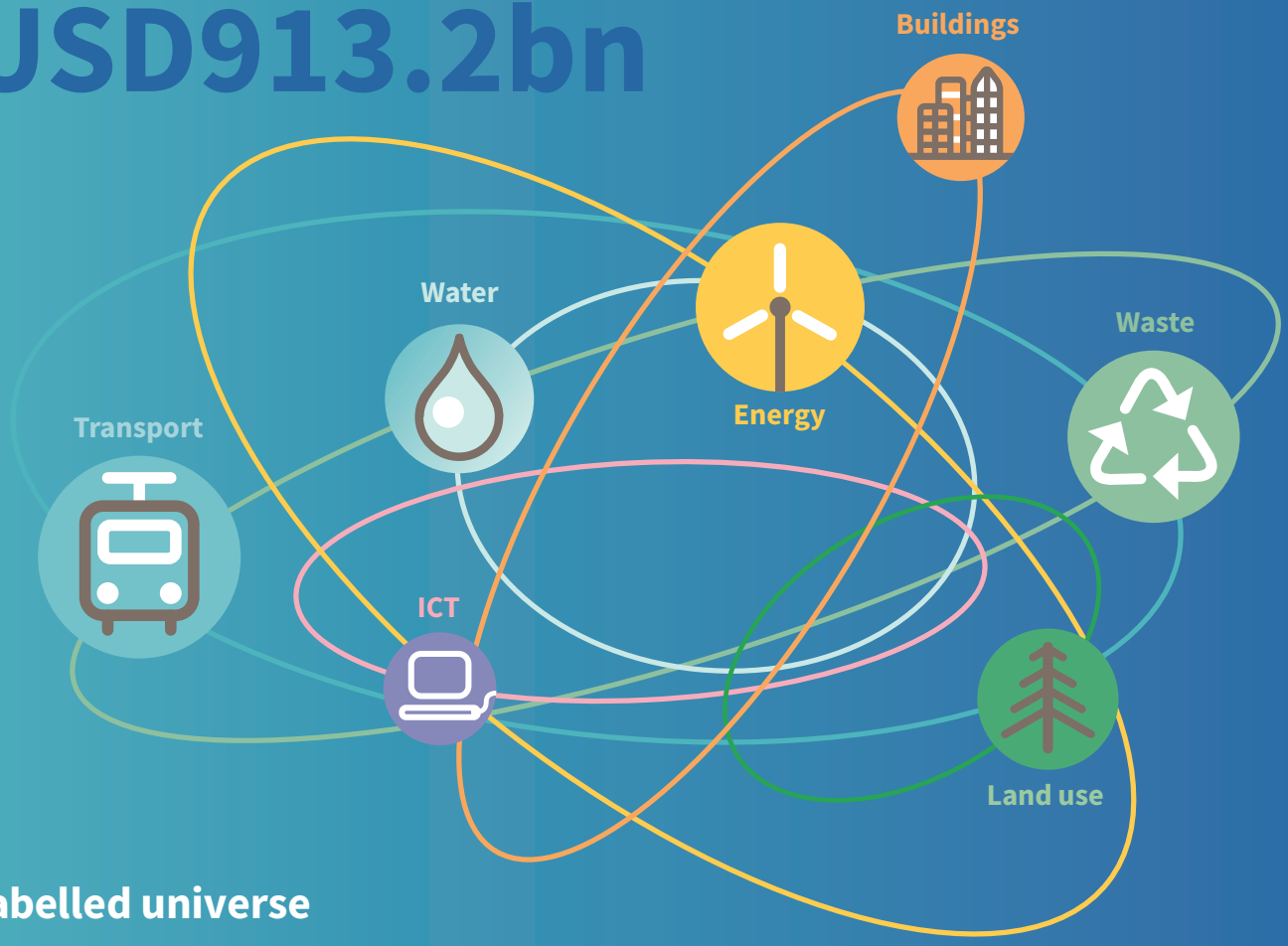
Climate-aligned activities

Climate Bonds has identified seven climate themes: Energy, Transport, Buildings, Water, Waste, Land use & agriculture, and Information & Communication Technologies (ICT). The specific climate-aligned activities and assets within these themes, along with the relevant eligibility criteria, are listed in the 'climate-aligned activities' table (Annex II).



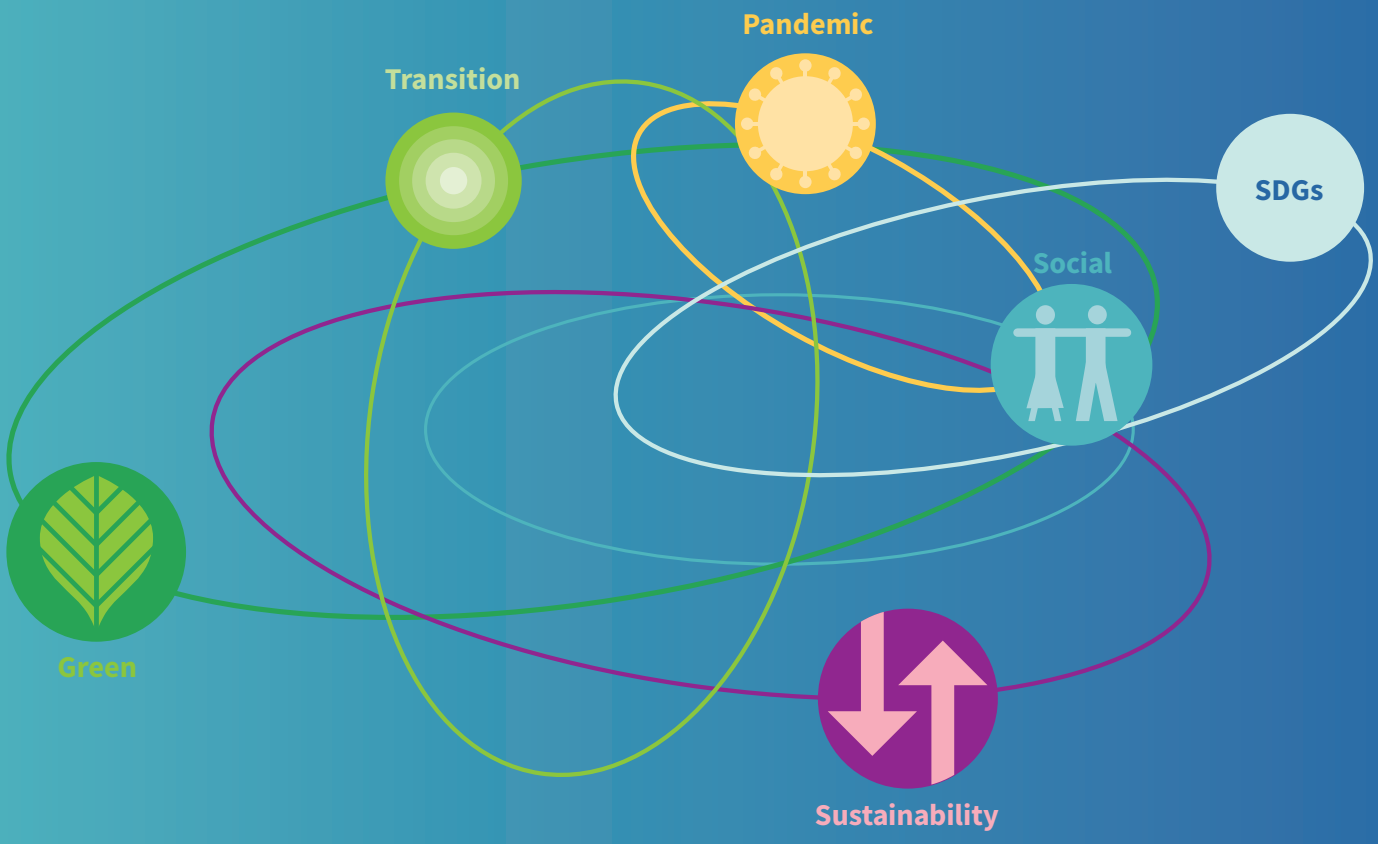
Climate-aligned universe

USD913.2bn



Labelled universe

USD1.7tn



3. The global climate-aligned universe

Summary figures

- **420** climate-aligned issuers
- **311** fully-aligned issuers
- **109** strongly-aligned issuers
- **45** countries
- **33** currencies
- **USD913.2bn** of outstanding climate-aligned bonds
- **USD >1tn** of climate-aligned bonds issued
- **Top three issuers:** China Railway Corp (USD230bn), SNCF (USD53.7), EDF (USD52.1)
- **Top climate themes:** Transport (USD502.3bn), Energy (USD219.3bn) and Water (USD91.2bn)

Global context: The need to scale up climate finance

Recent years have witnessed increased flows of capital towards low-carbon assets and economic activities, with substantial growth of the labelled GSS bond market. Unfortunately, such efforts fall short of what is needed to meet more stringent climate targets: estimates suggest that an annual USD6.9tn in infrastructure investment alone, as well as a corresponding figure between USD1.6tn and USD3.8tn for the energy transition, is required to meet the Paris Agreement targets.[8,9,10]

Driving private capital towards low-carbon investments is key to scaling up climate finance: public money alone is not sufficient for the investment needed. This research identifies additional opportunities for investors beyond the public realm to help facilitate the climate transition that is urgently needed.

USD913.2bn of outstanding climate-aligned bonds

Source: Climate Bonds Initiative

A universe of USD913.2bn of climate-aligned bonds has been identified as part of our 2020 research, highlighting sizeable investment opportunities. This accounts for approximately half of the labelled universe,[11] which amounts to USD1.7tn according to Climate Bonds data.[12]

Global climate-aligned universe analysis

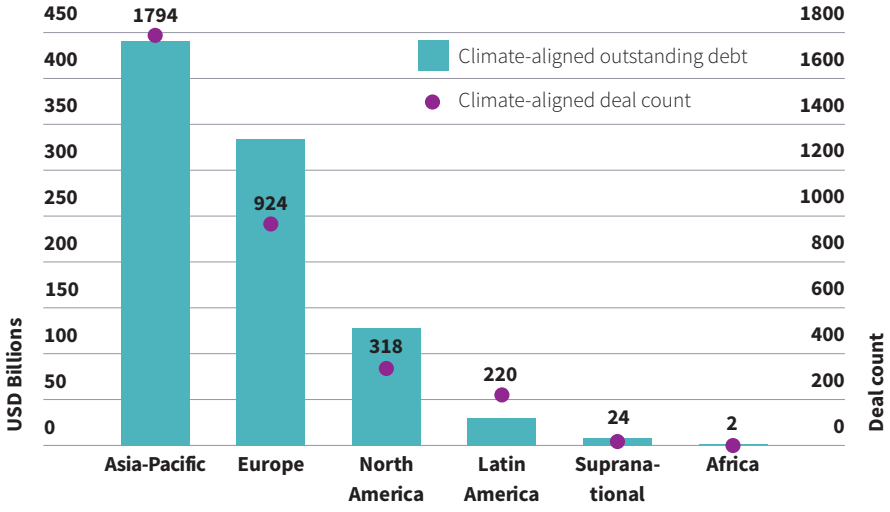
The climate-aligned universe continues to expand. The 2020 climate-aligned research identified a total of 420 climate-aligned issuers from 45 countries. The total climate-aligned bond universe is almost equally split between DM and EM, with 1% of volume coming from supranational institutions.

Asia-Pacific is the top region, accounting for USD436.6bn issued by 183 climate-aligned issuers. Bonds from China represent the vast majority of issuance from the region at 74%, and 36% of the global total. Europe ranks second, accounting for USD321.3bn of climate-aligned debt and 121 issuers. Top issuers Société Nationale des Chemins de fer Français (SNCF) and Électricité de France (EDF) are both domiciled in France. North America is home to 65 issuers and USD119.7bn. Rail company Union Pacific Corp (USD22bn) is the top issuer in the region, followed by Hydro-Québec (USD17bn) and American Water Capital (USD8.4bn).

EUROFIMA is the only supranational climate-aligned issuer, with USD8.8bn of outstanding climate-aligned bonds. Africa is also home to one single climate-aligned issuer: Umgeni Water Services, which accounts for USD140m.

China[13] and France together account for more than half of the total climate-aligned universe. The latter, which represents almost a fifth of the climate-aligned volume, is home to ten climate-aligned issuers which mostly operate in the transport and energy sectors. Notably, ICT company Orange SA ranks third with USD38bn of outstanding climate-aligned bonds. The United States (US) comes in third in the global ranking, with 45 issuers being identified as

Asia-Pacific tops the unlabelled climate-aligned universe



Source: Climate Bonds Initiative

Top 10 climate-aligned countries

Country	Outstanding climate-aligned debt (USD)	Market share (%)
China	325bn	36
France	173.6bn	19
United States	86.6bn	9
South Korea	59.8bn	7
United Kingdom	53.9bn	6
Canada	33.1bn	4
Germany	31.4bn	3
India	28.6bn	3
Austria	16.6bn	2
Brazil	16.2bn	2

climate-aligned. Most US companies fall under the transport, water, and waste themes, with examples from Tesla (USD5.6bn), American Water Capital, (USD8.4bn) and Republic Services Inc (USD5.7bn).

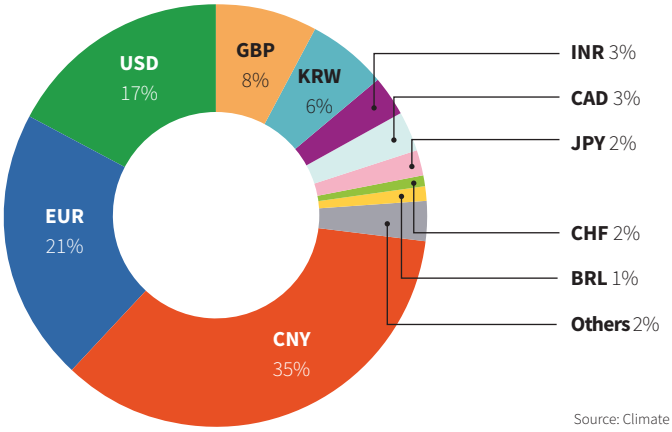
52% of bonds are issued in hard currency with EUR (21%), USD (17%) and GBP (8%) being the most popular. CNY is, nonetheless, the top currency at 35%, also accounting for the largest share of bonds issued in soft currency.

Just over 60% of climate-aligned bonds are rated by international rating agencies. Almost the entire climate-aligned universe (90% of volume) is investment grade. Only 6% is non-rated, while 4% is high yield. Almost 30% of the climate-aligned universe is AAA-rated, followed by 22% being AA-rated. BBB and A-ratings account for 20% of volume each.

Short-to-medium tenors are the most frequent: 32% of volume falls in the 5–10-year bucket, followed by 26% maturing within 10–20 years. Around a fifth of climate-aligned bonds have shorter tenors of up to five years, while 17% fall in the longest tenor bucket, maturing in 20 years or more. Perpetual bonds are the least frequent at 5%.

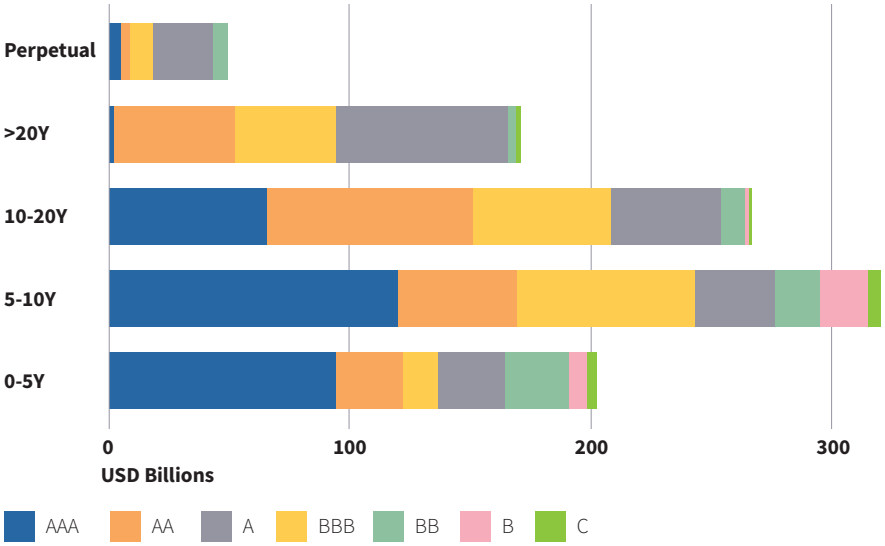
Climate-aligned issuers operating in low-carbon transport prefer tenors of up to 20 years (63% of volume in this theme). Renewable energy issuers favour medium tenors, with 50% of climate-aligned bonds maturing within 10 years. Around 20% of climate-aligned bonds in the Energy theme exceed 20 years. Water companies favour longer tenors, with most of the volume maturing in longer than 20 years. On average, land use, waste and ICT issuers prefer medium-length tenors, with 5–10 and 10–20-year buckets taking the largest share by volume.

CNY accounts for 35% of the climate-aligned universe



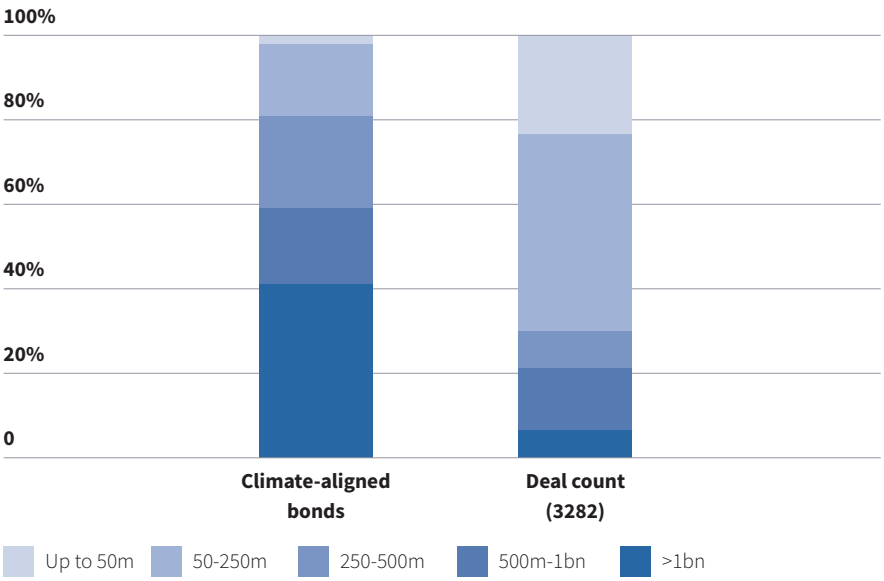
Source: Climate Bonds Initiative

Chart 90% of climate-aligned bonds are investment grade[14]



Source: Climate Bonds Initiative

Deals larger than USD1bn represent 42% of the climate-aligned volume



Source: Climate Bonds Initiative

Small-sized deals are the most frequent by number with almost 70% of climate-aligned bonds, by number, below benchmark size. A further 45% of deals fall in the USD50–250m bucket, while around 25% is up to USD50m. Deals in the USD250–500m bucket account for 14% of the total. Benchmark and large deals are less frequent: 7% of bonds are larger than USD1bn, while 9% fall in the USD500m–1bn size bucket. China Railway Corp is the top issuer with deals larger than USD1bn (115), followed by EDF (32) and SNCF (19).

Conversely, large deals comprise most of the climate-aligned outstanding volume: 42% of climate-aligned outstanding debt is larger than USD1bn, while benchmark-sized deals account for 22% of the outstanding volume. Most deals larger than USD1bn are issued by railway companies; three deals are from Tesla. The largest climate-aligned deal was issued by Hydro-Québec (CAD7bn/USD6.1bn).

Transport dominates the climate-aligned universe followed by Energy (24%), Water (10%), ICT (4%), Waste (4%), Land use & agriculture (2%) and Buildings (<1%).[15] Railway companies account for 90% of the transport climate-themed volume, with companies operating in public transport, electric vehicles (EVs), hybrid vehicles, shipping, buses, storage (EV battery), EV charging stations and bicycles accounting for the remaining 10%.

Transport climate-aligned companies are also widespread across the globe. In the Asia-Pacific region, three quarters of climate-aligned bonds are issued by transport companies (most of which are based in China), while in Europe these account for 40% of the volume.

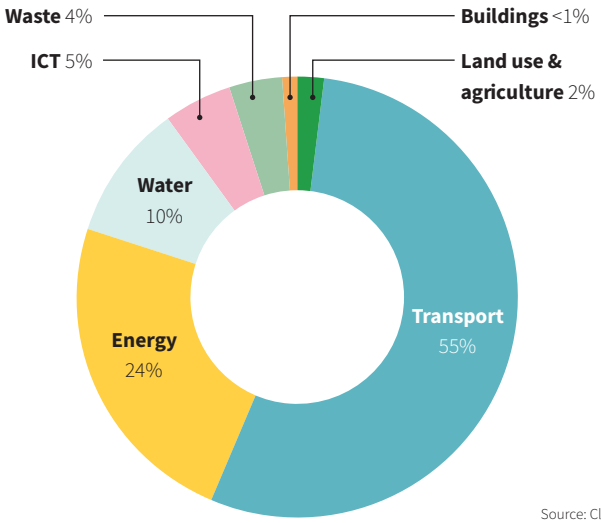
Energy is the second climate-aligned theme, with a similar share of volume in Asia-Pacific (21%) and Europe (24%). After China Railway Corp (USD230bn), Indian Railway Finance (USD22.8bn) and Korea Rail Network Authority (USD16.8bn) are the top issuers for transport in the Asia-pacific region, while Korea Electric Power Corp (USD25.3bn), China National Nuclear Corp (USD10.6bn) and China Three Gorges (USD9.1bn) are the top issuers for energy. In Europe, EDF (USD52.1bn), Vattenfall (USD4.8bn) and Ørsted (USD3.4bn) are the top issuers for energy, while SNCF (USD53.7bn), Deutsche Bahn (USD31.2bn) and OeBB-Infrastruktur (USD16.5bn) are the top issuers for transport.

Asia-Pacific, Europe and North America are also home to a wider variety of issuers operating across all the climate themes. Water companies issue 16% of the European climate-aligned volume and 13% of the total in North America. Waste management companies are mostly based in the US, with Republic Services Inc (USD5.7bn), Waste Management Inc (USD5bn) and Waste Connections Inc (USD3bn) representing the top three issuers. Land use & agriculture companies are also mostly based in North America, with a stronger presence in the US; International Paper Co (USD6bn) is the top issuer.

Latin America is dominated by energy companies (75%), with a smaller presence of the Water (12%), Transport (8%) and Land use (5%) themes. Brazil is the top climate-aligned country in the region, with 35 climate-aligned issuers. Eletrobras (USD3.1bn) is the top issuer for energy, followed by Cemig Geracao e Transmissao (USD2bn) and Engie Brasil Energia (USD1.2bn). Colombia is the second climate-aligned country in the region (five issuers), followed by Costa Rica (two issuers). Brazil's Suzano SA (USD1.2bn) is the only land use company in the region.

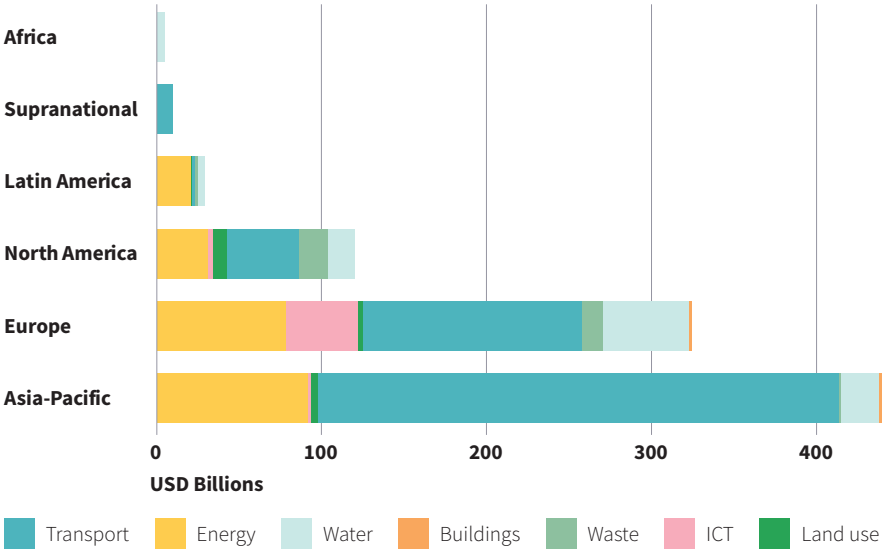
Africa is home to a single climate-aligned issuer, Umgeni Water Services Pty Ltd (USD140m), operating in the water sector. Rail company EUROFIMA (USD8.7bn) which finances rail projects across Europe is the only supranational climate-aligned issuer.

More than 50% of climate-aligned bonds are issued by transport companies



Source: Climate Bonds Initiative

Asia-Pacific is the largest source of climate-aligned bonds



Source: Climate Bonds Initiative

Opportunities to scale up labelled issuance

The maturity profile of the unlabelled climate-aligned bond universe shows that there are substantial opportunities to scale up the labelled bond universe. Companies which operate in the themes that are linked to climate-aligned business activities could refinance their maturing liabilities via the labelled bond market, and hence benefit from the extra visibility offered by such instruments.

More than 40% of climate-aligned bonds will mature by 2024, offering a volume of USD372bn which could be refinanced with labelled bonds in the short term. This is equivalent to almost 40% of the labelled green bonds issued by Q3 2020. An additional USD223.7bn (25% of the climate-aligned universe) could be refinanced by 2029. This could increase the availability of green bonds by 65% within nine years (based on current market size).

Most opportunities for refinancing arise from climate-aligned issuers with transport and energy-related operations: three quarters of the climate-aligned bonds maturing by 2024 are issued by the former, while 25% come from the latter. An additional 14% and 4% could be refinanced from transport and energy issuers by 2029, respectively.

Around 7% of climate-aligned bonds maturing by 2024 originate from water companies, while 4% are from the ICT theme. Around 6% of climate-aligned bonds from Waste, Land use, and Buildings, amounting to USD33.8bn, will roll off by 2029 and could be refinanced under the green bond label.

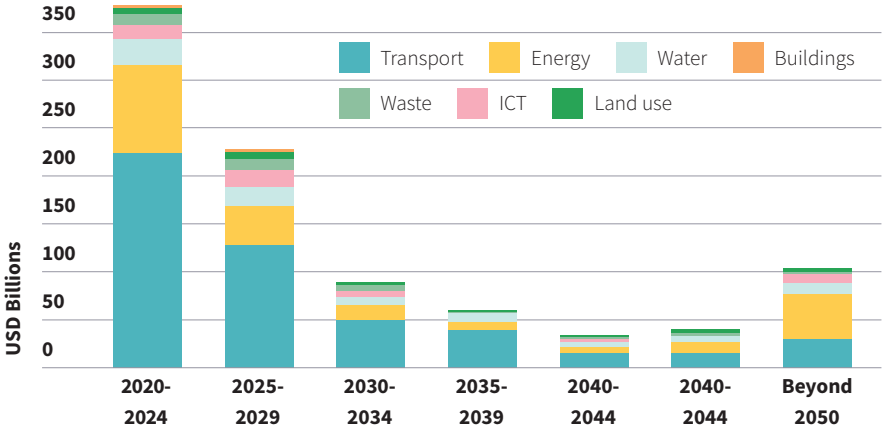
Climate-aligned issuers already issuing labelled green bonds

Approximately 30% of climate-aligned issuers included in this report have already come to the market with labelled bonds. These include top climate-aligned issuers such as SNCF, EDF, China Three Gorges, EUROFIMA and Ørsted.

Altogether, 91 climate-aligned entities have issued green labelled bonds (USD56.5bn), while five companies issued sustainability labelled bonds (USD933.6m). Only one issuer came to the market with a social labelled bond (USD386m). Climate-aligned issuers have collectively issued USD57.8bn worth of Green, Social and Sustainability (GSS) debt, which is not included in the scope of this analysis.

The overlap between climate-aligned issuers which have already issued green bonds is important as it suggests that almost a third of these entities have already discovered the extra value brought by the label. Multiple benefits of issuing green bonds were highlighted by 83 issuers interviewed for the 2020 Green Bond Treasurer Survey conducted by Climate Bonds.[16] Such benefits include a broader investor base and new engagement opportunities, enhanced reputation and visibility, as well as strengthened company internal integration. Some climate-aligned issuers have only issued labelled bonds. Verbund AG, Austria's largest electricity provider, issued two green bonds for a total of USD688m.

Maturity profile of the climate-aligned bond universe



Source: Climate Bonds Initiative

Global climate themes

Climate theme/Rank	Amount (USD)	Market share (%)	Issuer number
1. Transport	502.3bn	55	88
2. Energy	219.4bn	24	187
3. Water	91.2bn	10	74
4. ICT	49.1bn	5	10
5. Waste	34.0bn	4	31
6. Land use & agriculture	17.0bn	2	37
7. Buildings	113m	<1	3

Reporting practice

The global health and economic crisis resulting from the outbreak of COVID-19 has revealed the danger of understating the physical risks of climate change. Governments, businesses, and investors worldwide have come to realise the importance of adapting and reacting to the challenges presented by unforeseen disruptions. As investors seek better information to price risk and make informed decisions about the allocation of capital, mandatory and voluntary reporting schemes on sustainability have multiplied in recent years. Yet there is no single approach for how companies should identify and present environmental and climate change information in mainstream financial reports. Therefore, the information available is inconsistent. This has resulted in an increased reporting burden on organisations, and has made it hard for investors to evaluate and compare companies with respect to their sustainability performance and hence make informed investment decisions. The gap between investors' expectations and current reporting practice, both in the quality and granularity of information disclosed, represents a significant challenge.

Task Force on Climate-related Financial Disclosures (TCFD)

The industry-led TCFD was established by the Financial Stability Board in 2015 to develop effective climate-related disclosure enabling more informed decision-making, which would, in turn, enable stakeholders to understand the carbon-related assets in the financial sector and the financial system's exposure to climate-related risks.[17] To achieve its objectives, the Task Force developed a framework including four thematic areas for climate-related corporate disclosure on adoptable by all organisations. These are to be disclosed in companies' public annual financial filings in voluntary supplemental reports.

Climate Disclosure Standards Board (CDSB) Framework

Updated in 2018 to align with the recommendations of the TCFD, the CDSB Framework assists companies to streamline their reporting cycles. By complying with the Framework, companies can gain tangible business benefits, including:

- Improved organisational reputation
- Added value to existing mainstream financial reports
- Increased transparency to facilitate informed allocation of financial capital
- Reveal risks and opportunities
- Track and benchmark progress
- Stay ahead of upcoming regulatory requirements and policy changes
- Boost competitive advantage

Our 2020 climate-aligned analysis relies strongly on mainstream, publicly available reports as sources of information. Some aspects of disclosure, particularly clarity and specificity around definitions and environmental performance of assets and activities, remain problematic. It is crucial that companies continue to improve disclosure to enable comparisons to be made and investments to be aligned with low-carbon assets and activities. Governments have an important role to play in improving the quality and consistency of disclosures by introducing more stringent reporting requirements.

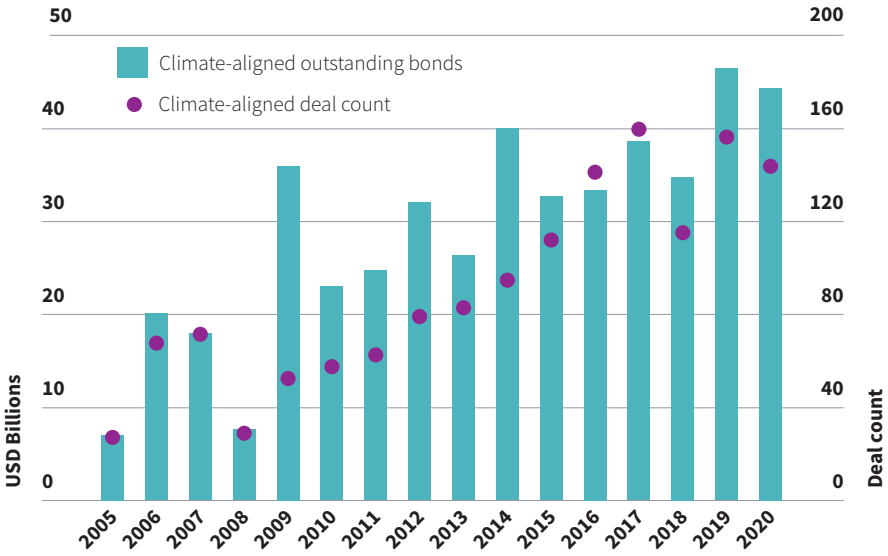
As demonstrated by CDSB, even Europe's largest companies are falling short of adequate disclosure despite the availability of resources and relatively mature reporting processes.[18]

4. Developed markets (DM) overview

DM summary figures

- **203** climate-aligned issuers
- **155** fully-aligned issuers
- **48** strongly-aligned issuers
- **21** countries
- **14** currencies
- **USD464.8bn** of outstanding climate-aligned bonds
- **USD522.4bn** of climate-aligned bonds issued
- **Top three issuers:** SNCF(USD53.7bn), EDF (USD52.1), Orange SA(USD38.1bn)
- **Top climate themes**: Transport (USD502.3bn), Energy (USD219.3bn) and Water (USD91.2bn)

USD464.8bn of climate-aligned bonds originate from DM



Source: Climate Bonds Initiative

DM context

This section focuses on DM issuers and bonds. The urgency and importance of fighting climate change has been widely recognised at a global level. The Paris Agreement marked a pivotal moment in global climate negotiations with 196 parties formally committing to decarbonise their economies at the Conference of the Parties (COP) 21 in Paris.[19] Developed markets will play a key role in leading the transition to a low-carbon economy while prompting and supporting emerging economies to follow suit.

Europe has emerged as a pioneer in the green financial and economic policy space. In addition to its commitment to cut GHG emissions by at least 55% by 2030,[20] the European Commission also kickstarted the process of defining green and sustainable economic activities in 2016, culminating in the publication of the Taxonomy Regulation in 2020.[21] The accompanying Delegated Acts define the technical screening criteria for economic activities that can make a substantial contribution to climate change mitigation and adaptation.[22] The EU Taxonomy Climate Delegated Act, which was adopted in June 2021,[23] will help to meet the objectives of the European Green Deal by guiding companies and investors on defining green assets, projects and activities – thereby supporting their transition towards carbon neutrality and resilience.

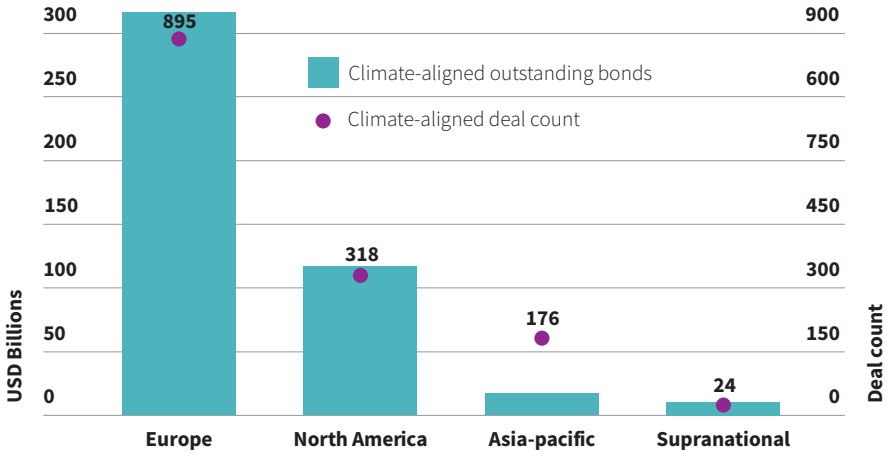
In the US, the change in administration in late 2020 saw President Joe Biden reinstate the country into the Paris Agreement. Soon after, on Earth Day 2021, President Biden hosted a virtual global climate summit which brought together 40 world leaders to galvanise efforts to tackle the climate crisis. On this occasion, Biden announced a renewed commitment to halve the country's emissions by 2030 compared to 2005.[24] A Climate Finance Plan with a focus on International Finance was also released on the same day. The US intends to double its annual public climate finance to developing countries by 2024, compared with what was budgeted during the Obama-Biden Administration, and triple adaptation finance by 2024.

The US also aims to support capital flows towards low-carbon pathways via climate-aligned investments, and to support climate-related disclosure from financial and non-financial institutions.[25] The Securities and Exchange Commission (SEC) has stepped up in this regard by announcing the creation of a Task Force focused on identifying ESG-related misconduct, and its Division of Examinations announced that climate-related risks now represent a top priority for the agency.[26,27] Similarly, the Federal Reserve has initiated two committees to investigate the systemic risks arising from climate change. Additional priorities from the US Climate Finance Plan include mobilising private finance with the support of blended finance mechanisms, as well as ending international financing of fossil fuels.

Other key DM economies are similarly expanding their climate pledges: announcements of increased ambition at the Leaders' Summit on Climate included Canada's aim to achieve a 40–45% emission cut by 2030 compared to 2005, while Japan ramped up its 2030 target to 46% compared to its original 26% below 2013 levels.

The latest developments show growing international momentum for climate action and finance, including from the private sector which is a key enabler to fund the low-carbon transition. This is of particular importance to many DM countries which contribute significantly to global GHG emissions and are home to many of the world's largest corporations and well-developed capital markets. The unlabelled climate-aligned bond universe shows that there are wider opportunities for responsible investing, as well as to scale up the labelled bond universe. Many of the climate-aligned bond issuers included in this research have already issued green labelled bonds, suggesting that they have already discovered the intrinsic value of the label in preventing greenwashing and increasing transparency.

Europe tops the unlabelled climate-aligned universe for DM



Source: Climate Bonds Initiative

DM climate-aligned universe analysis

Developed market countries account for 50% of the climate-aligned bond universe. The 2020 research has identified 203 climate-aligned issuers across 21 developed countries. EUROFIMA is the only supranational institution, accounts for approximately 1% of the universe.

Europe is the top region overall, with USD319bn of climate-aligned outstanding bonds (68% of the DM volume) issued by 112 issuers domiciled across 14 countries. European climate-aligned issuers alone account for more than half of the issuers from DM. This is in line with Europe's global leadership in cross-sector climate action, including the EU Taxonomy Regulation on disclosure and definition of green assets and economic activities.[28]

France is the largest source of climate-aligned debt (37% of DM volume) with ten climate-aligned issuers mostly falling into the Transport (34%), Energy (30%), and ICT (22%) climate themes. SNCF (USD53.7bn), EDF (USD52.1bn) and Orange SA (USD38bn) are the top three entities, with the first two also topping the global ranking. The UK, Germany, Austria, Spain, Norway and Switzerland all fall in the top ten DM ranking. The UK ranks third, with 25 climate-aligned issuers which operate predominantly in the Water and Transport climate themes. The UK top three issuers are: Thames Water (USD10.9bn), Channel Link (USD5.8bn) and United Utilities Water (USD5.3bn).

North America is the second most prolific region in the DM climate-aligned universe (USD119.7bn, 26% of DM). The relatively small volume of climate-aligned bonds from North America can be traced back to the fact that munis and government agencies such as Fannie Mae and Freddie Mac are not included in the current report as these issuer types are beyond the scope of the 2020 research.[29] Munis and government agencies account for 62% of the cumulative green labelled issuance in the US.[30]

The Asia-Pacific region accounts for only 4% of the DM universe, with 25 climate-aligned issuers. Japan dominates the region's issuance at 77%; Central Japan Railway (USD7.4bn), Tokyo Metro Co (USD3.7bn) and Oji Holdings (USD936m) are the top three companies.[31] Hong Kong SAR ranks second, with USD2.6bn of climate-aligned outstanding volume and nine climate-aligned issuers. MTR (USD1.2bn) is the top issuer in Hong Kong, followed by China Dynamics Holdings (USD303m) and China Water Affairs Group (USD300m). New Zealand is home to Mercury NZ (USD414m) and Trustpower (USD253m), both operating in the renewable energy climate theme.

DM volume is issued almost entirely in hard currency, predominantly in EUR (41%), followed by USD (29%) and GBP (15%) – a ranking that mirrors the top three climate-aligned countries. The remaining share mostly comes from AUD, CHF and JPY. Only 3% of the universe is issued in soft currency, of which approximately 1% is NOK-denominated (USD6.6bn).

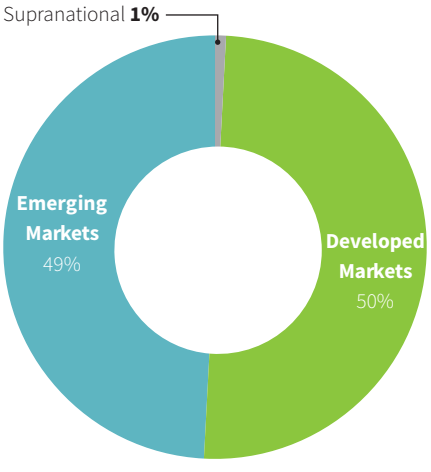
Top 10 DM climate-aligned countries

Country	Outstanding climate-aligned debt (USD)	Market share (%)
France	173.7bn	37
United States	86.6bn	19
United Kingdom	53.9bn	12
Canada	33.1bn	7
Germany	31.4bn	7
Austria	16.6bn	4
Japan	13.4bn	3
Spain	10.2bn	2
Norway	7.3bn	2
Switzerland	7.1bn	2

Medium-sized deals are the most common amongst the EUR-denominated issuance with 121 deals (30%) falling within the USD50–250m size bucket. Benchmark-sized deals follow at 26% (102 deals). GBP-denominated issuance follows the same trend. Conversely, USD-denominated bonds tend to be larger: 111 deals (40%) fall within the USD250–500m size bucket, while 75 deals (27%) are at least benchmark size or larger. Smaller-sized deals are generally less frequent with 11% of the DM universe by number.

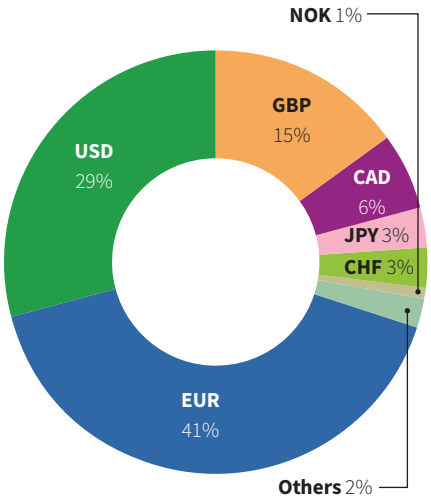
Almost the whole DM climate-aligned universe is investment grade (USD473.5bn, 91% by volume), of which the vast majority (89%) was issued in hard currency. Approximately 4% of deals are high yield, while 5% are non-rated. A-rated bonds are the most frequent at 31% of volume, followed by BBB-rated bonds at 30%. The reaming substantial share is AA-rated (29%). Almost the whole DM universe (94%) is rated by international rating agencies; only 1% of volume is assessed by local rating agencies.

DM and EM make up an almost equal share of the market



Source: Climate Bonds Initiative

EUR is the top currency in DM



Source: Climate Bonds Initiative

Longer tenors are the most prevalent: a third of the climate-aligned volume and 30% of the deal count falls in the 10–20 year size bucket, while an additional 30% of volume matures in longer than 20 years. A quarter of the outstanding volume has shorter tenors, with 25% of deals maturing in 5-10 years. Short tenors are by far the least popular: only 13% of deals and 7% of volume matures in up to five years. Perpetual bonds account for 5% of the climate-aligned universe and 2% of the deal count.

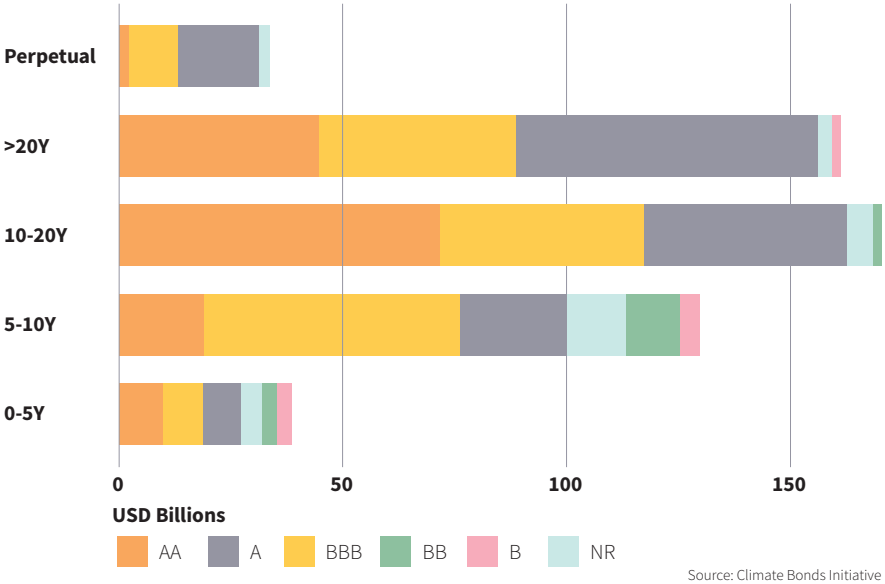
Longer tenors are also particularly popular amongst issuers operating in the Energy, Water, and Land use sectors, with 42%, 46% and 40% of their volume maturing in longer than 20 years, respectively. Climate-aligned issuers operating in transport favour tenors of 10–20 years (44% of their outstanding volume), while tenors longer than 20 years account for a quarter of their issuance. Medium-length tenors are also fairly common: 22% of volume from both transport and energy issuers falls into the 5–10-year bucket. The latter is also the most favoured by issuers operating in both waste and ICT sectors (50% and 45% of their outstanding volume, respectively).

Small-sized deals are the most frequent by number with just below 60% of climate-aligned deals below benchmark size. The USD50–250m size bucket is the most popular, accounting for just below 40% of the deal count. Smaller-sized deals (up to USD50m) and the USD250–500m bucket represent similar shares, each accounting for approximately 20% of climate-aligned bonds by number. Benchmark-sized bonds and above account for a quarter of the DM universe by number. French issuers such as EDF, SNCF and Orange SA have issued multiple bonds larger than USD1bn. These are followed by OeBB-Infrastruktur (9 deals), Union Pacific Corp (7 deals) and Deutsche Bahn (6 deals). The latter has also issued several deals in the USD500m–1bn and USD250–500m buckets.

Large-sized deals take the most substantial share of the DM climate-aligned volume: 37% of cumulative issuance is larger than USD1bn in size, while benchmark deals (USD500m-1bn) account for around 30% of volume. Large deals are mostly issued by energy and railway companies. Around 20% of the volume falls in the USD250–500m size bucket, while 15% of issuance is up to USD250m.

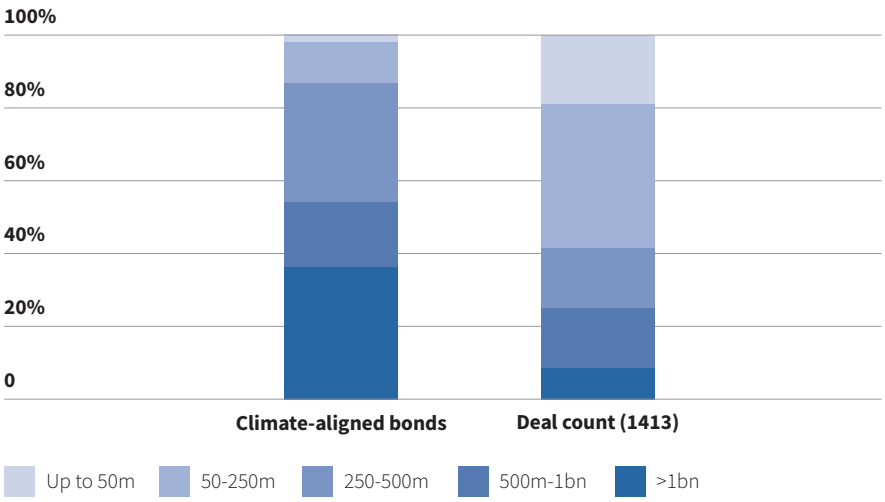
Transport theme leads DM issuance in the 2020 climate-aligned research. This is reflected in DM too, where 42% of the volume is issued by companies operating in the Transport climate theme. Energy (USD108.8bn) ranks second at 23%, followed by Water (USD67.4) which accounts for 15% of the outstanding climate-aligned bonds. ICT (USD47.9bn) companies account for 10% of the universe, which comes predominantly (78%) from top French issuer Orange SA. Waste (USD31.8), Land use & agriculture (USD13.3) and Buildings (USD1m) account for the remaining 10%.

91% of climate-aligned bonds are investment grade[33]



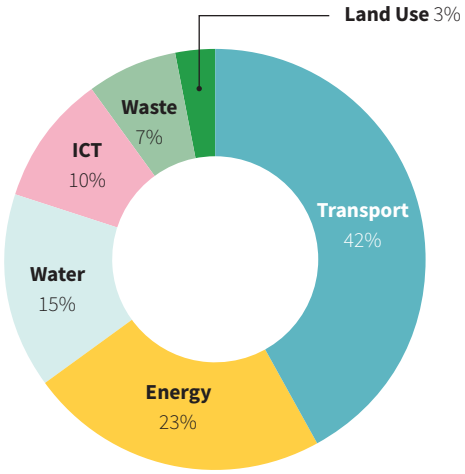
Source: Climate Bonds Initiative

USD1bn+ deals account for 42% of the climate-aligned volume



Source: Climate Bonds Initiative

More than 50% of climate-aligned bonds are issued by transport companies



Source: Climate Bonds Initiative

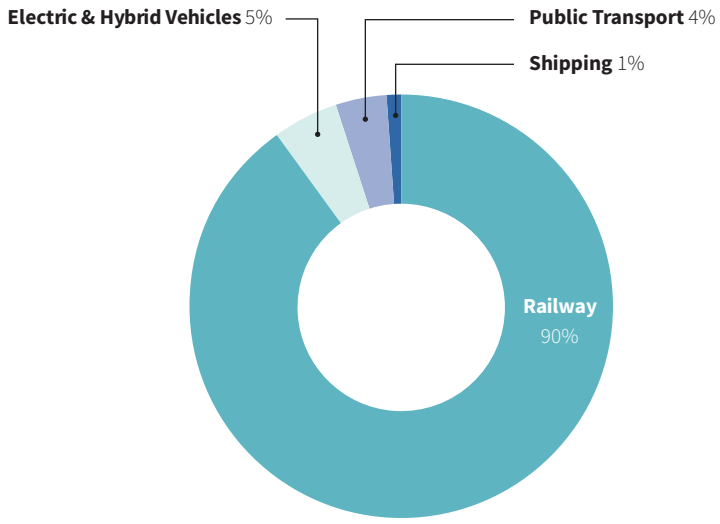
Transport-related activities are dominated by railway companies, which account for 90% of the volume. SNCF (USD53.7bn), Deutsche Bahn (USD31.2bn) and Union Pacific (USD22.1bn) are the top three issuers. Railway infrastructure is a key contributor to scaling up low-carbon mobility since high-speed trains represent a viable alternative to short-haul flights. Nonetheless, many trains are still fuelled by conventional energy sources, which calls for additional investments to be redirected towards the electrification of rail networks across the globe.[32] Only 5% of the issuers operate exclusively in the production of electric and hybrid vehicles, with Tesla being the top exponent.

Companies generating energy from a range of renewable sources account for over 60% (USD67.8bn) of the Energy theme. These are followed by vertically integrated utilities which generate power from renewables at 18% (USD19.8bn). The remaining share comes from issuers which solely operate in either hydro, nuclear, solar, wind and energy storage/ hydrogen. This suggests that most energy companies choose to diversify their asset portfolio with a range of different renewable generation technologies. Other than EDF, Hydro-Québec (USD17.1bn), Vattenfall (USD4.8bn) and Ørsted (USD3.3bn) are the top energy issuers.

Europe is home to a wide range of climate-aligned companies operating across different climate themes. As with all DM, Transport is the top theme in Europe with USD130.7bn (41%) of outstanding volume from 28 climate-aligned issuers. Energy follows, with 41 climate-aligned companies and USD77bn of outstanding bonds (24% of total volume). Water accounts for 16% of the European climate-aligned volume, while ICT accounts for 14%. The increasing role of ICT climate-aligned issuance is encouraging as it presents interesting prospects for further issuance in the labelled universe, which has so far played a smaller role (USD3.3bn of cumulative volume) compared to other more established themes.

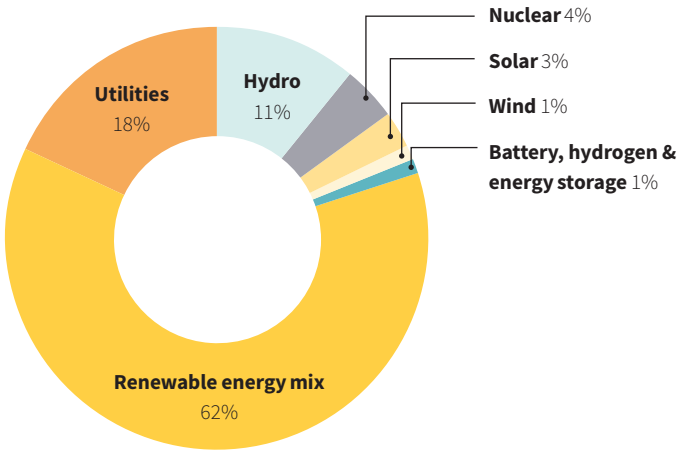
Climate-aligned issuers from North America also operate across a variety of climate themes, with Transport (35%) and Energy (26%) being the most prevalent. The largest share of climate-aligned volume comes from the US (USD36.4bn) with most companies operating in the railway sub-theme, except for Tesla which ranks second. USD6.6bn of transport climate-aligned issuance comes from six Canadian companies; Canadian Pacific Railway (USD4.7bn) is the top issuer. Most of the Energy climate-aligned volume comes from Canada (USD24.3bn, 78%), with Hydro-Quebec being the top issuer, as well as the source of the largest deal included in the current research (CAD7bn/USD6.1bn). Water and Waste companies are mostly based in the US (92% of cumulative Water and Waste climate-aligned volume). Land use takes a small share of the volume (7%), with International Paper Co accounting for over 70%.

Railway companies dominate transport



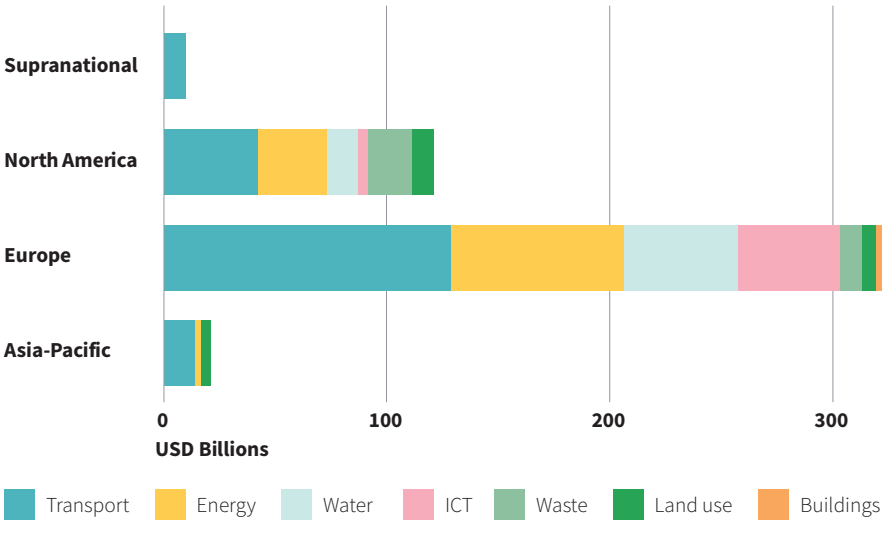
Source: Climate Bonds Initiative

Renewables dominate the energy sector[34]



Source: Climate Bonds Initiative

Europe has the richest mix of climate themes



Source: Climate Bonds Initiative

DM from the Asia-Pacific region operate almost entirely in the Transport theme (80% of the region's volume, USD13.7bn). Japan is the top country which accounts for 77% (USD13.4bn) of the DM share of the Asia-Pacific region. The top energy company is Hong Kong-based Panda Green Energy Group (USD112m), followed by Japan Atomic Power (USD120m).

Opportunities to scale up labelled issuance

As introduced in the overview section, the maturity profile of the unlabelled climate-aligned universe highlights opportunities for climate-aligned issuers to refinance their business operations with labelled green bonds.

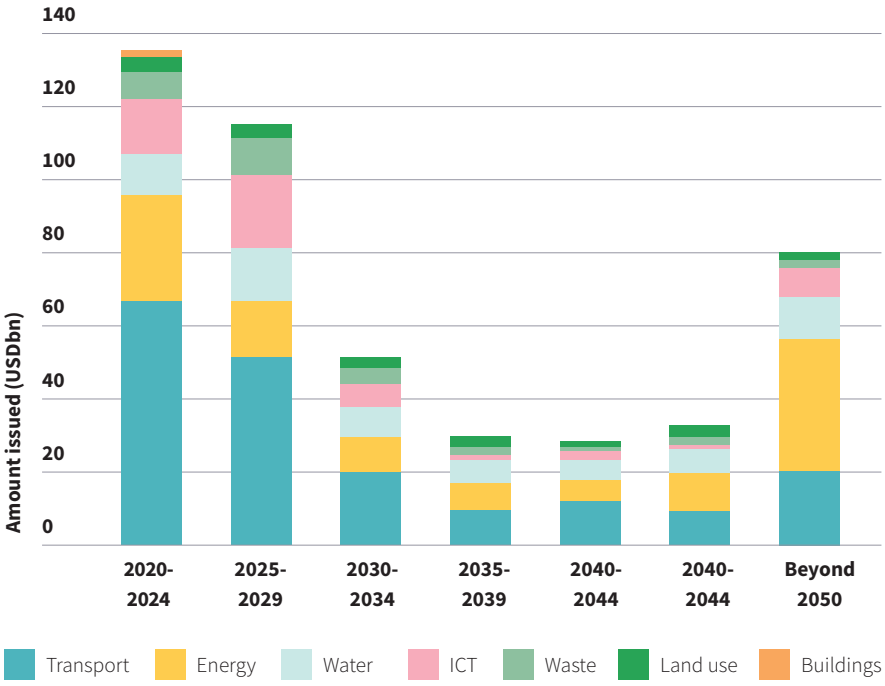
More than half of the climate-aligned bonds from DM will mature within approximately eight years, which shows huge potential for scaling up the labelled green bond market in the short to medium term.

Just below 30% (USD134.2bn) of the outstanding climate-aligned bond volume will mature by 2024, half of which comes from Transport entities. Around 20% of volume from energy issuers will also mature in the next three years, while 30% comes from companies operating across the Waste, ICT, Water and Land use themes. An additional USD113.9bn (25% of the DM universe) will mature by 2029.

Climate-aligned issuers already issuing labelled green bonds

Many climate-aligned issuers from DM have already issued labelled bonds: 34 issuers have issued green bonds, while Yorkshire Water Services has come to the market with both a social and sustainability bond. Indeed, all the top climate-aligned issuers by volume have discovered the value of the green label: SNCF (USD7.8bn), EDF (USD6.5bn), Ørsted (USD3.1bn), Adif-Alta Velocidad (USD2.7bn) and Bazalgette Finance (USD1.1bn) are just some examples. There remains further scope for climate-aligned issuers to label their debt. EDF and SNCF, for instance, have only labelled 12% and 15% of their volume, respectively. Other companies, such as Ørsted and Vattenfall, have issued a larger volume of labelled bonds compared to their plain vanilla bonds.

DM climate-aligned maturity profile



Source: Climate Bonds Initiative

Top DM climate themes

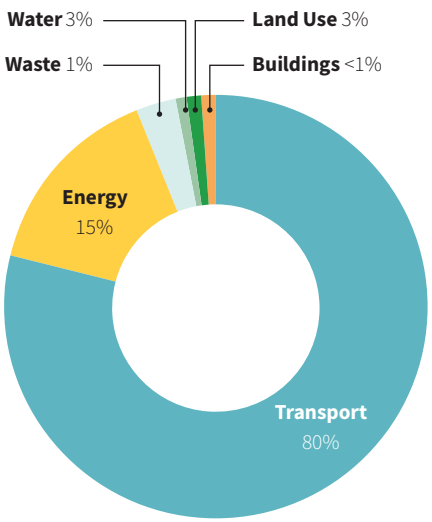
Climate theme/Rank	Amount (USD)	Market share (%)	Issuer number
1. Transport	195.7bn	42	51
2. Energy	108.8bn	23	73
3. Water	67.3bn	15	33
4. ICT	47.9bn	10	5
5. Waste	31.7bn	7	15
6. Land use & agriculture	13.3bn	3	25
7. Buildings	1m	<1	1

5. China: The largest source of climate-aligned bonds

China summary figures

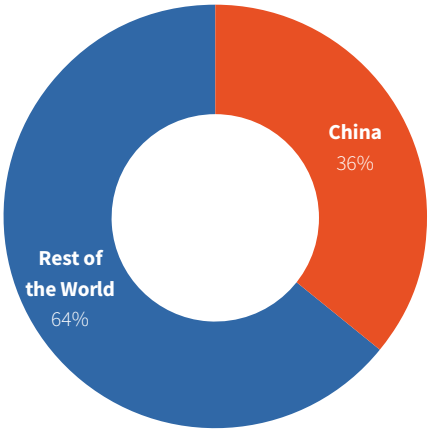
- **96** climate-aligned issuers
  - **69** fully-aligned issuers
  - **27** strongly-aligned issuers
- **USD325bn** outstanding climate-aligned debt
- **Top three issuers:** China Railway Corporation (USD230.1bn), China Railway Group (USD12.3bn), China National Nuclear Corporation (USD10.6bn)
- **Top three climate themes:** Transport (USD261.2bn), Energy (USD48.5bn), Water (USD10.6bn)
- **Top three currencies:** CNY (USD321.3bn), USD (USD2.7bn), HKD (USD1bn)

Transport represents 80% of the climate-aligned bond market



Source: Climate Bonds Initiative

China accounts for 36% of the global climate-aligned universe



Source: Climate Bonds Initiative

China context

With USD325bn of climate-aligned outstanding bonds, China accounts for 36% of the overall climate-aligned universe issued by 96 climate-aligned companies. Most of the country's climate-aligned debt comes from the Transport theme, with railway companies being the most prevalent. The country has invested greatly in the development of its high-speed rail network. Growth has been rapid in the past decade.[35] The total length of high-speed rail tracks in China came in at just under 38,000 kilometres at the end of 2020, making it the largest high-speed rail network in the world.[36]

Despite the relevant share of climate-aligned volume attributed to China, the country remains the largest greenhouse gas emitter, contributing to approximately 30% of global emissions.[37] In 2020, China pledged to achieve carbon neutrality by 2060, while more recently at the Leaders' Summit on Climate, China indicated that it will start phasing out coal over 2026-2030.[38]

The commitment to become net zero by 2060 will require a shift to the country's energy paradigm with virtually all coal-fired power plants to be phased-out, and a drastic change in its energy generation mix. This calls for an accelerated deployment of energy from renewables to offset the phase-out of conventional energy sources. Clean energy technologies are available and scalable: China has already played a key role in achieving economies of scale for solar PV, facilitating its penetration globally and subsequently bringing down generation costs. A similar approach must be taken to increase the uptake of storage and hydrogen technologies, which will allow for more flexible integration of renewables into the energy system. Increasing public and political willingness to transition to a low-carbon and resilient economy across the globe can help pave the way to meet net-zero targets.

The Chinese bond market is large enough to accommodate the gap in climate funding. Therefore, scaling up climate finance via labelled green bonds will be an inevitable path for China if net-zero targets are to be met, with estimates suggesting that the cost of the energy transition alone could reach USD5tn.[39]

China climate-aligned universe analysis

Rail dominates China's climate-aligned universe (77% of China's aligned volume, or USD248.7bn) and is the primary reason that the Transport theme accounts for 80% of the total debt. Railway companies are extensively state-backed, and rail bonds are typically large and liquid. China Railway Corp is the top issuer with a cumulative USD230.1bn of aligned outstanding bonds, which accounts for 25% of the global climate-aligned universe and 71% of China's climate-aligned universe.

Energy is China's second largest climate theme after Transport, and accounts for approximately 15% of climate-aligned outstanding volume (USD48.5bn and 37 climate-aligned issuers). The top three issuers are China National Nuclear Corp (3% of China's volume, USD10.6bn), China Three Gorges Corp (3%, USD9.1bn) and China Yangtze Power (2%, USD7.8bn).

Water, Waste and Land use & agriculture account for over USD1bn of climate-aligned outstanding debt. Water represents 3% of total volume (USD10.6bn and 22 climate-aligned issuers) with Beijing Enterprises Water Group being the top issuer (USD2.7bn). With USD2.4bn and 13 climate-aligned issuers, Waste makes up roughly 1% of the volume; Yunnan Water Investment Co Ltd (USD<1bn) tops the theme's ranking. Land use & agriculture also accounts for 1% of volume (USD2.2bn and 3 climate-aligned issuers), with Sinar Mas Paper China Investment Co Ltd being the top issuer (USD1.5bn).

Shorter tenors are the most popular with 38% of cumulative volume maturing in up to five years and 37% within the 5–10-year range. Longer tenors, including those grouped into 10–20 and more than 20 years account for 20% of cumulative volume.

Just under three-quarters of transport bonds volume is issued with medium-length tenors (up to ten years). Longer dated bonds within the 10–20-year tenor bucket account for just under a quarter of transport issuance, while those grouped into more than 20 years represent only 1% of the volume. Bonds with long tenors are prevalent in the Transport theme only.

China's aligned debt is almost entirely CNY-denominated. Onshore issuance in CNY is preferred by climate-aligned issuers, representing virtually the entire universe by volume (just under 99%, or USD321.3bn). The remaining share of China's climate-aligned debt is denominated in USD (1%, USD2.7bn) HKD (<1%, USD1bn).

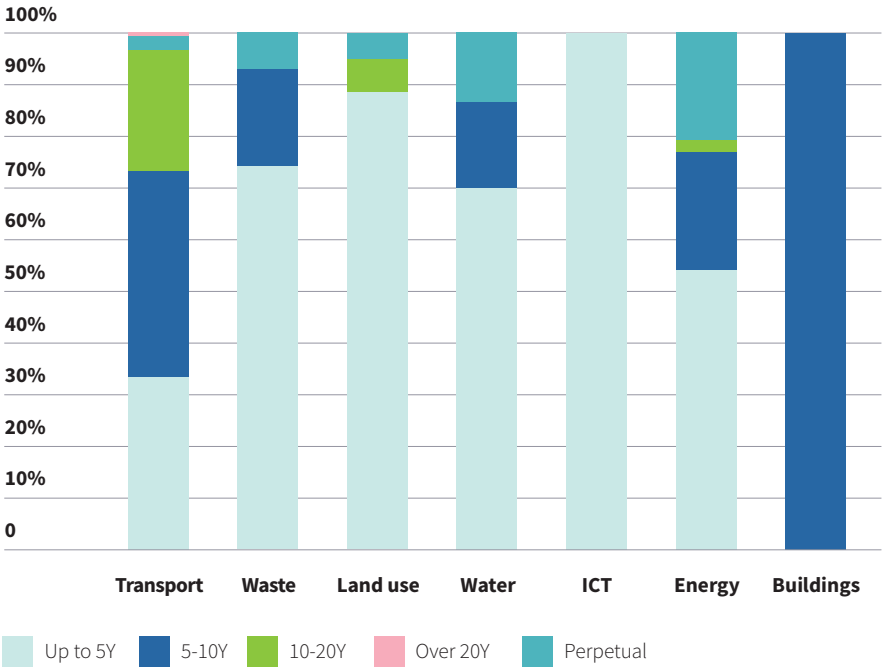
Most of the Chinese climate-aligned universe has been rated by local rating agencies (84% of volume). Only a small share of bonds has an international rating (9%), while 7% is non-rated. The entire share of Chinese climate-aligned bonds is investment grade according to both local and international rating agencies. Less than 1% of the universe is high yield, according to local rating agencies.

Opportunities to scale up China's labelled bond issuance

More than half of China's outstanding climate-aligned bonds (56%) will mature by 2024. This highlights opportunities for climate-aligned issuers to refinance their debt with labelled green bonds. Most opportunities come from the Transport theme, followed by Energy and Water. An additional USD69.7bn will mature by 2029, indicating more opportunities from 2025, particularly for transport and energy issuers.

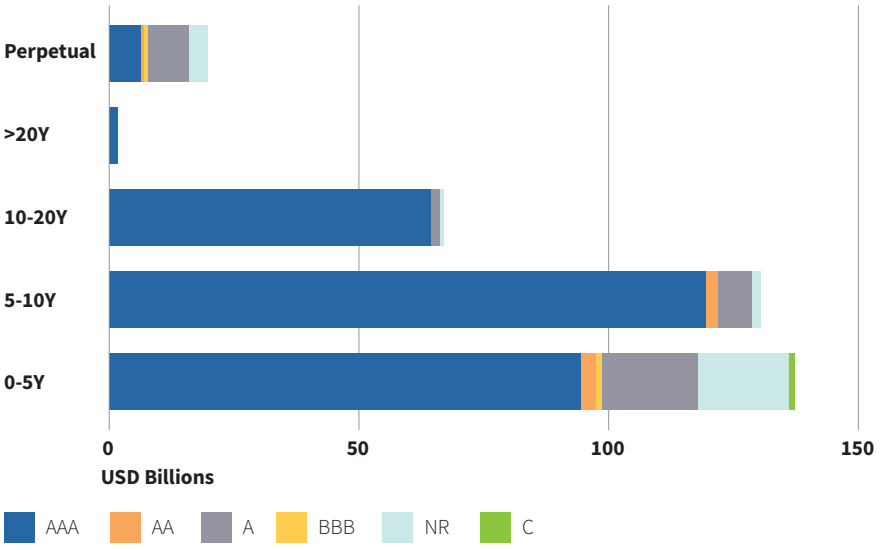
Some climate-aligned issuers have already entered the labelled green bond market. China Three Gorges Corp, the second-largest climate-aligned issuer in the Energy theme and a leading hydropower operator, tapped the labelled green bond market; one deal was also earmarked towards wind energy projects in Europe, which was Certified under the Climate Bonds Standard.[40] Other climate-aligned issuers which entered the labelled bond market include Beijing Enterprises Water Group, Nanjing Metro Group Co Ltd and CGN Power Co Ltd.

Tenors up to 10 years dominate issuance



Source: Climate Bonds Initiative

84% of the CA universe is in local ratings



Source: Climate Bonds Initiative

6. Emerging markets overview

EM summary figures

- **121** climate-aligned issuers
  - **87** fully-aligned issuers
  - **34** strongly-aligned issuers
- **23** countries
- **23** currencies
- **USD123.3bn** of outstanding climate-aligned bonds
- **Top three issuers:** Korea Electric Power Corporation (USD25.3bn), Indian Railway Finance Corporation (USD22.8bn), Korea Rail Network Authority (USD16.8bn)
- **Top three climate themes:** Energy (USD62bn), Transport (USD45.5bn), Water (USD13.3bn)

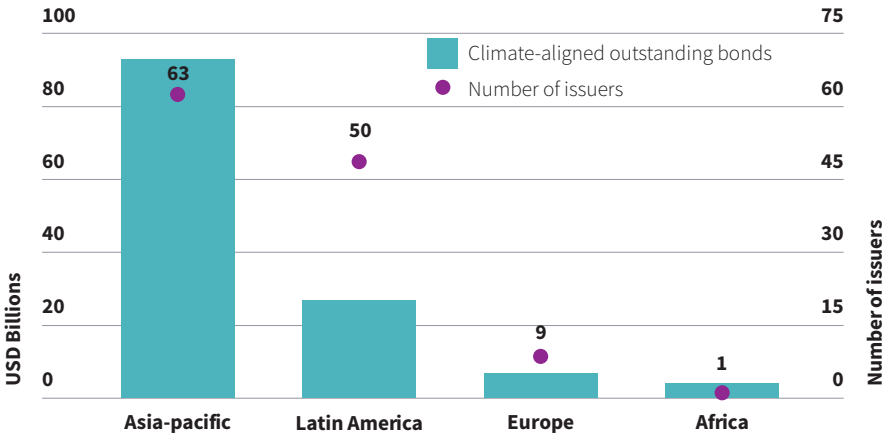
This section focuses on EM. China has been analysed separately from the rest of the EM section as it accounts for a large share of the market, which would have skewed total numbers and the underlying analysis. For a more in-depth analysis on China, please refer to the preceding section.

EM context: The 'build back better' challenge

Climate change poses significant threats to EM, many of which are at risk of suffering disproportionately from the impacts of the climate crisis. Sea level rise, frequent drought periods as well as resource scarcity could trigger severe economic downturns in these countries, also seriously constraining their ability to meet the Sustainable Development Goals (SDGs). Scarcity of resources may also result in regional conflicts. Moreover, the economic impact of the ongoing COVID-19 pandemic on EM risk appetite has caused a decrease of investment flows into these countries.[41] The pandemic represents a dire threat, yet it also represents an unprecedented opportunity for EM to reboot and accelerate the low-carbon transition.

Designing and implementing ambitious recovery packages which integrate climate action is perhaps the biggest challenge faced by EMs. Strong and sustainable recovery plans are needed not only to support economic growth but also to position countries on the right path to achieve the SDGs. Increased investment in sustainable and climate resilient infrastructure has been identified as a top priority for the coming decades.

Asia-Pacific is the top climate-aligned EM region



Source: Climate Bonds Initiative

To date, post COVID-19 economic recovery plans in many countries have also continued to support and even bail out polluting industries. In South Korea, despite a commitment to invest KRW73.4tn (USD62bn) by 2025 towards low-carbon infrastructure as part of its Green New Deal, the country has also extended support measures to key carbon intensive industries, such as aviation and shipbuilding[42]. A substantial share of India's stimulus package has been dedicated to coal infrastructure. In Colombia, commitment to renewable energy projects is accompanied by spending proposals for mining.[43] Such an approach falls short of meeting carbon neutrality targets which many EM countries have already committed to. Now more than ever it is crucial to drive capital from and into the private sector to fund low-carbon infrastructure together with public funding and policy action from central governments in EM.

Top 10 climate-aligned EM

Country	Outstanding climate-aligned debt (USD)	Market share (%)
South Korea	59.9bn	44
India	28.6bn	25
Brazil	16.2bn	9
Colombia	7.3bn	4
Thailand	2.6bn	4
Costa Rica	1.9bn	1
Czech Republic	1.3bn	<1
Indonesia	1.1bn	4
Laos	1bn	1
Mexico	1bn	<1

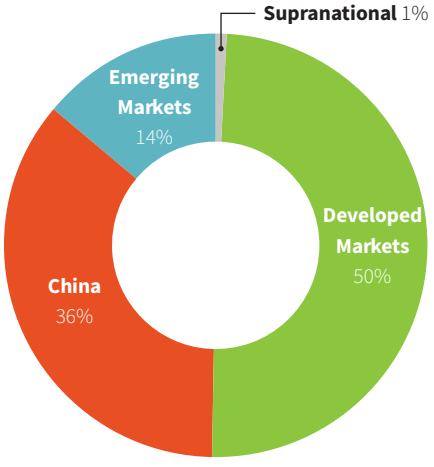
EM climate-aligned universe analysis

EM account for 14% of the global climate-aligned volume with USD123bn of outstanding bonds and 38% of bonds by number (1260). This indicates that unlabelled climate-aligned bonds from EMs are relatively small compared to DM and China.

Asia-Pacific dominates total issuance with 73% of volume and 80% of deals, followed by Latin America which accounts for 24% of volume and 17% by deal count; EM from Europe make up roughly 2% of issuance, both by volume and deal count, while Africa represents less than 1% of the market.

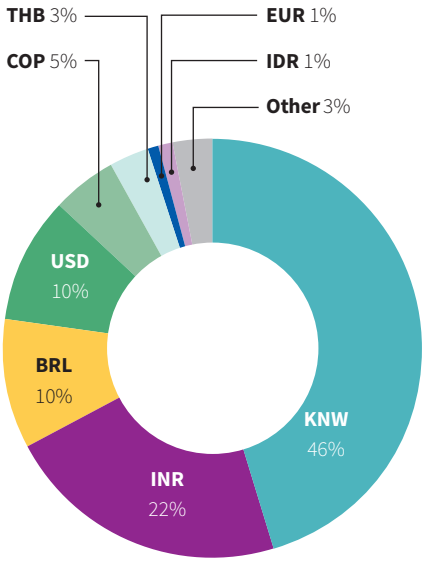
South Korea is the largest source of EM climate-aligned bonds, both by amount outstanding and deal count. India ranks second, with just below half of South Korea's outstanding amount, followed by Brazil. Combined, the remaining seven of the top ten countries make up USD16bn of the climate-aligned debt outstanding and 197 bonds.

EM account for 14% of the global climate-aligned market share



Source: Climate Bonds Initiative

KRW represents almost half of the market share



Source: Climate Bonds Initiative

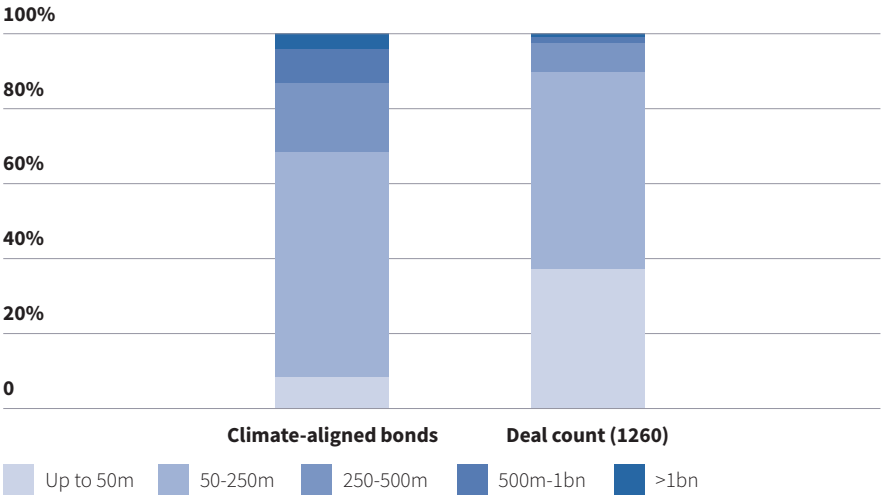
KRW dominates climate-aligned issuance in EM (46%). INR is the second most popular currency (22%) by volume, followed by USD and BRL, each representing 10% of the market. A large proportion of EM climate-aligned outstanding bonds is in soft currency (89%), while only 11% is in hard currency. Issuers that have issued in hard currencies include Korea Hydro & Nuclear Power Co, Electrobras SA, Empresas Publicas de Medellin and Instituto Costarricense de Electricidad.

The average deal size is small across EM with the preferred bucket being USD50–250m (61% of total amount issued, 54% of total number of deals). The largest deals (USD1bn+) are concentrated in Latin America, primarily in the Energy theme (79% of volume, 75% of deals) but also in Land use & agriculture (21% by volume, 25% by deal count).

81% of the universe is investment grade with almost 90% of the EM climate-aligned universe rated by international rating agencies. Roughly 3% of the universe is in local rating, while 9% is not rated. Most of the climate-aligned universe is investment grade, in both international and local ratings, with 81% of issuance being at least BBB-rated. AA makes up almost half of the market, followed by BBB at 31% and BB at 9%.

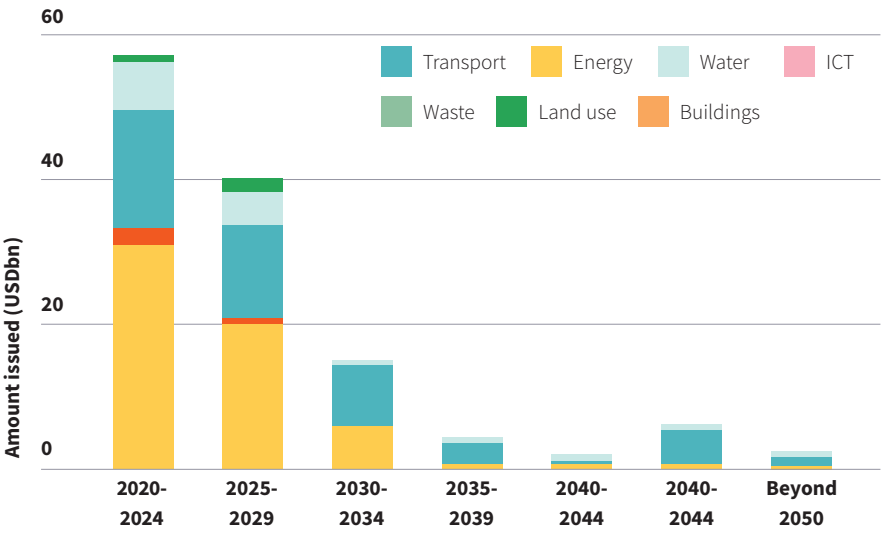
Short tenors are the most popular in the EM climate-aligned universe. Roughly one quarter of cumulative volume will mature in up to five years, and just under half within the 5–10-year range. Medium tenors make up 22% of the volume, with 22% maturing within 10–20 years since issuance. Long tenors (over 20 years) account for only 6%.

USD50–250m is the preferred deal size



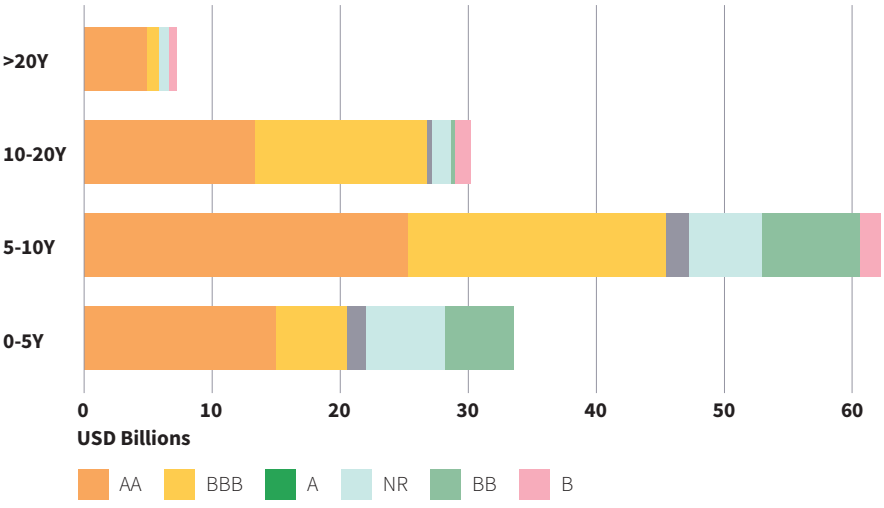
Source: Climate Bonds Initiative

Maturity profile of EM climate-aligned bonds



Source: Climate Bonds Initiative

Short tenors are the most popular in EM



Source: Climate Bonds Initiative

EM climate themes

Climate theme/Rank	Amount (USD)	Market share (%)	Issuer number	Top issuers
1. Energy	62bn	50	71	Korea Electric Power Corp, Korea Hydro & Nuclear Power, EPM
2. Transport	45.5bn	37	16	IRFC, Korea Rail Network Authority, Bangkok Expressway and Metro
3. Water	13.3bn	11	18	Korea Water Resources Corp, Cia de Saneamento Basico do Estado de Sao Paulo, AEGEA Saneamento e Participaco
4. Land use & agriculture	1.5bn	1	8	Suzano SA, Moorim Paper, Pabrik Kertas Tjiwi Kimia
5. ICT	1.1bn	1	4	Indosat, Bali Towerindo Sentra, Sterlite Technologies
6. Buildings	<1bn	<1	1	Laster Tech Corp
7. Waste	<1bn	<1	3	Taiwan Environment Scientific, Aguas Andinas SA, Insun ENT

Refinancing opportunities in the labelled bond market

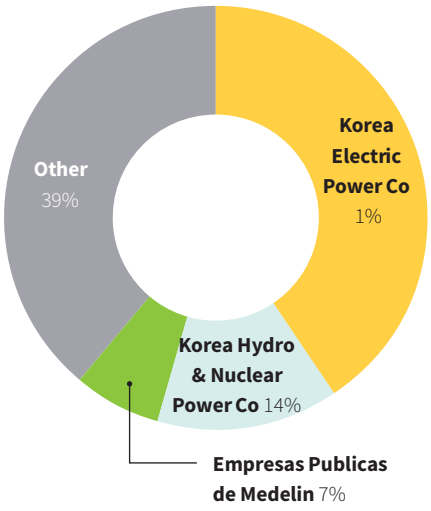
There are substantial opportunities for issuers across EM to refinance their debt with labelled green bonds in the near term, as almost half of the climate-aligned outstanding debt (46% or USD57bn) will mature by 2024, with an additional USD40bn (33%) maturing by 2029.

Korea Electric Power Corporation (KEPCO) and Korea Hydro & Nuclear Power, the top two climate-aligned issuers in the EM Energy theme, have already entered the labelled green bond universe. The former has raised funds for new and renewable businesses both domestically and overseas. The latter has earmarked its labelled issuance for renewable energy, clean transport and green buildings located in South Korea and abroad. Other climate-aligned issuers have already tapped into the labelled green bond market, including India's ReNew Power – one of its deals was also certified under the Climate Bonds Standard & Certification Scheme. Climate Bonds' *2019 Green Bond European Investor Survey* revealed that investors want to buy more labelled bonds from EM issuers. Most development banks have programmes in place to assist issuers through the process of GSS bond issuance. Such help extends to identifying eligible assets, preparation of framework, and designing post-issuance reporting.

EM: Energy theme analysis

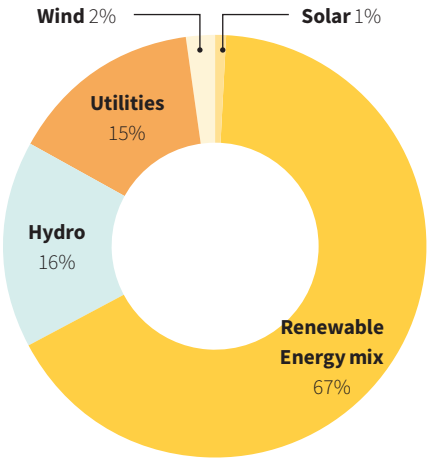
Energy is the largest climate theme in EM with USD62bn outstanding, accounting for 50% of EM issuance. Within the theme, 66% of issuance comes from South Korean and Colombian issuers, both of which have ambitious renewable energy targets in place. South Korea has committed to expanding its renewable electricity share to 20% by 2030 and 30–35% by 2040, while Colombia has been working to increase solar and wind capacity to 9% of the total by mid-2022, on top of the share of power generation already originating from hydro (70%). Colombia has also developed a green recovery plan for the post-pandemic era.[44,45,46]

Energy: Top 3 South Korean and Colombian issuers account for 61% of the market



Source: Climate Bonds Initiative

Energy dominates EM climate-aligned universe



Source: Climate Bonds Initiative

After South Korea, Brazil is the second-largest country in the energy sector with USD10.5bn of climate-aligned outstanding volume, accounting for 17% of the energy sector. Roughly 29% of the Brazilian energy market is represented by Eletrobras SA (USD3.1b), Latin America's largest electricity company. Brazil's abundant sources of renewable energy, particularly hydropower, positions the country amongst the least carbon-intensive energy systems in the world.[47]

Mixed renewable energy makes up 67% of the energy theme and encompasses issuers with multiple eligible energy activities such as utilities which operate wind, solar and nuclear assets. We note that for the purposes of this report, nuclear energy is included due to its low carbon characteristics. However, we note that nuclear energy is not yet certifiable under the Climate Bonds Standard and is not included under the EU Taxonomy. The debate around nuclear is largely concerned with non-climate features such as waste and accidents. These are noted but not discussed in this report.

The top three issuers account for almost 90% of the volume: KEPCO (61%), Korea Hydro & Nuclear Power Co (20%) and Eletrobras SA (7%).

Hydro is the second-largest sub-theme (16%), followed closely by Utilities (15%). The top three issuers for Hydro are Indian and Latin American: NHPC Ltd (27% of Hydro volume), Cemig Geracao e Transmissao SA (20%), Isagen SA E.S.P. (11%). Almost half of the Utilities debt is from Empresas Publicas de Medellin, one of the largest EM climate-aligned issuers. Instituto Costarricense de Electricidad ranks second, with 20% of the volume, followed by Copel Geracao e Transmissao SA (9%).

Wind accounts for 2% of the Energy theme, and Solar for 1%. The top three Wind issuers are Suzlon Energy Ltd (60%), ReNew Power (17%) and Narmada Wind Energy Pvt (8%). Within Solar, 55% of climate-aligned outstanding debt is made up by two Thai issuers: SPCG PCL (33%) and Thai Solar Energy PCL (22%). The third largest issuer is Gigasolar Materials Corp of Taiwan, with 13% of volume.

The role of development banks in sovereign GSS bond issuance

Development banks can support EM throughout the whole process of issuing sovereign GSS bonds. For example, **Farah Hussein**, *Senior Financial Officer in the World Bank Treasury* described the potential involvement as follows:

"The World Bank provides technical assistance to EM public sector issuers to develop sustainable capital markets, facilitate sustainable market-based solutions, promote sustainable investment, and engage in dialogue on ESG issues for all investments. The technical assistance provided by the World Bank Treasury to facilitate the issuance of GSS bonds is part of the Bank's broader work to promote and finance sustainable development, encourage transparency and supportive regulation, drive resources towards national environmental and social priorities, design and implement better policies, strengthen institutions, inform development strategies and contribute to the global agenda.

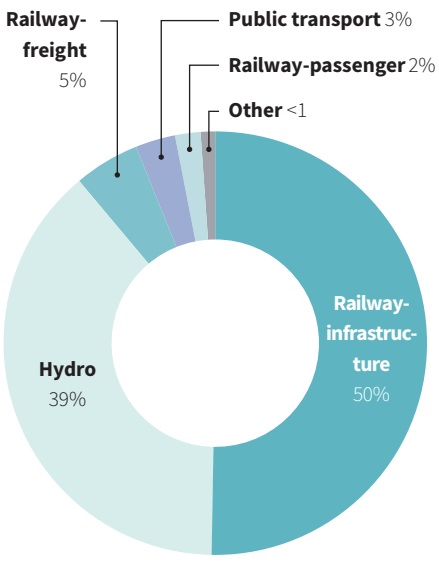
The World Bank Treasury serves as an impartial broker, sharing with issuers its own knowledge and experience, including its innovative market-based transactions such as Green Bonds, Sustainable Development Bonds and debt and risk management practices, expertise in sustainability issues, and relationships with market actors and convening power. The Bank's sustainable finance technical assistance programme is generally funded by its own administrative budget, donors, etc."

EM Energy Climate Sub-Themes

Climate sub-theme/ Rank	Amount (USD)	Number of issuers	Top issuers
1. RE Mix	40.2bn	20	Korea Electric Power Corp, Korea Hydro & Nuclear Power Co, Eletrobras SA
2. Hydro	9.6bn	13	NHPC Ltd, Cemig Geracao e Transmissao SA, Isagen SA E.S.P.
3. Utilities	9.3bn	14	Empresas Publicas de Medellin, Instituto Costarricense de Electricidad, Copel Geracao e Transmissao SA
4. Wind	<1bn	8	Suzlon Energy Ltd, ReNew Power Ltd, Narmada Wind Energy Pvt Ltd
5. Solar	<1bn	12	SPCG PCL, Thai Solar Energy PCL, Gigasolar Materials Corp

EM: Transport theme analysis

Transport represents 37% (USD45.5bn) of the EM climate-aligned bond universe and is the second-largest climate theme. Rail-related bonds dominate the segment at 97%. Rail infrastructure accounts for 50% of Transport debt. The remaining half is composed of Railway-comprehensive (39%), Railway-freight (5%), Public transport (3%), Railway-passenger (2%), and Other (<1%). The 'Other' category includes Railway-services, Bicycle, EV charging stations and EVs.



Promoting the uptake of EVs in emerging markets

There are several barriers preventing the uptake of EVs in EM. On the supply side, reliable electric power sources and charging infrastructure need to be installed; EM oil dependency needs to be broken; and broader political and social acceptance reached to make EVs a viable alternative. EV market penetration has begun in urban environments, which typically suffer from a high number of annual premature deaths from transport-related pollution.[48] While government and municipal interventions are crucial to ease the current pressure on profitability of the EV business case in EM and to support growth of the market, private capital investment can play an important role in bridging the gap that exists due to lacking public financial resources.[49] Climate-aligned debt can contribute to meet the financing needs of the EM EV market.

EM Transport Climate Sub-Themes

Climate sub-theme/ Rank	Amount (USD)	Number of issuers	Top issuers
1. Railway-infrastructure	22.8bn	1	Indian Railway Finance Corp
2. Railway-comprehensive	17.9bn	2	Korea Rail Network Authority, Ceske Drahy AS
3. Railway-freight	2.4bn	5	GMexico Transportes SAB de CV, MRS Logistica SA, Rumo SA
4. Public transport	1.3bn	2	Bangkok Expressway & Metro PCL, SuperVia- Concessionaria de Transporte Ferroviario SA
5. Railway-passenger	<1bn	2	Taiwan High Speed Rail Corp, BTS Group Holdings PCL
6. Railway-services	<1bn	1	Eastcomtrans LLP
7. Bicycle	<1bn	1	Ideal Bike Corp
8. EV charging stations	<1bn	1	Signet EV Inc
9. EVs	<1bn	1	Hankook Technology Inc

EM: Water and Land use & agriculture analysis

Water and Land use & agriculture rank third and fourth, respectively, by share of climate-aligned outstanding volume in EM.

The debt outstanding in the Water theme is USD13.3bn. More than 90% of the volume relates to water treatment and supply, while the remaining portion comes from other activities. The top three issuers account for 85% of the climate-aligned outstanding volume. These are Korea Water Resources Corp (70%), Cia de Saneamento Basico do Estado de Sao Paulo (10%) and AEGEA Saneamento e Participaco (5%). The remaining 15% comes from 15 other issuers.

The Land use & agriculture theme consists of USD1.5bn outstanding and eight issuers, operating entirely in the paper business. The top three issuers are Suzano SA (representing 83% of the climate sub-theme), Moorim Paper Co Ltd (4%) and Pabrik Kertas Tjiwi Kimia Tbk (4%).

Demand for food in EM is projected to increase dramatically, supported by a fast-growing population and a growing middle class. Coupled with the physical disruptions from climate change, this is expected to result in even greater pressure on land and natural resources, and to continue to push agriculture operations beyond environmental limits. Cutting GHG emissions and increased climate-aligned investments are necessary to support sustainable economic growth in EM.

EM Water Sub-Themes

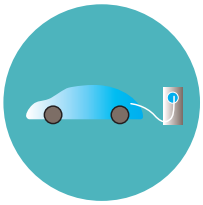
Climate sub-theme/ Rank	Amount (USD)	Number of issuers	Top issuers
1. Water treatment & supply	12	10	Korea Water Resources Corp, Cia de Saneamento Basico do Estado de Sao Paulo, AEGEA Saneamento e Participaco
2. Water supply	<1	5	WHA Utilities and Power PCL, SmVAK, TTW PCL
3. Water / Waste	<1	1	Cia de Saneamento do Parana
4. Water treatment & supply / Waste management	<1	1	IGUA SA
5. Infrastructure	<1	1	Kuo Toong International Co Ltd

7. Spotlight on Transport

Globally, the transport sector is responsible for 24% of direct CO_2 emissions from fuel combustion, of which approximately three-quarters are attributed to road transport (45% from passenger vehicles and 29% from freight).[50] Emissions from transport continued to grow in 2019 as the sector is fundamentally reliant on internal combustion technologies, which are based on oil and gas. 2020 witnessed a substantial decrease in carbon emissions from transport due to the COVID-19 pandemic, which caused an unprecedented decrease in mobility in the first half of the year.[51,52] A switch to more sustainable technologies in the transport sector is imperative to meet net-zero targets and to guarantee a sustainable recovery from the COVID-19 economic downturn.

As the world transitions to low-carbon power systems, EVs offer a viable alternative to conventionally fuelled rivals. Scaling up other major technological innovations, such as hydrogen, can accelerate the phase-out of emissions from certain transport categories. Rail transport has long been recognised as one of the most energy-efficient modes of transport since energy intensity and greenhouse gas emissions per passenger kilometre are relatively low. Fully decarbonising rail transport, however, requires a major shift from diesel traction to electrified railway systems in tandem with a rapid decarbonisation of the electricity grid.

Low-carbon road transport: EVs and hydrogen vehicles



Long-term reduction of carbon emissions requires considerable investments in low-carbon technologies. Recovery programmes post COVID-19 present viable opportunities to align public policies with climate objectives and take credible steps towards the low-carbon transition. EVs, which play a key role in decarbonisation, are gaining ground due to a more favourable regulatory landscape and more advanced technological development across the globe. While only a few auto manufacturers had sufficient revenues from low-carbon vehicles to be classified as climate-aligned for this research, numerous developments both at a country and company level are indicating that this may not be far off.

In China, government intervention has shaped a successful EV market through subsidies, support for technological innovation and energy performance.[53] Non-monetary incentives, such as mandatory requirements for car manufacturers, reserved license plates and parking space for EVs, have also proved effective.

In Europe, both France and Germany's ambitious policy commitments are crucial to support the low-carbon transition for the transport sector:

- In December 2019, France was the first country to legislate on phasing out the sale of new fossil fuel vehicles by 2040. In 2020, the country announced a multi-billion stimulus plan to restart the local auto industry. It will include a major boost for EVs, as France aims to take a leading role in the European EV market.[54]
- Germany has committed to a green recovery post COVID-19. To stimulate demand, in Q2 the country has increased the EV subsidy scheme for a total discount of EUR9k (USD10.6k) for EVs whose market price amounts to less than EUR40k (USD47k).

In addition, in 2020 the UK committed to ban the sale of new petrol and diesel-powered cars and vans in 2030, with the objective of phasing out fossil fuel vehicles. This positions the UK robustly as the first G7 country to decarbonise road vehicles. Substantial action is still needed from other countries: the US for instance is losing ground to Europe, as its EV market decelerates due to loosened regulations and lower oil prices.

Volvo AB launched a range of electric trucks in 2020, which have also been funded with labelled bonds. The electric trucks will be available in Europe in 2021. This is in line with the company's objective to make Volvo Truck's entire product base fossil fuel-free by 2040. Electric trucks have become an increasingly compelling option as the transport and logistics sectors begin to push towards transitioning heavy-duty vehicles to green alternatives. We hope to see more companies join Volvo in the effort to decarbonise the heavy transportation industry, as well as to see increased public and private investments channelled towards charging infrastructure and energy supply.

Getlink SE operates international transport networks; the company is a leader in mobility infrastructures and energy-efficient transport in Europe. Getlink's Eurotunnel holds the Channel Tunnel Concession until 2086, offering a railway network to operators while managing the circulation of high-speed passenger trains (i.e., Eurostar) and freight trains. It also operates piggyback transport services through the Tunnel. Getlink's Eurotunnel commercial brand has been dedicated to energy consumption optimisation and carbon footprint minimisation since inception and plays a key role in the development of Europe's low-carbon transportation. Journeys from London to Paris by train are estimated to save more than 90% of the carbon emissions per passenger compared to air travel.[55]

Future developments of the US EV market will likely depend significantly on the number of states joining the Zero Emission Vehicle Programme, which to date hosts only 12 states. In January 2021, President Joe Biden announced that the entire gasoline-powered fleet of government vehicles will be replaced by EVs made in America with union labour, a move that could substantially boost the US EV industry.

The climate-aligned research shows that the share of revenues generated by auto companies from EV business operations are unfortunately still too small. For this reason, it is crucial for auto companies to increase their investments towards low-carbon vehicles if net-zero targets are to be met by 2050. In addition, increasing investment toward low-carbon vehicle-related infrastructure would also facilitate the penetration of EV technologies in the market. For instance, cleaner and more efficient batteries, improved range, storage and extended charging networks are all areas which still need to be developed further.

Hydrogen

With declining costs for renewable electricity, green hydrogen has gained unprecedented levels of interest and is currently enjoying strong momentum as policies and projects continue to expand worldwide.

Hydrogen vehicles represent a key enabler for the decarbonisation of the transport sector. However, more efforts are needed to scale up and commercialise hydrogen vehicle technologies in order to benefit from such an increasing momentum. We refer to clean hydrogen in more detail in our Energy spotlight section on page 22.

Railway electrification is key to decarbonise transport

The COVID-19 pandemic requires a rethinking of public transportation.[56] Although ridership decreased over the last year due to confinement and social distancing measures, public transport will continue to play a crucial role in reducing transport-related emissions, even with a continued decrease in commuter traffic.

Electrification of rail transport systems can contribute substantially to the low-carbon transition, while also offering opportunities for a sustainable post COVID-19 green recovery. The need for electrification of rail networks (e.g., converting urban diesel services into electric ones) is extremely relevant as many rail lines are still powered by conventional combustion technologies. According to the International Energy Agency (IEA), Europe, Japan and Russia have the largest share of electric rail transport activity, while North and South America continue to rely heavily on diesel; in nearly all regions, passenger rail is more widely electrified than freight rail.[57] Conventional electric rail networks seem to be dominant in most regions, while substantial development of high-speed rail has occurred in China in the last decade. Investments need to focus more heavily on expanding the high-speed rail network, which offers a viable alternative to short-haul flights. Unfortunately, many companies considered as part of the climate-aligned research do not disclose the share of electrified versus non-electrified rail in their reporting. This level of disclosure is important to enhance transparency and allow targeted investments to be made.

Examples of climate-aligned issuers in transport

Tesla Inc continues to be the market leader in electric and hydrogen vehicle manufacturing, and has positioned itself uniquely as the world's first fully integrated sustainable energy company. Tesla's current products include various EV models and related parts, battery energy storage, solar panels and solar roofs.

SNCF SA is an important player in European low-carbon mobility, committed to continuous improvements in its carbon performance. The company has set ambitious targets: phase-out of diesel power by 2035, and deployment of hydrogen-powered trains in 2022. SNCF has signed power purchase agreements with renewable energy suppliers and has been developing solar energy programmes to generate its own power.

Despite the growth of investments in low-carbon mobility in recent years, substantial emissions reductions in the transport sector are still necessary to meet the 1.5°C climate ambition. There is urgent need to scale up investment in low-carbon technologies and infrastructure, transitioning away from fossil fuels. Increased investments from and into climate-aligned entities can help bridge the funding gap at the scale and pace required to meet stringent climate targets.

8. Spotlight on green and low-carbon hydrogen

Green and low-carbon hydrogen

Hydrogen today

Hydrogen is the lightest and most abundant element in the universe. On earth, it is present mainly in water and hydrocarbons and is used predominantly to produce fertiliser and in oil refinery processes. Hydrogen production is carbon intensive, and the preferred process is usually steam methane reforming (SMR), which results in the production of 'grey' hydrogen. CO_2 emissions from grey hydrogen production alone are estimated to be equivalent to the combined emissions of the UK and Indonesia.[58]

Hydrogen tomorrow

If the production of hydrogen molecules can be decarbonised cost-effectively, hydrogen can play a substantial role across the energy system. It can be a versatile solution to decarbonisation across many sectors. Existing industrial processes are obvious candidates, but hydrogen can play a significant role in transport (including shipping and aviation), and domestic and industrial heating too. Furthermore, by offering energy storage solutions, it can facilitate variable renewable energy (VRE) penetration.

The cleanest way to produce hydrogen is via electrolysis of water using renewable energy – resulting in 'green' hydrogen. While electrolysis is currently much more expensive, the rapid cost reductions already seen in renewable energy are increasing the viability of this route. The other cost barrier, historically, is the cost of electrolysers, which is high due to the low installed capacity and size of current electrolysers (in 2019 just 25MW of electrolyser capacity was installed).[59]

The alternative production method is to combine SMR with carbon capture and storage (CCS) to generate 'blue' hydrogen. The current low cost of gas, when compared to green hydrogen costs, makes this an attractive option if CCS was realised at scale. This approach can speed up the transition and is recognised as a key mechanism in the EU Taxonomy.

Hydrogen investment – public sector

To reach widespread adoption of green/low-carbon hydrogen, public sector investment is required to provide the necessary infrastructure, attract private investment and drive down costs. The table below summarises current public policy and, whilst not exhaustive, indicates a new commitment to hydrogen as a pathway to meet net-zero targets.

Hydrogen investment – private sector

Iberdrola, in partnership with Fertiberia, is constructing Europe's largest electrolysis plant at 20MW in Southern Spain in 2021. Dedicated solar energy will produce hydrogen which will then feed an ammonia plant. This project is part of a wider partnership to invest EUR1.7bn to develop 800MW of green hydrogen capacity by 2027.[60]

In a similar partnership, offshore wind produced by Ørsted will feed a 50MW electroyser to produce green hydrogen, replacing grey hydrogen at BPs Lingen refinery in Germany in 2024. [61]

Hydrogen and the climate-aligned universe

In a world where just 25MW of electrolyser capacity was installed in 2019, hydrogen does not appear significantly in our analysis, but is certainly a technology to watch over the next decade. Plug Power Inc based in the United States is the only company specifically focusing on hydrogen in the fuel cell supply chain to appear in the analysis. However, most hydrogen investments would be contained under the climate-sub-theme 'Renewable Energy Mix' and not in significant enough quantities to be categorised under the Hydrogen climate sub-theme. Thus, the total amount of investment to facilitate hydrogen production and application across sectors may be larger.

Tracking the hydrogen economy

Climate Bonds' climate-aligned analysis (as well as labelled bond reports) are one way to track growth in hydrogen investments, but there are other signals and indicators which will provide insight into the development of this technology as a bridge to net zero.

i. Public sector investments:

- Market-based instruments aimed at delivering cheaper low-carbon generation by lowering the cost of financing projects. To this end, the UK established a Contracts for Difference (CfD) scheme, which could support deployment of green hydrogen technologies.
- De-risking new green hydrogen projects with the support of public capital. This could be achieved via credit enhancement mechanisms, guarantees and other tools to help attract private investments towards green hydrogen.

ii. Hydrogen competitiveness with alternatives:

- Suggestions are that green hydrogen production costs could fall to USD0.7-1.6/kg before 2050, making it competitive with natural gas. [62]
- In the transport sector, with accelerating focus on EVs (rapidly falling costs, fast rollout, improved efficiency, existing grid infrastructure), hydrogen may be more suitable for heavy goods vehicles (HGVs) and is also being considered as a potential low-carbon fuel alternative in aviation and shipping.

iii. Trade and distribution of hydrogen:

- Deployment of ammonia as hydrogen carrier, facilitating transportation and energy storage at times when supply exceeds demand, and enabling hydrogen to be traded between resource-rich countries and countries with limited production potential.
- The emergence of hydrogen as a potential new energy vector in North Africa, which could substantially contribute to the hydrogen supply of the EU. Transcontinental pipeline connections, through the conversion of the existing natural gas grid, could transport renewable energy to Europe.

Green and low-carbon hydrogen capacity

Nation	Capacity target	Funding
European Union[63]	40GW by 2030 (Electrolyser)	EUR26–44bn
Germany[64]	5GW by 2030 (Electrolyser)	EUR7bn + EUR2bn in FDI
United Kingdom [65]	5GW by 2030 (Low- carbon)	GBP240m
Netherlands[66]	3–4GW by 2030 (Electrolyser)	EUR35m per annum
Portugal[67]	Not strict – target to reduce natural gas imports by EUR300-600m	EUR7bn
Spain[68]	4GW by 2030 (Electrolyser)	EUR9bn

9. Spotlight on real estate companies

Introduction

Many property companies, real estate investment trusts (REITs), construction companies and funds own certified green buildings, develop energy efficient buildings, and/or have invested in energy efficiency upgrades. More and more property companies also recognise the urgency for a shift towards low-carbon buildings. However, information on the green credentials of their building portfolios is rarely clearly delineated in corporate reporting.

Moreover, the real estate sector poses unique challenges for evaluation because properties have many different uses, requirements, and external inputs resulting in vastly different environmental performance. It is not feasible to define a single metric that captures the multi-faceted nature of what would define a 'green' property company. Instead, we considered a variety of metrics to form a broad view (refer to methodology below). For this exercise, we have sought to use metrics which could be used across the wider real estate sector: if a company were to meet these various criteria it would signify a stronger predisposition towards developing green projects.

According to the International Energy Agency, the buildings and buildings construction sectors together account for over a third of the world's total final energy consumption and almost 40% of total direct and indirect CO_2 emissions.[69] We believe that this snapshot of the real estate sector will provide insight into the measures that are being taken within the industry to help mitigate against climate change and develop green and resilient assets.

Findings

25 of the 100 companies evaluated have issued green bonds or loans and 15 of these have issued more than one green bond/loan. This suggests that there is considerable scope to use green bonds to finance low-carbon green buildings, particularly as governments introduce new policies to incentivise the development of low-carbon buildings.

Almost half of the companies have set some form of environmental performance target to reach in the coming years. These targets vary in ambition and the timescale. Science-based targets are emissions reduction targets that are in line with climate science. Only ten of the companies reviewed in this exercise had such targets in place and tended to score higher in our rankings as they have clear environmental performance criteria they must meet. In addition, we investigated whether companies had clearly signposted their journey to reduce emissions and lower their environmental footprint. This could be achieved in a variety of different ways, such as interim targets and investment plans, however relatively few companies had done this.

Real estate analysis methodology

Real estate companies and REITs have been treated separately from the rest of the climate-aligned analysis as these companies are often difficult to classify. Generally, it is challenging to identify the share of revenue streams associated with highly energy efficient green buildings. Industry certification schemes and metrics to quantify energy efficiency and/or improvements vary substantially across building types (new or existing) and across countries, which makes it difficult to compare and evaluate the climate-alignment of these companies. The assumptions underpinning these are also often not made available.

Indicators

To try to simplify this, a different analytical framework has been used to indicate how well property companies are reporting on their environmental impacts. A range of indicators categorised under Issuer information, Targets, and Environmental performance were used to approximate how property companies are responding to environmental and climate issues. These criteria were chosen following a review of 'best-in-class' real estate companies and the metrics they use in their reporting.

Our analytical framework is based on a mix of criteria, which include both technical parameters on the buildings' performance as well as a binary type of assessment which relates to transparency, disclosure, decarbonisation strategies and targets. The companies which 'ticked most boxes' according to our framework represent the best performing property companies. Our criteria include:

- Total GHG emissions
- GHG emission intensity
- Total energy consumption
- Energy intensity
- Total water consumption
- Water consumption intensity
- GRESB participation
- CDP A-list inclusion
- Green bond/loan issuance
- Company level, science-based climate targets
- Company level transition pathway defined
- The percentage of portfolio under management with one of the top two building certification standards

Scope

The companies analysed are the top 100 real estate companies in the world ranked by debt outstanding as of June 2020. Companies which solely operate communications real estate, such as communications towers, have been excluded.

Data sources and scoring

This research is based on publicly available resources such as companies' websites, annual reports, corporate sustainability reports, CDP, GRESB, as well as Climate Bonds' own databases. Using a variety of metrics provides a more comprehensive overview of how companies are incorporating and setting environmental and climate metrics.

Companies were evaluated using a scoring system: meeting each criterion earns a company a set of points, with each criterion being weighted according to its relevance. The best performing companies were those that scored the highest overall. Refer to Annex I for tables indicating the list of criteria and their associated weighted points.

Some countries have introduced policies to set targets for businesses. For instance, as part of their 2019 Climate Action Programme, the German government set out an ambitious vision for the country's real estate sector, aiming to reduce annual CO_2 emissions from 120 million tonnes CO_2/annum (as of 2019) to 72 million tonnes CO_2/annum by 2030. Other policy developments include the European Energy Performance of Buildings Directive (EPBD) which sets out the legislative framework to meet the broader objectives of the European Union Green Deal. The EPBD seeks to improve the energy performance of the existing building stock, while since December 2020, all new buildings must be 'nearly zero-energy buildings' (NZEB). The EPBD will also strengthen the effort to climate-proof EU members' building stock, with the goal of full decarbonisation by 2050.[70,71]

Top 20 best performing property companies:

1. **Boston Properties Inc**
2. **Alexandria Real Estate Equities**
3. **CPI Property Group SA**
4. **ICADE**
5. **Digital Realty Trust Inc**
6. **Iron Mountain Inc**
7. **Swire Pacific Ltd**
8. **Unibail-Rodamco-Westfield**
9. **Frasers Property Ltd**
10. **Simon Property Group Inc**
11. **CapitaLand Ltd**
12. **Regency Centers Corp**
13. **Hysan Development Co Ltd**
14. **Brixmor Property Group Inc**
15. **Fastighets AB Balder**
16. **Vonovia SE**
17. **Samhallsbyggnadsbolaget i Nord**
18. **Norstar Holdings Inc**
19. **Welltower Inc**
20. **Klepierre SA**

Real estate companies are increasingly looking to achieve the highest building certification levels, and properties meeting these standards can qualify for green bond financing. These certification schemes include standards like BREEAM, LEED, NABERS, and many others used by developers around the globe. What the research does highlight though is the inaccessibility of this data at the company level. Over half of the companies analysed report that green buildings make up a portion of their portfolio. While this is valuable information, the reporting is often not granular enough to make these statements useful. Metrics describing the percentage of a portfolio or assets under management that are covered by the highest standards/levels of certification would make it easier to identify the companies with the strongest environmental credentials.

Of the criteria we set, only 17 of the 100 companies meet two-thirds of the requirements. This suggests that there is still great potential to improve environmental performance.

Considerations

There is considerable scope for real estate companies to use green finance tools to fund low-carbon real estate projects. Green bonds can demonstrate that an entity is developing a green building portfolio to limit its environmental footprint.

Reporting on the proportion of buildings meeting the highest levels of certification such as LEED Gold of BREEAM Excellent is minimal. This type of information is very often provided within the documents accompanying green bond issuance, such as the framework and Second Party Opinion (SPO), and the entities that are already doing this could easily share the percentage of their certified building in their annual reports. This information is especially useful in identifying entities which are likely to have the better performing portfolios from an environmental standpoint. Ideally, this would be reported as a percentage of area under management or gross lettable area.

While beneficial, standardised reporting such as the GRI protocols do not help to distinguish between the companies in terms of best environmental performance. Roughly half of the companies evaluated in this exercise have reported on their energy usage and water usage, and about 60 of the 100 companies have reported on their GHG emissions. There are still a considerable number of companies that have not adopted these reporting techniques. In addition, common reporting metrics would be extremely beneficial in comparing companies. For example, the most used metric for greenhouse gas emissions intensity is $kgCO_2e/m^2$ but other metrics do exist which complicate comparisons.

MSCI estimated the professionally managed global real estate market to be worth USD9.6tn in 2019.[72] As a large consumer of energy, with a high environmental footprint, swift transformation is required to decarbonise the sector. It is incumbent upon developers, managers, and investors to demand greater environmental standards in this area. A shift towards more sustainable building portfolios is underway. Some entities only have green buildings as part of their portfolios, while others have made commitments that all new developments will be in line with the highest levels of building certification schemes. With the right tools and policy incentives, there is already a solid foundation on which the real estate sector can develop climate-friendly portfolios.

A recent development from the sector came from French Real Estate Gecina: in May 2021, the company reclassified its debt portfolio under the green theme. Gecina labelled its 15 outstanding bonds worth a combined EUR5.6bn as green and committed to issue all future bonds under the green label.[73] The ambitious framework was published in April 2021 and reviewed by Sustainalytics. Gecina does not appear amongst the best performing companies as its relabelling exercise took place almost a year after this research was carried out. However, Gecina may be eligible to become the first climate-aligned real estate company as it has committed to achieve carbon neutrality in its portfolio of buildings in operation, as well as at a company level, by 2030.

10. Conclusion

Transforming the global economy is crucial to reaching carbon neutrality by 2050 and avoiding catastrophic climate impacts. The Paris Agreement and, more recently, the US-hosted Leaders Summit on Climate, show increased global momentum to shift to a green economy. Sizing the relevant market segments is a key step in helping companies and financial market stakeholders take advantage of the opportunities presented by the low-carbon transition.

In addition to the USD1.7tn labelled GSS bond universe, this research has identified USD913.2bn of outstanding unlabelled bonds from climate-aligned issuers, with a focus on corporates. The flow of capital into climate-aligned assets and activities is therefore more significant than the financing available via the GSS bond market only. However, the identification of such instruments presents several challenges. Despite the increased efforts to define appropriate and standardised climate and broader sustainability reporting practices including initiatives from CDP, GRI, TCFD and SASB, as well as the recent support for mandatory disclosure on climate-related risks by the G7, corporate reporting often omits information that is most important to investors and other financial market players (FMPs).[74] For instance, it is difficult to evaluate corporate revenues that are specifically linked to green business lines for companies with diversified business activities. Further, the definition of 'green' assets and activities still varies across countries and entities, and the lack of clear and consistent metrics to define the associated sustainability impacts exacerbates the difficulties in evaluating the green exposure of an asset portfolio or indeed an entire entity.

The EU's Taxonomy Regulation which entered into force in July 2020 provides an ambitious framework to overcome some of the shortcomings related to green definitions and corporate reporting. The EU Taxonomy Delegated Act sets out a list of environmentally sustainable economic activities that make a significant contribution to climate change mitigation and adaptation, hence creating a common language for investors and other FMPs.[75] Moreover, the Taxonomy Regulation creates additional legal disclosure obligations that will enter into force in January 2022. The EU Sustainability Reporting Standards include the Non-Financial Reporting Directive (NFRD) which requires 'public interest companies' to report sustainability information annually, and the Corporate Sustainability Reporting Directive (CSRD) proposes the introduction of more detailed reporting requirements as well as extending the scope of the NFRD to all large companies and some SMEs. The harmonisation of the EU Sustainability Reporting Standards with the Sustainable Finance Disclosure Regulation (SFDR), which requires mandatory ESG disclosure for assets managers and other FMPs, will enable more consistent and transparent disclosure, thereby facilitating the identification of climate-aligned investments.

The climate-aligned universe shows that green investment opportunities exist beyond the thematic bond market. Climate-aligned issuers could refinance their business operations with labelled bonds. This could enable them to kickstart the process of green tagging their assets and activities, hence becoming more familiar with green definitions, impact reporting practices, and broader best practice sustainability disclosure. The labelling exercise can also contribute towards defining corporate sustainability strategies backed by science-based targets, thus helping deliver credible corporate transitions to net zero. French Real Estate company Gecina has set a precedent for this: the company recently reclassified its debt portfolio under the green label and committed to reaching carbon neutrality across its buildings portfolio by 2030. As highlighted in the Climate Bonds 2020 Green Bond Treasurer Survey, additional benefits from labelling bonds come in the form of a broader and stickier investor base and new engagement opportunities, enhanced reputation and visibility, as well as strengthened internal integration between company departments.

Growth in the climate-aligned universe is mostly expected from Europe, where the favourable regulatory regime is poised to enable and facilitate the identification of climate-aligned investments. European climate-aligned issuers could also help scale up the GSS bond market, in which demand already outstrips supply. This will be further exacerbated by the ECB, which has said that under its EUR7tn APP it already buys around 20% of European green bonds, and plans to ramp this up and expand into other GSS labels in the future.

The German Bundesbank President Jens Weidmann also recently commented on the importance of central banks incorporating climate-related financial risks into their risk management framework, suggesting that the Eurosystem should only consider purchasing bonds or accepting them as collateral for monetary policy purposes if their issuers meet certain climate-related reporting requirements.[76]

Climate-aligned investment opportunities arise from other regions too: China and North America are home to considerable outstanding volume and number of issuers, however the lack of harmonisation of green definitions and reporting standards across countries and regions can cause an underestimation of the actual climate-aligned investment opportunities in those regions. The Climate Bonds Taxonomy and the EU Taxonomy represent a starting point to create common green definitions globally, as well as to implement policy incentives for companies and other entities to properly report on their environmental impacts. EM issuers could also rely on reporting best practice and labelling debt to raise their profile and attract more institutional investment – especially from DM.

Annex I

Companies were evaluated using a scoring system: meeting each criterion earns a company a set of points, with each criterion being weighted according to its relevance. The best performing companies were those that scored the highest overall. The tables below indicate each criterion and its associated weighted points.

Binary criteria

Criteria	Scoring points	
	Yes	No
GRESB participation	1	0
CDP A-list inclusion	1	0
Green bond/loan issuance	2	0
Multiple green bond issuance	2	0
Company level, science-based climate targets	2	0
Company level transition pathway defined	1	0

Technical parameters

Criteria	Scoring points		
	Yes – as per defined metrics	Yes – other metrics	No
Total GHG emissions (scope 1 &2) TCO_2e	2	1	0
GHG emission intensity (kg/CO_2)	2	1	0
Total energy consumption (MWh)	2	1	0
Energy intensity (MWh/sqm)	2	1	0
Total water consumption (m^3)	2	1	0
Water consumption intensity (m^3/m^2)	2	1	0
The percentage of portfolio under management with one of the top two building certification standards (%)	2	1	0

Annex II

ENERGY

General proxy 1	Electricity generation (GWh/a) from eligible generation as a % of total generation in the company portfolio (GWh/a) is assigned to the revenue from electricity generation.
General proxy 2	Installed climate-aligned generation capacity (GW) as a portion of total installed generation capacity in the company portfolio (GW) is assigned to the revenue from electricity generation.
Assumption 1	Unclear amount of revenue from fossil fuels (gas/coal/oil) leads to exclusion.
Assumption 2	Lack of descriptive information on certain activities, e.g. "recovered energy", "thermal energy", or "district heating", leads to exclusion.
Assumption 3	If the portfolio of assets of an issuer span across multiple eligible business activities and in significant quantities then they are assigned under "RE Mix", i.e. Renewable Energy Mix.

Eligibility

- Always included
- Included if screening condition is met
- Excluded

Screening condition - Conditions which need to be met for activity to be climate-aligned

Types of assets/activities

Sub-sector business activity	Activity Type	Eligibility	Screening condition
Utilites	Energy generation	●	i. Included if vertically integrated (i.e. has generation assets as well as transmission and distribution) ii. Alignment is calculated from % generation from eligible energy sources and applied to total company revenue using the general proxies iii. Exclude if solely transmission and distribution
	Transmission/distribution	●	
Grid	Infrastructure	●	i. Infrastructure supports the integration of renewable energy or energy efficiency systems and their load-balancing
	Distributed assets	●	ii. If purpose to reduce renewable energy curtailment
	ICT/smart grid applications	●	N/A
Solar	Energy generation	●	N/A
	Manufacturing/supply chain	●	N/A
	Infrastructure	●	N/A
Wind	Energy generation	●	N/A
	Manufacturing/supply chain	●	N/A
	Infrastructure	●	N/A
Geothermal	Power generation	●	N/A
	Manufacturing/supply chain	●	N/A
	Infrastructure	●	N/A
Bioenergy	Biofuel/biomass/ biogas production	●	i. Biofuel sourced from sustainable feedstock
	Generation	●	i. Biofuel sourced from sustainable feedstock
	Supply chain facilities	●	N/A
	Infrastructure	●	N/A
Hydropower	Power generation	●	N/A
	Manufacturing/supply chain	●	N/A
	Infrastructure	●	N/A

(Continued)

Types of assets/activities			
Sub-sector business activity	**Activity type**	**Eligibility**	**Screening condition**
Marine renewables	Power generation	●	N/A
	Manufacturing/supply chain	●	N/A
	Infrastructure	●	N/A
Nuclear	Energy generation	●	N/A
	Mining facilities	●	N/A
Battery & Energy Storage		●	i. Revenues from the manufacturing of battery components (e.g. lithium materials) or other climate-aligned assets (such as battery storage applications associated with solar photovoltaic (PV) energy generation).
Hydrogen	Power generation	●	N/A
	Storage	●	N/A
	Manufacturing/supply chain	●	N/A
Fossil Fuels	Oil, gas, coal	●	Automatically excluded

WASTE

Eligibility

- ● Always included
- ● Included if screening condition is met
- ● Excluded

Screening condition - Conditions which need to be met for activity to be climate-aligned

Types of assets/activities			
Sub-sector business_activity	**Activity type**	**Eligibility**	**Screening condition**
Hazardous waste management	Appropriate hazardous waste disposal.	●	N/A
Waste management	Processes/activities to manage waste from its inception to its final disposal.	●	N/A
Waste Treatment	Processes/activities to ensure that waste has waste has limited impact on the environment.	●	N/A
Waste to energy	Waste to energy plants (e.g. incineration, gasification, pyrolysis and plasma).	●	Not linked to oil & gas
Circular economy	Waste elimination and continual use of resources.	●	N/A
Recycling	Reuse materials for new products.	●	N/A

TRANSPORT

Assumption 1	For railway and metro companies, revenues from advertisement, shops instations or other railway or railway station linked assets are climate aligned if the total revenue streams from these sectors account for less than 10% of the total.
Assumption 2	Buses and coaches are automatically included as, generally, they are more efficient in terms of CO_2/passenger than cars.
General proxy 1	Freight rail alignment may require analysis on a pro-rata basis (i.e. number/volume of products related to fossil fuel out of the total number/volume of product categories), should more detailed information not be available.
General proxy 2	Manufacturing of both passenger and freight equipment, rolling stock, etc. is included.
General proxy 3	Manufacturing of buses/coaches is included.
General proxy 4	Products from plastic materials for the automotive market are not eligible.

Eligibility

- Always included
- Included if screening condition is met
- Excluded

Screening condition - Conditions which need to be met for activity to be climate-aligned

Types of assets/activities

Sub-sector business activity	Activity type	Eligibility	Screening condition
Bicycles	Bicycles	●	N/A
	Operating (e.g. rental fleet)	●	N/A
Storage (EV battery, energy storage)		●	N/A
EV & Hybrid vehicles 	Manufacture, distribution	●	N/A
	Operating (e.g. rental fleet)	●	N/A
	Charging stations	●	N/A
Hydrogen vehicles	Manufacture, distribution	●	N/A
	Operating (e.g. rental fleet)	●	N/A
Conventional buses/coaches	Manufacture, distribution	●	N/A
	Operating	●	N/A
EV & Hybrid buses/coaches 	Manufacture, distribution	●	N/A
	Operating	●	N/A
	Charging stations	●	N/A
Hydrogen buses/coaches	Manufacture, distribution	●	N/A
	Operating	●	N/A
Metro/light railway	Manufacture, distribution	●	N/A
	Operating	●	N/A
Passenger Railway 	Manufacture (rolling stock)	●	N/A
	Operating	●	N/A
	Infrastructure	●	N/A
	Services	●	N/A
Freight Railway	Manufacture (rolling stock)	●	N/A
	Operating	●	Transporting goods other than coal, oil, petroleum products, natural gas and other similar goods
Marine vessels	Operating	●	Passenger-related

(Continued)

Types of assets/activities			
Sub-sector business activity	**Activity Type**	**Eligibility**	**Screening condition**
ICE passenger vehicles	Manufacture, distribution	🔴	Excluded
	Operating (e.g. rental fleet)	🔴	Excluded
Lead-acid batteries		🔴	Excluded

WATER

Assumption 1

Most of the activities related to the water sector are considered "climate-aligned" as water is essential for survival. United Nations General Assembly explicitly recognized the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realisation of all human rights.

Assumption 2

For water management companies, revenues from other relevant assets (e.g. water meters and water pipeline installations) are eligible for inclusion in that they are necessary components of a well-functioning, sustainable water infrastructure system.

Eligibility

- 🟢 Always included
- 🟠 Included if screening condition is met
- 🔴 Excluded

Screening condition - Conditions which need to be met for activity to be climate-aligned

Types of assets/activities			
Sub-sector business activity	**Activity type**	**Eligibility**	**Screening condition**
Infrastructure	Infrastructure which allows for regular functioning of the water supply system.	🟢	N/A
Water / Waste	Activities related to both water management/ supply and waste water management.	🟢	N/A
Water management	General water distribution activities.	🟢	N/A
Water supply 	Rainwater harvesting systems, gravity fed canal systems, pumped canal or water distribution systems, terracing systems, drip, flood and pivot irrigation systems.	🟢	N/A
Water treatment	Drinking water treatment, desalination plants, water recycling systems, wastewater treatment facilities, manure and slurry treatment facilities Ecological retention system, current force reduction mechanisms.	🟢	N/A

LAND USE & AGRICULTURE

General proxy 1	Revenues from land use and agricultural products are aligned only when the products or processes are certified against the FSC Standard or equivalent internationally recognised schemes.	**Eligibility** ● Always included ● Included if screening condition is met ● Excluded **Screening condition -** Conditions which need to be met for activity to be climate-aligned

Types of assets/activities

Certified products	Business activity	Eligibility	Screening condition/ Assumption
Products with a 2BSvs (Biomass Biofuels Sustainability voluntary scheme) certification	Bioenergy	●	N/A
	Crop	●	N/A
Products with an ASC (Aquaculture Stewardship Council) certification	Fisheries	●	N/A
Products with a Bonsucro certification	Crop (sugarcane)	●	N/A
Products with a Fairtrade certification	Crop	●	N/A
Products with a FSC (Forest Stewardship Council) certification	Paper & Pulp	●	N/A
Products with an International Sustainability & Carbon Certification (ISCC)	Supply chains	●	N/A
	Biobased feedstocks	●	N/A
	Renewables	●	N/A
Products with a Marine Stewardship Council Certification (MSC)	Fisheries	●	N/A
Products with a PEFC (Programme for the Endorsement of Forest Certification)	Forestry	●	N/A
Products that are Rainforest Alliance Certified	Forestry	●	N/A
	Crop	●	N/A
Products with a RedCert certification	Biomass	●	N/A
	Biofuels	●	N/A
	Bioliquids	●	N/A
	Biobased feedstocks	●	N/A
Products with a Roundtable on Sustainable Biomaterials (RSB) certification	Biomass	●	N/A
	Biofuels	●	N/A
	Biomaterials	●	N/A
Products with a RSPO (Roundtable on Sustainable Palm Oil) certification	Crop (palm oil)	●	N/A
Products with a RTRS or the Round Table on Responsible Soy	Crop (soy)	●	N/A
Products with a SFI (Sustainable Forest Initiative) certification	Forestry	●	N/A
	Forest products	●	N/A
Products with a FSA certification	Crop	●	N/A

ICT

Assumption 1	Activities related to Broadband networks, Connectivity, and Power management are considered climate aligned.
Assumption 2	Infrastructure related to some IT solutions (i.e. cloud, telecom, broadcasting) is considered climate aligned.
Assumption 3	Production of electronic devices is considered not aligned.

Eligibility

- Always included
- Included if screening condition is met
- Excluded

Screening condition - Conditions which need to be met for activity to be climate-aligned

Types of assets/activities

Sub-sector_ business_activity	Activity Type	Eligibility	Screening condition
Broadband networks	Fibre optic and cable networks	●	N/A
	Supporting infrastructure (e.g. internet exchange points)	●	N/A
Connectivity	Infrastructure and network management	●	N/A
IT solutions	Cloud	●	N/A
	Telecom infrastructure	●	N/A
	Broadcasting infrastructure	●	N/A
Power management	Infrastructure, software and hardware for remote power management	●	N/A
	In situ power management	●	N/A
Electronics	Electronic devices	●	For mobile devices and automotive other than EV/Hybrid

Endnotes

1. MSCI, Market Classification, 2021.
2. Climate Bonds Initiative, Green Bond European Investor Survey, 2019.
3. See 'Research methodology' section for more details.
4. A range of assumptions and proxies are used should the revenue breakdown by business line/segment be insufficient to determine climate-alignment; proxies and assumptions are listed in the 'climate-aligned activities' table.
5. All unlabelled climate-aligned data as of 31 September 2020.
6. All figures are converted to USD; the exchange rate is as of 'issue date' of the climate-aligned bonds.
7. Climate Bonds Initiative, Sustainable Debt Global State of the Market 2020, 2021.
8. OECD, Financing Climate Futures: Rethinking Infrastructure, 2018.
9. Climate Policy Initiative, Global Landscape of Climate Finance 2019, 2019.
10. Climate Policy Initiative, Global Landscape of Climate Finance 2019, 2019.
11. Includes green, social and sustainability labelled bonds.
12. Climate Bonds Initiative, Sustainable Debt Global State of the Market 2020, 2021.
13. For more details on the Chinese climate-aligned bond market, please see its dedicated section on p.13-14
14. Climate Bonds collects ratings from both international and local rating agencies; entity-level ratings are used when bonds are non-rated. Consolidated ratings are used for the chart below.
15. Please note that REITs and Real Estate Companies are not included under Buildings. See section 9 on p.24-25
16. Climate Bonds Initiative, Green Bond Treasurer Survey, 2020.
17. Financial Stability Board, Proposal for a disclosure task force on climate-related risks, 2015.
18. Climate Disclosure Standard Board, The state of EU environmental disclosure in 2020, 2020.
19. UNFCC, The Paris Agreement, no date.
20. European Commission, EU climate action and the European Green Deal, no date.
21. European Commission, EU taxonomy for sustainable activities, no date.
22. European Commission, Questions and Answers: Taxonomy Climate Delegated Act and Amendments to Delegated Acts on fiduciary duties, investment and insurance advice, 2021.
23. European Commission, Sustainable finance package, 2021.
24. Reuters, Takeaways: Key takeaways from the Biden Earth Day summit, 2021.
25. The White House, Executive Summary: U.S. International Climate Finance Plan, 2021.
26. US Securities and Exchange Commission, SEC Division of Examinations Announces 2021 Examination Priorities, 2021.
27. US Securities and Exchange Commission, SEC Announces Enforcement Task Force Focused on Climate and ESG Issues, 2021.
28. European Commission, Sustainable finance taxonomy - Regulation (EU) 2020/852, 2020.
29. Please refer to the research methodology on p.3 for more details on the research scope.
30. USD242bn as of 30 April 2021.
31. For more detailed analysis on the Japanese unlabelled climate-aligned universe, please see the 'Japan Green Finance State of the Market 2020' available at: https://www.climatebonds.net/resources/reports/japan-green-finance-state-market-2020.
32. For additional insights, please see the 'Spotlight: Low-carbon transport' section on p.21-22
33. Climate Bonds collects ratings from both international and local rating agencies; entity-level ratings are used when bonds are non-rated. Consolidated ratings are used for the chart below
34. If the portfolio of assets of an issuer spans multiple eligible business activities and in significant quantities, they are assigned under 'Renewable Energy Mix'
35. International Energy Agency, The Future of Rail, 2019.
36. The Chinese Central Government, China's high-speed rail lines top 37,900 km at end of 2020, 2021.
37. Shan, Y., Huang, Q., Guan, D., Hubacek, K., China CO2 emission accounts 2016–2017, 2020.
38. Reuters, Takeaways: Key takeaways from the Biden Earth Day summit, 2021.
39. Reuters, China's 2060 carbon neutral goal bill could hit over $5 trillion, 2020
40. Climate Bonds Initiative, Certification, no date.
41. Bhattacharya, A., Calland, R., Averchenkova, A., Gonzalez, L., Martinez-Diaz, L., Van Rooij, J., Delivering on the $100 billion climate finance commitment and transforming climate finance, 2020.
42. S&P Global, Feature: South Korea's Green New Deal faces cost, political hurdles, 2020.
43. Carbon Brief, Coronavirus: Tracking how the world's 'green recovery' plans aim to cut emissions, 2020.
44. Lee, J-H., Woo, J., Green New Deal Policy of South Korea: Policy Innovation for a Sustainability Transition, 2020.
45. International Hydropower Association, Colombia Country Profile, 2018.
46. World Bank Blogs, A green recovery of Latin America and the Caribbean is possible and necessary, 2020.
47. International Energy Agency, Electricity Market Report, 2020, https://www.iea.org/reports/electricity-market-report-december-2020/2020-regional-focus-americas#abstract.
48. Meszaros, F., Shatanawi, M., Ogunkunbi, G., Challenges of the Electric Vehicle Markets in Emerging Economies, 2020.
49. McKinsey & Company, Leaving the niche: Seven steps for a successful go-to-market model for electric vehicles, 2020.
50. Our World in Data, Cars, planes, trains: where do CO2 emissions from transport come from?, 2020.
51. International Energy Agency, Transport: Improving the sustainability of passenger and freight transport, 2021.
52. Liu, Z., Ciais, P., Deng, Z. et al., Near-real-time monitoring of global CO2 emissions reveals the effects of the COVID-19 pandemic, 2020
53. Zhang, X., Liang, Y., Yu, E., Rao, R. & Xie, J. Review of electric vehicle policies in China: Content summary and effect analysis, 2017.
54. Automotive News Europe, France's new $13,000 EV incentive is the most generous in Europe, 2020
55. Eurostar, Train vs Plane, no date.
56. OECD, COVID-19 and the low-carbon transition: Impacts and possible policy responses, 2020.
57. International Energy Agency, The Future of Rail, 2019.
58. International Energy Agency, The Future of Hydrogen, 2019.
59. International Energy Agency, Hydrogen, 2020.
60. Iberdrola, Iberdrola will construct the largest green hydrogen plant for industrial use in Europe, no date.
61. Bp, Bp and Ørsted to create renewable hydrogen partnership in Germany, 2020.
62. BloombergNEF, Hydrogen Economy Outlook, 2020.
63. European Commission, European Clean Hydrogen Alliance, 2020.
64. Reuters, Germany earmarks $10 billion for hydrogen expansion, 2020
65. UK Government, The Ten Point Plan for a Green Industrial Revolution, 2020
66. Government of the Netherlands, Government Strategy on Hydrogen, 2020.
67. República Portuguesa, Portugal National Hydrogen Strategy, 2020.
68. Reuters, Spain approves hydrogen strategy to spur low-carbon economy, 2020.
69. International Energy Agency, Buildings: A source of enormous untapped efficiency potential, no date.
70. European Commission, Energy performance of buildings directive, 2021.
71. European Commission, Nearly zero-energy buildings, 2020.
72. MSCI, Real Estate Market Size 2019, 2020.
73. Gecina, 100% of Gecina's bond issues now transformed into Green Bonds, 2021.
74. Thomson Reuters Foundation News, G7 backs making climate risk disclosure mandatory, 2021.
75. European Commission, Questions and Answers: Taxonomy Climate Delegated Act and Amendments to Delegated Acts on fiduciary duties, investment and insurance advice, 2021.
76. Deutsche Bundesbank, Weidmann: All of us should do more to combat climate change, 2021.

Prepared by Climate Bonds Initiative.

Sponsored by DBS Bank.

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Suggested citation: Giorgi, A. & Michetti, C., 2021. Climate Investment Opportunities: Climate-Aligned Bonds & Issuers 2020, Climate Bonds Initiative.

Design: Godfrey Design

We want to thank the following for the valuable comments and support: Krista Tukiainen, Caroline Harrison and Bridget Boulle