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THE GREEN BOND MARKET IN EMERGING MARKET ECONOMIES

Green Bond Market Development and Green Premium
analysis in Emerging Market Economies

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Introduction

The first concerns regarding climate change risk date back to the late 19th century, but the matter of global warming started growing in importance only from the 1960s and, in particular, when in the 1970s it was discovered that, according to 97% of climate scientist (NASA, no date: online), human-caused emissions triggered global warming with disastrous consequences for the planet. However, such consequences are not restricted to the ecosystem but fall also to the economy, hitting markets and investors and posing new risks and threats, as well as opportunities. Investors' increased awareness concerning the matter brought to the creation of new type of assets able to link finance to environmental objectives, among which green bonds stand.

This study covers the green bond market and focuses on its development in emerging market economies. Green bonds characteristics, together with the issues concerning their definition, their stage of development at global level and a comparison of green bond markets between developed and emerging market economies are covered in Chapter 1. Particular attention is directed towards the gap in the stage of development between advanced and emerging market economies. Threatening factors like population growth, scarcity of resources and increased poverty are very likely to undermine the efforts made to close this gap and to hinder the already demanding actions needed to boost the development of an efficient green bond market in the emerging market economies. For this reason, Chapter 2 provides an analysis of the emerging market economies presented as a series of case studies organised with respect to the geographical region to which selected countries belong.

In order to understand more deeply the market for green bonds in emerging market economies, Chapter 3 presents a financial analysis concerning green bond pricing in these countries, aimed, in particular, at the identification of the presence of a green bond premium and its drivers. While the existing literature concerning the green bond premium usually focuses on developed countries or covers the global green bond market, this study tries to identify the trends in the emerging markets, as they are increasing in dimension and importance, and the role they play in green finance is critical. The hypothesis of the existence of a green bond premium is verified through the identification of a small, albeit significant, positive green premium, which entails that green bonds yields are, on average, lower than those of their equivalent conventional bonds. Finally, also the determinants of this premium are analysed with the purpose to understand which, among the green bonds' characteristics, could significantly affect the green premium.

1. Green Bonds

“Some may still deny the overwhelming judgment of science, but none can avoid the devastating impact of raging fires and crippling drought and more powerful storms.”

Barack Obama, Former President of the United States

Climate change is a real threat to the environment, the economy and the society. Compelling evidence in climate change can be found in global temperature rise, warming oceans, glacial retreat, sea level rise and extreme weather events. Governments role is critical in developing and implementing climate change policies, as first recognized in the 1992 United Nations Framework Convention on Climate Change (UNFCCC), where multilateral efforts were established in order to limit gas concentration in the atmosphere, to eventually reduce and prevent the impacts of climate change on humanity and on the environment. The Convention also settled two of the most important international treaties concerning climate change – the 1997 Kyoto Protocol and the 2015 Paris Agreement. When the 197 governments which ratified the UNFCCC, known as the Parties, met in Paris at the 21st Conference of the Parties (COP21) on December 2015, it was set the objective to *“strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius”* (UNFCCC, no date, a: online). Indeed global warming is increasing at an incredibly high growth rate, with evidence represented by the facts that the last 35 years accounts for the majority of such increase and planet's average surface temperature has risen of about 1.62 degrees Fahrenheit (0.9 degrees Celsius) since the late 19th century (UNFCCC, no date, a: online).

In that occasion, Parties also committed to cooperation, as the Convention compels them to share technology and provide enhanced assistance and financial support to developing countries Parties in order to fulfil the objectives identified. In fact, whilst the engagement of developed countries in sustainability and environmental matters has always been inescapable – as most of them carry major responsibility for the usage of carbon-intensive technologies and industries and their action in changing policies and regulations are necessary for the transition to a low-carbon economy – emerging market economies (EMEs) participation raised at a later time and also encountered some difficulties. Between the efforts made to support EMEs, in fact, the Copenhagen Accord of December 2009 had already established the provision of \$100 billion a year by 2020 to help reduce their greenhouse gas emissions.

Between the tools designed to achieve the objectives of the Conventions, climate finance plays its part highlighting the supporting role of financial instruments in local, national or transnational financing. Infrastructure sector, for example, is concerned by significant opportunities concerning the reduction of carbon emissions and the construction of climate resilience. As the majority of infrastructure investments, which are characterised by large capital costs and long terms, are currently financed by debt, bonds constitute an attractive financial instrument for this kind of projects (OECD, 2017). Bonds whose proceeds are allocated to climate-related projects or assets are called green bonds. They are defined by the International Capital Market Association as *“any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the Green Bond Principles”* (ICMA, 2018a).

In this section, we are going to analyse how the market for green bonds was established and developed, including a description of its general characteristics and further exploring the rationale for its growth and the way it is being regulated. This will be necessary to understand how the green bond market developed in the EMEs, which represents the focus of this study. The last part of this section finally explores EMs general features, characteristics of the green bond market and barriers faced in its development in EMs countries.

1.1 Green Bond Market Development

The green bond market experienced an incredible growth ever since its naissance in 2007. Policies and regulations are the cornerstone of the green bond market development, further fostered by the increasing diffusion of different types of bonds and the participation of different categories of issuers. However, this market growth has been and still remains conditioned by country-specific issues, resulting in considerable differences in the stages of development reached when distinguishing between developed and developing countries.

The green bond market originated when the European Investment Bank issued the first bond with the specific purpose of increasing climate awareness in 2007. It successfully raised \$600 million, which have been devoted to renewable energy and energy efficiency projects. In 2008, just one year after the first green bond issuance, the World Bank and the Skandinaviska Enskilda Banken issued the first “labelled” green bond for \$440 million, with the purpose of raising awareness on climate change risks. In 2010 another major player joined the green bond market, namely the International Finance Corporation (IFC). The IFC is a sister

organization of the World Bank and member of the World Bank Group, and it represents the largest global institution working on the private sector in developing countries. Besides creating markets with its own products and services and those of the WB Group, the IFC also mobilizes third-party resources to generate opportunities for all. Its first green bond has been issued for \$200 million, and since then the IFC issued more than \$7 billion in green bonds to private investors (IFC, no date, a: online).

Market volume grew consistently year to year: in 2011 it was at \$11 billion, while in 2013 it was almost four times higher, at \$42 billion, with the majority of green bonds still issued by developed countries. In fact, from 2007 to 2012, the main participants to the market were merely represented by supranationals issuing green bonds for the major part denominated in Euro and Dollar. The green bond market experienced a quick and remarkable growth in developed economies like Europe and United States, to which the great majority of issuers initially belonged, mainly because their countries already presented robust finance infrastructures upon which the green bond market could be built and further fostered by political support. However, supranational organizations like multilateral development banks (MDBs) played a critical role for the initiation of green bond markets also in EMEs. MDBs are institutions providing development-related support in both financial terms and professional advising, behaving as creditworthy issuers allocating funds (monitored and granted by undisbursed capital) to new green project which are not able to be accessed and attract substantial financing by themselves. EMEs first entered in the green bond market with the issuance of a green bond from South Africa's Industrial Development Corporation in 2012. As a matter of fact, MDBs were the only institutions issuing green bonds in emerging markets until 2014, when financial and non-financial corporates and, successively, other kinds of issuers joined the market (SBN, 2018a).

Going back to the global perspective, 2013 was a year characterised by an enrichment of types of green securities and market participants, which widened to municipalities, local governments and private sector –with *Électricité de France* and *Bank of America* as first players. *Vasakronan*, a Swedish real estate company, was the first non-financial corporate to issue a green bond. Moreover, also the issuance of green Muni bond started, the first of them coming from the Swedish City of Gothenburg, followed by Massachusetts and State of California (USA) and Province of Ontario (Canada). Green muni bonds are issued at state-, county-, or city-level governments and by public funding authorities to fund public investments. The market for green muni bond grew especially in the US, reaching half of the domestic green bond market in 2016, also thanks to the tax exemption they enjoy in many

cases. In 2014, the type of forms green bonds could take extended also to ABS when Toyota issued the first green ABS to invest in electric and hybrid vehicles (GIZ, 2018a).

The growth experienced so far and the changes in market structure highlighted the need for standards and criteria to define green projects or activities. Voluntary guidelines like the Climate Bond Standards and Certification Scheme by the Climate Bond Initiatives (CBI) in December 2010, the Green Bond Principles by the International Capital Market Association (ICMA) in June 2014, and other recognized standards and guidelines – which usually address to the two major standards from the CBI and the ICMA – were developed with the purpose to enhance clarity and enable greater access to the market, fostering also the inclusion of developing countries. The development of international guidelines also had the positive effects of increasing the level of transparency and gaining market scale through greater participation.

In 2015, emerging markets governments put particular effort in sustaining the development of local green bond markets, increasing issuances, enlarging the set of categories of green sectors and including a growing number of projects eligible for green financing. That year new countries entered the green bond market, most of them from EMEs, including Brazil, Denmark, Estonia, China, India, Latvia and Mexico. China has been the first EME among them to issue a green bond, entering the market with a \$1 billion green bond raised by the Agricultural Bank of China. The following year, China's Bank of Communications issued the largest green bond at that time, amounting to \$4.3 billion and classifying as the largest green bond in the world.

The realization of the Paris Agreement in 2015 represented a main boost for the global green bond market development, setting new targets and challenges for both developed and developing countries. Of the 197 Parties to the Convention, 185 of them have actually ratified the Agreement. It officially entered into force on November 4th, 2016, and the Parties' communication of their Nationally Determined Contribution¹ (NDC) should be submitted no later than the ratification, acceptance, approval or accession with the Depositary (UNFCCC, no date, b: online). At the United Nations Sustainable Development Summit of September 2015, countries also adopted the 2030 Agenda, which identified 17 Sustainable Development Goals (SDG) concerning poverty, inequality, climate, environmental degradation, prosperity, peace and justice.

¹ Whether the Party has already communicated its NDC without joining the agreement, these are called Intended Nationally Determined Contribution – INDC.

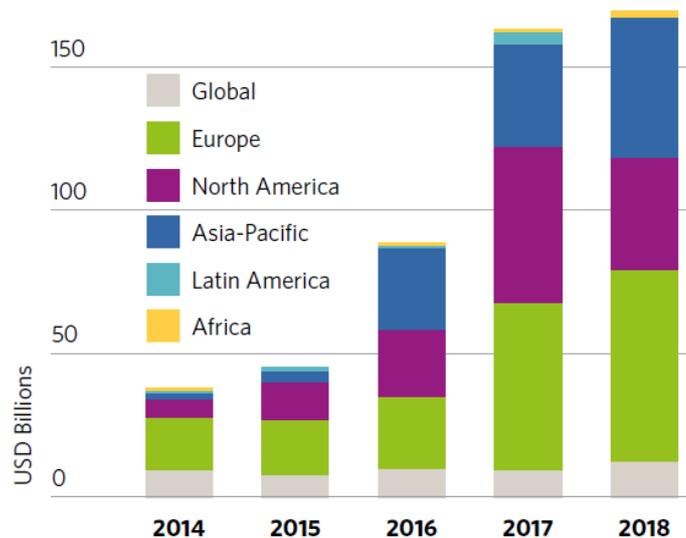


Figure 1: Issuance by geographic area

Source: (CBI, 2019b)

As shown in Figure 1, in 2016 the volume reached by the green bond market doubled with respect to 2015, reaching \$80 billion. That year also EMEs efforts concretized, with many EMEs countries entering the market for the first time, issuing green bonds mainly characterised by medium-term maturity and denominated in local currencies (Ehlers T., Packer F., 2017). In addition, in December 2016, Poland – an EME – issued the first sovereign green bond of the market. This new type of security was positively accepted and the example was quickly followed by France in January 2017, which issued the largest and longest-dated benchmark green bond until date – a \$7.6 billion green OAT (Obligations Assimilables du Trésor) bond with a maturity of 22 years (M. Chiesa, 2017: online). After that, Fiji issued a sovereign green bond in October 2017. A collaboration with the IFC and the World Bank made it possible to raise the equivalent of US\$50 million in Fijian dollars. On December 18th of the same year also Nigeria followed the example, becoming the first African country to issue a Certified sovereign Climate Bonds. Sovereign issuances represented 7% of the green bond market in 2017 and grew to 10% in 2018, for an amount of \$17.5 billion, thanks to the contribution of Belgium, France, Indonesia, Ireland, Lithuania, Seychelles and Poland, the last of them being the first sovereign repeat issuer with a \$1.2 billion deal in February 2018, and also a third one in March 2019 (CBI, 2019a).

In 2017 the volume of the green bond market reached \$162.1 billion, representing a growth of 84% with respect to previous year. By contrast, 2018 volume was \$167.3 billion, meaning only a 3% growth from 2017. The slowdown occurred as a consequence of a decrease in issuance regarding in particular US Muni issuers. Nevertheless, as shown in Figure 2, a

variety of financing tools concerning Environmental, Social and Governance (ESG) criteria like sustainability, SDG and social bonds arose and, when taken into account, they bring the total market volume from a 2017 value of \$199.3 billion to a 2018 value of \$266.1 billion, which consists in a 13% one-year increase. For this reason, the United Nations published a Sustainable Development Goals (SDG) Bond Framework in 2018 to enhance clarity of definitions and differences between “green”, “sustainability” and “social” bonds with respect to the use of proceeds (CBI, 2019a).

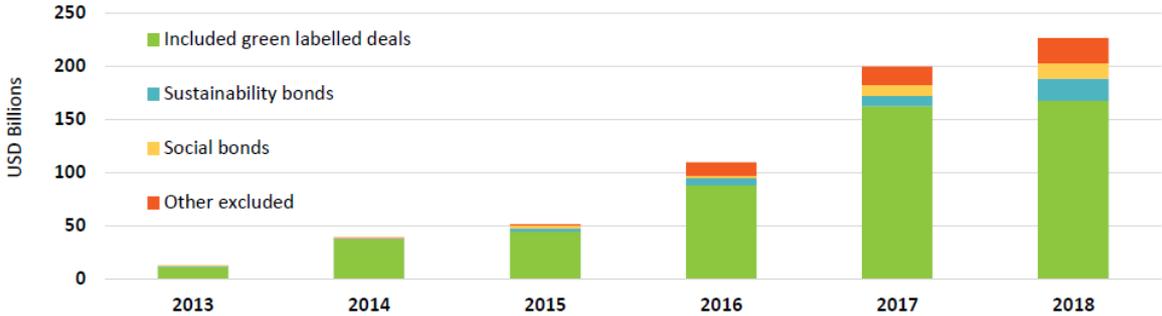


Figure 2: Share of green, sustainable and social bonds
Source: 2018 Green Bond Market Summary CBI (CBI, 2019a)

Eight more countries joined the green bond market in 2018 - Iceland, Indonesia, Lebanon, Namibia, Portugal, the Seychelles, Thailand and Uruguay, totalling an amount of \$3.3 billion and increasing even more its geographic diversification. In 2018 the IFC collaborated with Amundi to launch the world’s largest green bond fund, raising \$1.4 billion for the Amundi Planet Emerging Green One (EGO) fund. Amundi is Europe’s largest asset manager and the fund’s perspective is that of positioning \$2 billion in developing countries green bond market. It aims at enhancing capital market development in emerging market economies and attaining environmental and social objectives. The capital structure of the fund allows public investors, development and international financial institutions to safeguard private investments from risks.

Year 2018 was characterized not only by strong European issuances but also by a substantial increase of issuance from EMEs countries and, in particular, from the Asia-Pacific area, which volume of issuance grew of 35% with respect to 2017. EMEs green bonds reached \$40 billion in 2018, approximately 20% of global issuances, while in 2017 they represented 23%. However, when taking into considerations also MDBs issuance, EMEs’ shares change for 2017 and 2018 in 29% and 31% respectively. Moreover, the introduction of the Association of Southeast Asian Nations (ASEAN) Green Bond Standards in late 2017 boosted the participation of the region’s countries, in particular Indonesia and Thailand, which entered

the green bond market in 2018, and Singapore, which issuances experienced a significant growth. Sovereign green bonds started being issued also in Asia, the first of them taking the form of an Indonesian green Sukuk² bond of \$1.25 billion in March 2018 (CBI, 2019b). Although financial institutions still represent the main green bond issuer type in most countries, the presence of different kinds of participants in the market is significant. Figures 3 and 4 display the development of the increased differentiation of green bond issuer types for the whole market (Figure 3) and for EMEs (Figure 4).

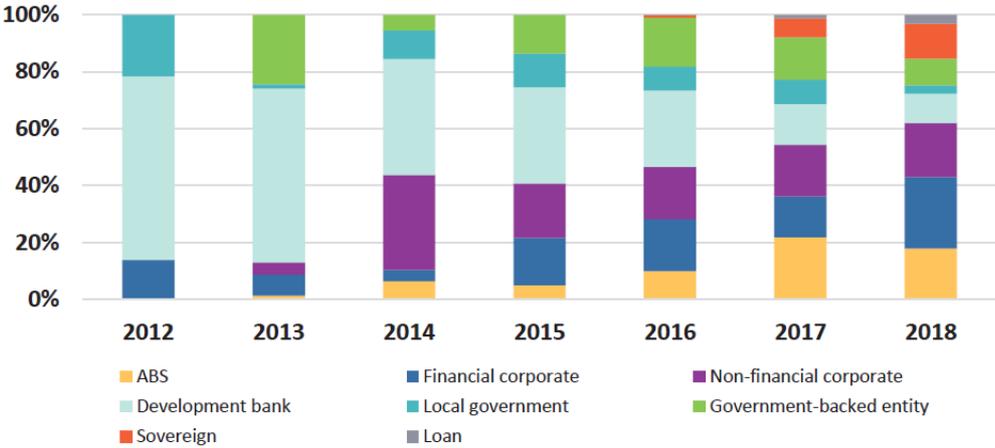


Figure 3: Evolution of green bond issuers as of June 2018

Source: C

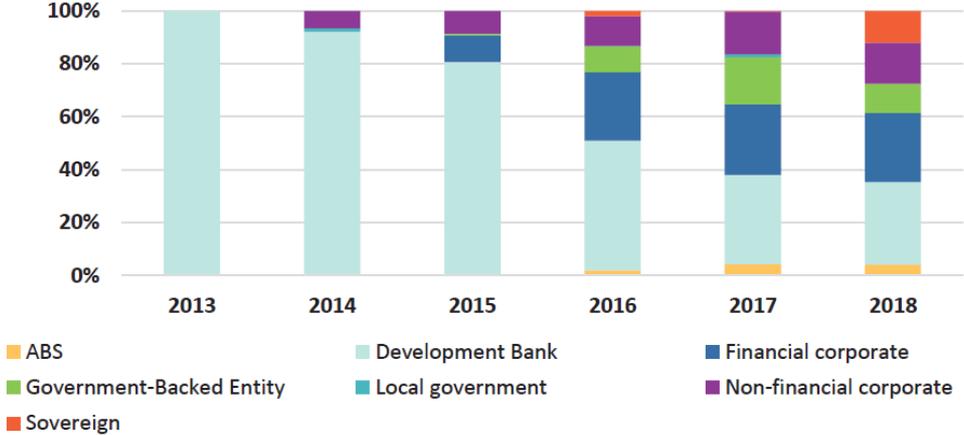


Figure 4: Evolution of green bond issuers in EMEs as of June 2018

Source: Climate Bond Initiatives, 2018 (SBN, 2018a)

Considering the global picture represented in Figure 3, the share of financial institutions started increasing considerably from 2016, mainly as a consequence of China’s contributions. China, in fact, is one of the main players in the market, and 76% of Chinese issuances for the

² an Islamic financial instruments observing Sharia law. See page 23 in this section.

year were green financial bonds, while non-financial corporates relied heavily on bank lending (GIZ, 2018a). Financial corporates represented only 14% of annual total in 2017 but grew to 29% in 2018, issuing green bonds for \$49 billion. One third of this amount can be traced back to Industrial Bank Co(China), ING (Netherlands) and ICBC (China) only. Commercial banks were the most active in the category, almost doubling their issuances with respect to 2017. In 2018 financial institutions represented for the first time the largest share for annual volume, while in 2017 the largest share belonged to ABS, and before that to development banks.

Green bonds reached a great degree of diversification both in terms of issuer types and geographical areas, covering all rating levels and all sectors. Also when considering the types of investors, they shifted from central banks to financial institutions, like banks, assets managers and pension funds. However, the need for major private sector involvement is urgent, especially in developing countries. Institutions like pension funds have large allocations to fixed income instruments. For this reason, they are incentivized to finance private green investments, with the final effect of reducing the burden on public credit usage to fund green projects.

According to the OECD, in 2015, labelled green bonds were less than 1% for the US and less than 0.2% of global debt securities issuance (OECD, 2017). Additionally, considering Bloomberg data on fixed-income securities, it can be observed how the proportion of green bonds over total debt increased over time for the period 2015-2018. However, it still represents an extremely low value, as displayed in Table 1.

Table 1: Green bond/loans represented as a percentage of total global active securities
Created by the author using data from Bloomberg database

Green bond/loans	2015	2016	2017	2018
As a % of total global securities	0,093%	0,170%	0,282%	0,387%

Table 2: Share of green bond/loans from EM with respect to total green bond market and total global securities
Created by the author using data from Bloomberg database

Green bond/loans from EM	2015	2016	2017	2018
As a % of total green bond/loans	6,682%	29,218%	34,998%	33,636%
As a % of total global securities	0,006%	0,050%	0,099%	0,130%

Similarly, when considering green bonds identified in Bloomberg database, it can be observed how the share of green bonds from emerging markets demonstrates to be increasing with respect to total global securities, and also reached one third of the total of green active bonds/loans by the end of 2017, followed by a slight decrease in 2018. However, such decrease is not signalling a decrease in the amount outstanding of securities labelled as green bond/loans from EMs, but it is due to a greater increase in the amount of total green securities outstanding than the increase in green bond/loans issued by EMs (Table 2).

1.1.1 Characteristics of the Green Bond Market

The State of the Market Report, provided annually by the CBI, considers the market for green bonds pictured in Figure 5. While “fully-aligned” issuers realize more than 95% of their revenues from green business activities, “strongly-aligned” issuers dedicate a minimum of 75% of proceeds to green assets aligned with Climate Bonds Taxonomy. For them, the amount of revenue taken into consideration corresponds to the percentage of green revenue over their full outstanding value. The reason stands in the intention to “capture companies transitioning to ‘green’ and to take into account the fact that as ‘pure-play’ issuers grow, their revenue streams tend to diversify” (CBI, 2018a).



Figure 5: Climate-aligned bond universe
 Source: CBI State of the Market 2018 (CBI, 2018a)

Of the 498 labelled green bond issuers, only 52 issuers are also fully- or strongly-aligned issuers. The remaining 446 issuers, instead, use less than 75% of proceeds for green business activities. The figure does not include Fully-aligned US Muni issuers, namely Municipal bond issuer from the United States whose revenue derived from climate-aligned projects exceeds 95%, which amount for \$264bn. Of them, \$14bn are labelled green bond and are thus included in the corresponding section of Figure 5. When taking Fully-aligned US Muni

issuers into account, the amount of the climate-aligned bond universe would reach \$1.45tn. The evolution of the state of the market over time represented distinguishing between fully-aligned, strongly-aligned, and labelled green bond issuers (Figure 6)³ denote the increasing share of participation of labelled green bond issuers.

An analysis of the ranking of climate-aligned bonds issuance per country outlines as China exhibits the highest volume of strongly-aligned bonds, while the greater share of fully-aligned bonds is reached by UK, and the US owns that for labelled green issuers, as shown in Figure 7.

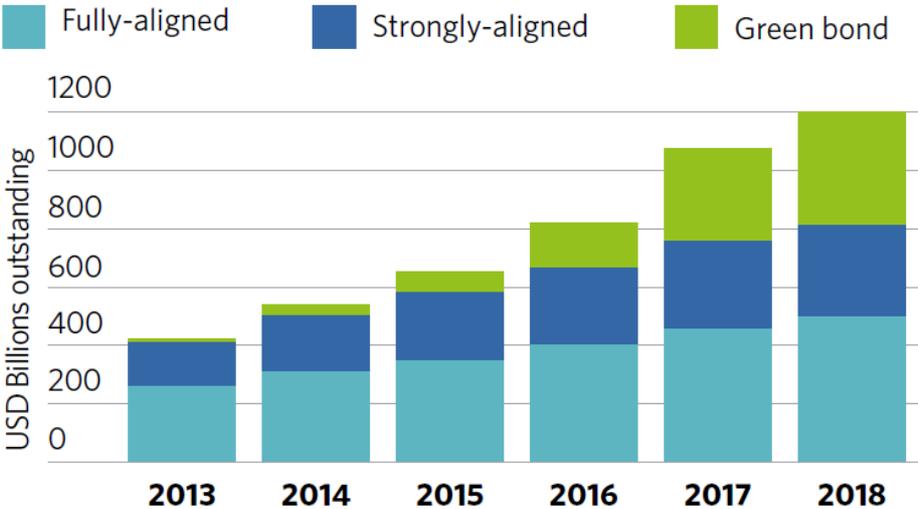


Figure 6: Time evolution of climate-aligned bonds
 Source: CBI State of the market 2018 (CBI, 2018a)

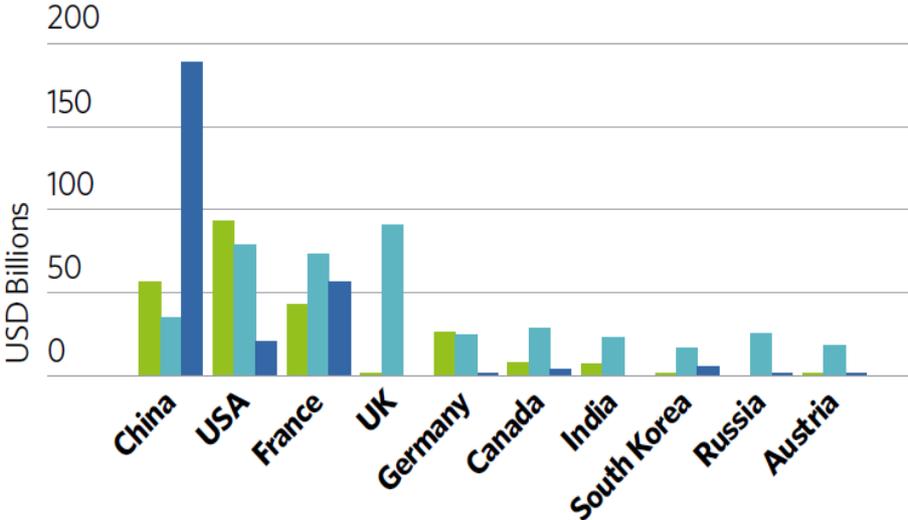


Figure 7: Climate-aligned bond types per Country
 Source: CBI State of the market 2018 (CBI, HSBC, 2018)

³ All figures in this section, except for Figure 11, refer to H1 2018 when considering data for year 2018.

For what concern the outstanding volume of climate-aligned bonds, Europe presents a market accounting for \$509bn in 1.418 bonds. The value of the market for North America is approximately half of the European's one, but the number of bonds issued counts for almost 1.000 bond more, as showed in Figure 8.

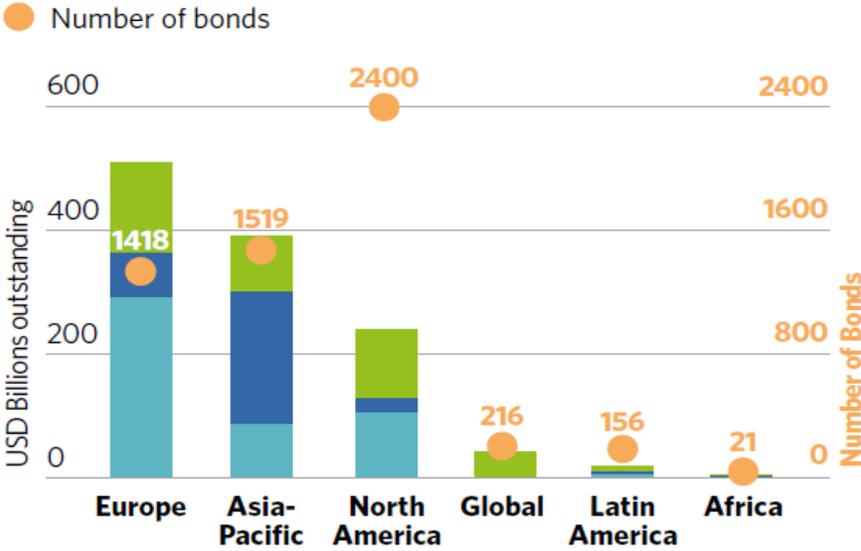


Figure 8: Amount outstanding and number of bonds per geographic area
 Source: CBI State of the market 2018 (CBI, 2018a)

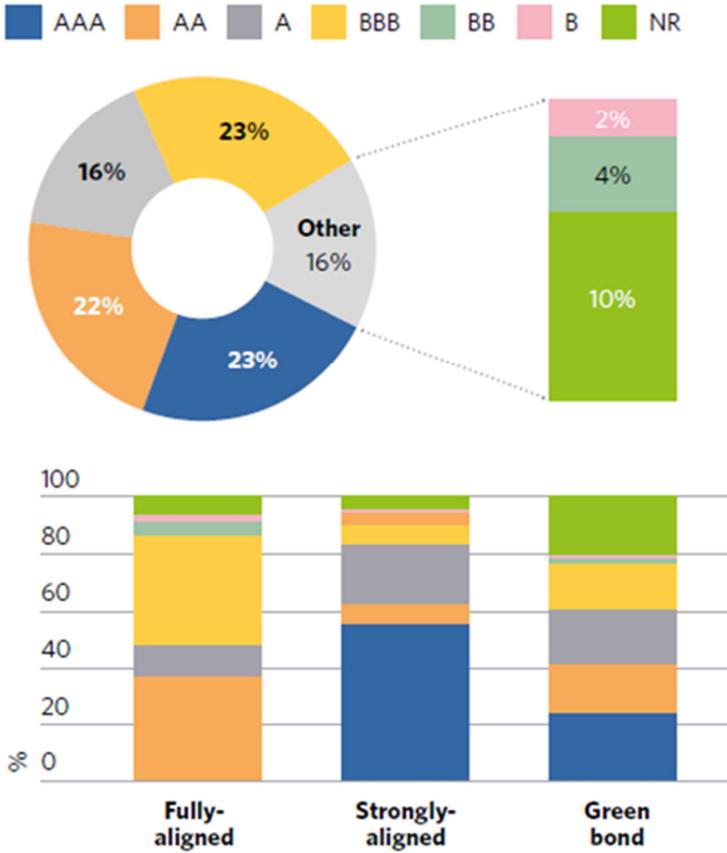


Figure 9: Bond rating
 Source: CBI State of the market 2018 (CBI, 2018a)

Figure 9 displays green bonds' ratings. AAA rating accounts for almost a quarter of the global picture, and investment grade bonds (which indicate relatively low default risk, usually rated BBB- or higher) account for 84% of the outstanding climate-aligned universe. Of the remaining, 6% are non-investment grade bonds and 10% are not rated. Most of the AAA-rated bonds are from strongly-aligned issuers, which account for 63% of total issuance, and 67% of AA-rated bonds originate from fully-aligned issuers. CNY-denominated bonds rating is obtained by local rating agencies and is composed for 83% of AA and AAA rated bonds.

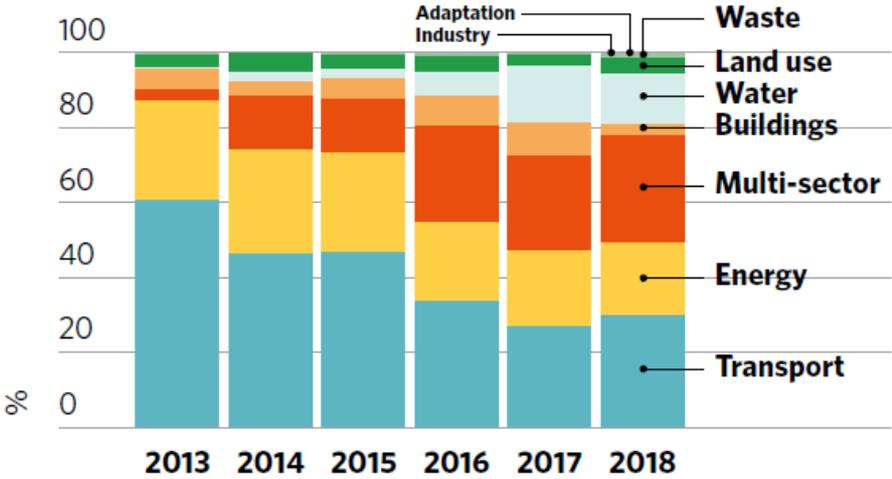


Figure 10: Time evolution of use of proceeds per sector
 Source: CBI State of the market 2018 (CBI, 2018a)

Table 3: Green bonds distribution per sector
 Source: CBI State of the market 2018 (CBI, 2018a)

Theme	Amount (USDbn)	Share	Bond issuers	Bonds
Energy	271	23%	292	1,139
Multi-sector	179	15%	177	600
Transport	532	44%	131	1,361
Buildings	72	6%	102	1,843
Water	101	8%	89	564
Land use	37	3%	50	166
Waste	7	1%	26	55
Other	0.04	<1%	2	2
Total	1,199	100%	869	5,730

For what concerns the use of proceeds, an analysis of the sectors benefiting from green financing for the years 2013-2018 highlights as transports maintains the largest share of the global picture, besides the share decrease experienced up to 2017 (Figure 10). Market trends and improved screening methodology explains the increase in multi-sector and buildings-related. However, Table 3 shows that the greatest number of issuers concerns energy sector, with 292 climate-aligned issuers, while in terms of bond number the peak is reached by the buildings sector, accounting for 1.843 bonds. Transport accounts for the major share for sectors as a main consequence of its position as second largest contributor of global greenhouse gas (GHG) emissions – 30% of human-caused CO₂ emissions in developed countries and 23% of total global emissions derive from this sector. The region the most contributing in terms of number and value of green bonds dedicated to transport sector is Asia-Pacific, with China Railway Corporation being the largest climate-aligned bond issuer, thanks to a total of \$172bn outstanding. Bonds' tenor reflects the nature of transport projects, which is usually long, and averages at 12 years. Thanks to the lower climate impact with respect to road and air, and to its relatively energy efficient features, railway accounts for 90% of transport sector financing, for a total of \$481bn bonds from climate-aligned railway issuers. The second largest climate theme, whose dedicated bonds account for a share of 23% over the total, is energy. It represents a critical sector for the accomplishment of the Paris Agreement's goals. Emerging markets, especially India, China and South Korea, issue the majority of the fully-aligned bonds whose proceeds are allocated to this sector. Renewable energy accounts for 66% of energy sector financing, originating from 142 issuers and amounting to \$180bn outstanding. The market for green bonds in water sector is heavily focused on developed markets, where goals of adaptation, resilience and integration are better satisfied. In emerging economies, in fact, lack of investments in resilient infrastructure worsen the water stress problem. 86% of bonds outstanding for water treatment sub-sector come from developing countries, mainly China and South Korea. The length of the financing is usually quite long, with 39% of them exceeding 20 years. A problem not to be underestimated is represented by the energy demand and carbon emissions linked to buildings sector, which increase considerably as population grows and global energy access increases. For this reason it is critically important to address consistent investments to energy efficient buildings, equipment and materials. Agriculture and forestry theme accounts only for 3% of the climate-aligned bond universe, with \$37.3bn outstanding, notwithstanding the pivotal role they play in decarbonisation targets. Finally, waste management occupies 54% of waste sector, which account, as a whole, for \$6.9bn of bonds outstanding.

The trend for green bond size has always been increasing, with the consequent positive effect of raising market liquidity and attracting additional investors. In 2018, the largest deals originated from financial corporates (mostly from China) and sovereign issuances. On the other hand, a substantial increase in the number of smaller deals also signals that either new issuers or entities with lower funding requirements entered the market. Considering tenor, the largest category by volume switched from 5-10 years in 2017 to “up to 5Y” in 2018, while deals of “20Y or more” decreased in volume. The increase of short tenor bonds is partially due to the increased share of total volume issuances from commercial banks, which prefer this kind of bonds, and to the decrease of US municipalities issuances, which usually favour longer-dated bonds. Moreover, also the increased market volatility and raising interest rates could have led to lower bonds’ duration, trying to reduce exposure to interest rate risk.

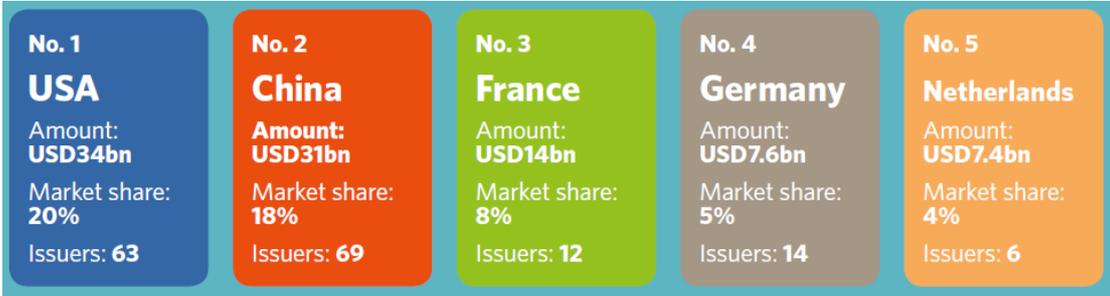


Figure 11: Top 5 countries per volume in 2018
Source: CBI State of the market 2018 (CBI, 2019b)

Figure 11 represents the top 5 countries with respect to 2018 issuances: by the end of the year, US figures as the main issuer in terms of volume, reaching the amount of \$34 billion for the year, and accounting for 20% of the market share. In second place, China’s share stands at 18% for \$31 billion.

Considering bonds currency denomination, Euro represents 40% of market volume for 2018, followed by US Dollar at 31% and Chinese Renminbi - CNY at 13%. The drop in US dollar from 2017 level (when it accounted for 46% of total market volume) is partially due to a decrease of 70% of US municipal issuance and the increase of large-scale European issuances, with three sovereign issuances from Poland, Belgium and Ireland. The share of the top 5 currencies decreased from 94% in 2017 to 91% in 2018, and five new currencies entered the market (Chilean Unidad de Fomento - CLF, Icelandic króna - ISK, South Korean Won - KRW, Namibian Dollar - NAD, Thailand Baht - THB), increasing the range of domestic issuers and, therefore, the degree of diversification (CBI, 2019b).

1.2 Reasons behind Green Bond Market Growth

1.2.1 Limit Emissions

Green bonds are a precious tool that would possibly allow to achieve a low-carbon, climate-resilient (LCR) economy. Sustainable investments are becoming even more cost-competitive than carbon-intensive business activities, especially when taking into considerations the implications of climate changes. In 2009, Copenhagen's Conference of the Parties (COP15) had Parties to state again the importance to “*stabilise greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*” (UNFCCC, 1992), as first recognized in the 1992 UNFCCC, so that emissions must be limited to an amount that keeps the increase in global average temperature below 2°C above pre-industrial level. Estimates and considerations are provided by the International Energy Agency (IEA), the global energy authority that explores all of energy features, providing data, analysis and solutions regarding fuels and technologies that can support in making aware energy choices (IEA, no date: online). At Paris COP 21, on December 12th, 2015, almost all nations recognized the need to take action against climate change and to support investments for a sustainable, low-carbon future. At the COP24 of Katowice – Poland, 2018 – the IEA stated that the only way to meet long-term Paris Agreement's goals is having energy production to change through innovation, efficiency and usage of low-carbon technologies. Global CO₂ emissions generate from energy for the 85% and their level is continuously rising, constituting a major threat for the achievement of long-term climate-related objectives. According to IEA's studies, these emissions should peak around 2020 and then decrease rapidly in order to satisfy Sustainable Development Goals objectives and achieve the targeted temperature of the Paris Agreement. Anyway, the New Policy Scenario, displayed in Figure 12, clearly identifies that in the current situation CO₂ emissions will not peak until 2040, unless governments change policies and plans. In order to be able to reach the predicted sustainable emissions level, it is necessary to take action to achieve universal energy access, reduce the health impact of air pollution and enhance decarbonisation through a clean energy technology progress. This last goal can be attained only through a deep transformation of energy production and usage, as the utilization of fossil fuels still accounts for 81% of global energy mix. A critical issue is the management of the process of carbon capture, storage and utilization.

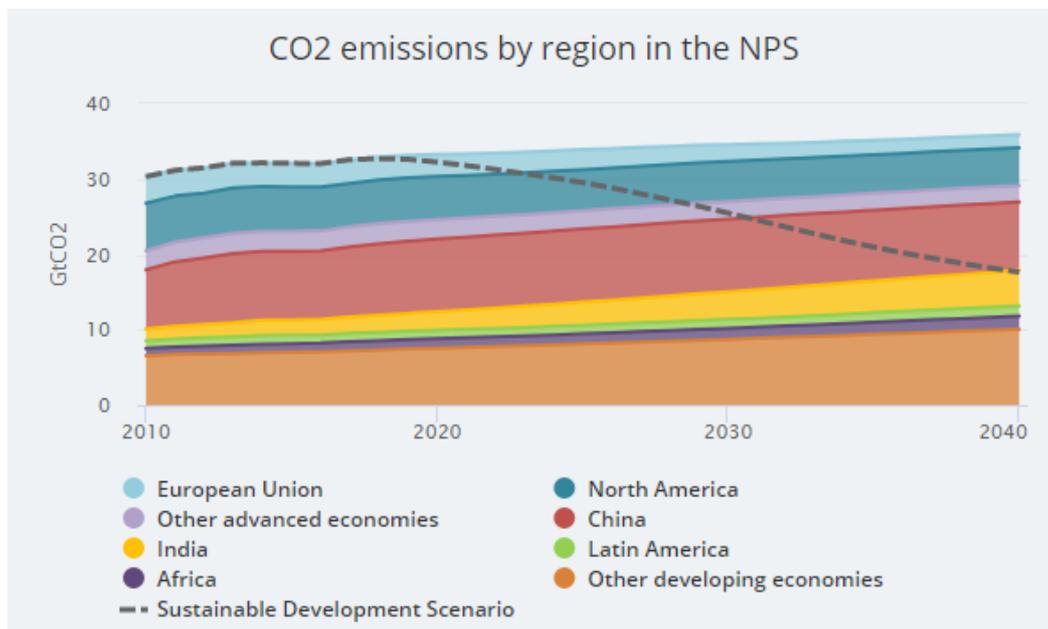


Figure 12: IEA’s New Policy Scenario – CO2 emissions by region
Source: IEA’s Sustainable Development Scenario, 2018 (IEA, no date, b: online)

The IEA also recommends some of the actions necessary to transform the Sustainable Development Scenario in reality, such as technology improvement and costs reduction, integrated policies from governments – which control or regulate approximately 70% of energy supply investments – and a cumulative overall energy sector investment 13% higher than the actual level. Incentives may represent a relevant element to redirect investments to efficient and clean energy technology, smart electrification, innovation and policy alignments (UNFCCC, no date, a: online). Besides incentives, bonds also play a crucial role as they are financial instruments able to provide low-cost, long-term sources of debt capital through financing and refinancing. They allow for the matching of investments needs with the capital provided by a diversified base of investors and with the demand for sustainable investments from institutional investors. The Organization for Economic Co-operation and Development, named OECD, estimated that a growth in green bond market sustained by policy makers and market participants could be able to finance the debt capital needed for the transition to a low-carbon economy. Specifically, green bond market plays a key role in reallocating debt capital to low-carbon, climate-resilient infrastructure investments (OECD, 2015).

1.2.2 Green Bonds Structure

Green bonds own characteristics very similar to those of conventional bonds in terms of credit quality, yield and price. They are tools whose features make them suitable for ready

understandability, high quality transfer of information and solid market development. A green bond is a fixed-income security raising capital from investor through debt capital market. The issuer raises a fixed amount of capital from investors over a set period of time, i.e. the maturity, and he pays an agreed amount of interest through the coupons at specific time intervals during the life of the bond. At bond's maturity, the issuer repays the capital – i.e. the principal. Being regulated by the same legal framework, green bonds issuance is the same of that of a regular bond, with the exception that they need to incorporate also a Green Bond Framework that entails further disclosure and procedures aimed at the verification of the use of proceeds (the principal reinvested in assets or projects). What makes green bonds unique in their definition is, in fact, the use of proceeds: when green bonds are *labelled* it means that they have been qualified as *green* by the issuer itself or another entity which can assess that the use of proceeds has satisfied a specific set of conditions which usually entails the financing or refinancing of green projects, assets or business activities and a clear and transparent information display. Principles and guidelines refers to third party verifiers that assert the usage of proceeds, enhancing information disclosure.

Being a green bond and a conventional bond of a same issuer equal in yield and credit quality, any difference in price would not be justified. For this reason green bonds are said to be characterised by “flat-pricing”, which contributed to allow a rapid demand-driven expansion of the market. Flat pricing implies that neither investors could demand higher yield on the basis of additional risk of green bonds, carrying them the same credit risk of a conventional bond from the same issuer (with the exception of project, covered and ABS bonds), nor issuers could take advantage of price advantages and correspondingly lower cost of capital as the green label itself does not justify higher returns (OECD, 2015). However, literature concerning green bond pricing and the presence of a “green premium” shows conflicting results and it would be further analysed in Chapter 3.

Green bonds can take many forms depending on their issuer and on the set of regulations they are concerned by. Initially, green bonds issued took the form of senior unsecured corporate or supranational, sub-sovereign and agency (SSA) bonds. As the market expanded and new players entered in it, new types of bond structures emerged and allowed to adapt to specific investor kinds, enhancing even more the market development and the matching of demand and supply sides. In particular, OECD firstly analysed green bonds categories as follow:

Corporate bonds are issued by a corporate entity with recourse to the issuer and have the characteristics of a “use of proceeds” bonds as defined afterwards in the Green Bond

Principles (GBP).⁴ The same definition from GBP is applied for **project bonds** and they will be both described in the specific section.

Asset backed securities (ABS) are backed by specific projects or financial assets – such as mortgages or lease receivables. Investors acquiring ABS bonds receive a return drawn from the cash flows of such assets. They are collateralised by one or more specific projects and recourse is possible only to the assets. On the other hand, for **covered bonds** the primary recourse is to the issuing entity while the secondary recourse is to an underlying cover pool of assets.

Supranational, sub-sovereign and agency (SSA) bonds have to satisfy the use of proceeds criteria and are characterised by the recourse to the issuer. Supranational bonds are issued by international financial institutions. Agency bonds are issued by government agencies (permanent or semi-permanent commissions responsible for specific tasks) and sub-sovereign bonds are issued by states, provinces, cities or towns in order to fund municipal and local projects.

Municipal bonds are issued by municipal governments, regions or cities.

Financial sector bonds are a specific type of corporate bond issued by financial institutions to collect capital with the purpose of financing green activities (OECD, 2015).

Considering instead the 2018 State of the Market report from the CBI, additional forms of bonds are included:

Solar ABS are securitisations granted on cash flows from solar assets. Most of them are issued in US, as Europe still lacks standardised documentation and presents some other obstacles, while India and other emerging markets are also interested in solar ABS loans as a mean to pursue renewable energy related objectives in the measure of the lending capacity of banks. **US Property Assessed Clean Energy (PACE) ABS** aims at financing energy efficiency and renewable energy improvements in an innovative way. Starting costs are funded by PACE loans and property owners pay them back over time through property tax bills, supported by legislation. ABS investors withhold funding and credit risk with the securitisation of the loans – allowing companies and lenders to sell off existing financial assets to release capacity for more business, then ABS are created and supported by financial assets such as mortgages or lease receivables.

⁴ See page 29 in this section.

US Municipal bonds enjoy favourable tax treatment in order to enhance availability of private funding for public sector spending. Tenor is usually long and many of them are sold in the form of pension investments.

Schuldschein (SSD) is a certificate of indebtedness usually administered by German law. It is a privately placed bilateral loan, unlisted and unregistered. As the debt is legally constituted by the underlying loan agreement, SSD are not securities and are treated as loans.

Sukuk is an Islamic financial instrument observing Sharia law, complying with Islamic ethical values and green asset and projects definition. Certificates are sold to an investor group, then the proceeds are used by the issuer to buy an asset which is partially owned by the investor group itself. Investors receive part of the asset revenues in the form of periodic payments.

Covered bonds are highly regulated securities with superior credit ratings. Their dual recourse structure, which allows investor to have a general claim against the issuer and one over a monitored cover pool of assets, enables the bonds to maintain lower funding costs than unsecured debt.

Hybrids securities can take the form of perpetual bonds, acting like perpetuities, as they do not have a maturity date (feature reminding to equity) but call dates for bond redemption are typically set by the issuers after 5-7 years. They still pay a coupon and the presence of a call date is typical of bonds. They exist since 2016.

Medium term notes (MNT) are programmes that allow the issuer to raise funding from the market repeatedly. Eligibility criteria are fixed but each bond issue sets the terms.

Private placements (PP) bonds are issued directly with the investor, so features like tenor or currency may change according to investor needs. They are typically not listed. Some features, as pricing, usually remain confidential, but issuers use to disclose information on the assets or projects financed, to develop a green bond framework in compliance with Green Bond Principles and they are subject to external review. They are expected to enhance green bond markets in emerging economies, with institutions like IFC investing in green bonds issued by developing countries banks (like Fransabank SAL in Lebanon, Bank Zachodni WBK in Poland, Davivienda in Colombia and YES BANK in India). PP green

bonds have been issued for \$1.4bn by emerging markets, for \$3.4bn from developed countries and for \$233m by the World Bank and Asian Development Bank (CBI, 2018a).

1.2.3 Adaptation and Mitigation

Climate change impacts created all new challenges and risks, like the physical risks from extreme weather events, potential reputational risks, the risks arising from revisions of policies and regulations, from the changes in consumer behaviours and from the employment of innovative and disruptive technology (GIZ, 2018b).

Paris Agreement stressed out the importance of two already existing lines of action necessary to respond to climate change impacts and to contribute concretely to the reduction of the emissions: mitigation and adaptation. The first one indicates the actions taken to reduce emissions and directly translate in mitigating climate change, pursuing nationally determined measures, communicating contributions and information in a clear and transparent manner. The second concept is referring instead to the strengthening of adaptive capacity through resilience and reduction of vulnerability to climate change, to respond to present climate change impacts as well as to be prepared to the future ones. Through adaptation, societies try to habituate to the adverse effects of climate change, reacting and preparing for forthcoming impacts at the same time. Countries have to develop specific and resilient processes, practices and structures, able to stem vulnerability and to manage risks efficiently and effectively. Adaptation represents a real challenge when considering specific needs and limited capabilities of least developed countries (LDCs). In order to support LDCs in their action, 2001 COP7 of Marrakesh developed a dedicated work programme that includes national adaptation programmes of actions (NAPAs) and established the LDC Fund to support the programme's implementation. Moreover, it was through adaptation objectives that also EMEs could increase their participation in the green bond market. The Paris Agreement brought new elements to the accomplishment of the goal of adaptation, requiring the parts to engage in planning, implementation and communication and establishing a new transparency framework. Additionally, it recognized the critical role that stakeholders and management of knowledge play in supporting adaptation activities.

On the other hand, mitigation comprehends policies, incentives schemes and investment programmes whose objectives are the enhancement of cleaner economic activities and the discouragement of those that implicate large emissions of GHGs in all sectors. Kyoto Protocol of 2009 set caps for developed countries emissions and encouraged developing countries to focus on specific related programmes and projects. Quantified targets regarding emission

levels for 2020 have been set for developed countries after the 2009 Copenhagen Accord and the 2010 Cancun Agreements, but the IEA’s New Policy Scenario already underlined its scepticism concerning the possibility to reach these targets with the policies currently implemented. Moreover, Kyoto Protocol also saw developed countries taking responsibility to support EMEs countries in the realization of nationally appropriate mitigation actions. Countries’ planned efforts was formalized under the Nationally Determined Contributions (NDC and/or INDC) of the Paris Agreement, which target emissions reduction and increasing resilience, and have to be formulated and communicated by the Parties every five years (UNFCCC, no date, a: online).

In this picture, green bonds feature characteristics and requirements that make them tools suitable to be used to finance the programmes developed to achieve adaptation and mitigation goals.

1.2.4 Pros and Cons

The OECD provides users with a table displaying advantages and disadvantages of green bonds, considering both the points of view of investors and issuers (Table 4).

Table 4: Advantages and disadvantages of green bonds
Source: OECD, Green Bonds: mobilising the debt capital markets for a low-carbon transition (OECD, 2015).

FOR INVESTORS	
Advantages	Disadvantages
Commonly cited	
<ul style="list-style-type: none"> Investors can balance risk-adjusted financial returns with environmental benefits Satisfies Environment, Social and Governance (ESG) requirements and green investment mandates Improved risk assessment in an otherwise opaque fixed income market through use of proceeds reporting Potential use pure-play, project and ABS to actively hedge against climate policy risks in a portfolio that includes emissions intensive assets Recognised by UNFCCC as non-state actor “climate action” 	<ul style="list-style-type: none"> Small and nascent (and potentially less liquid) market, small bond sizes Lack of unified standards can raise confusion and possibility for reputational risk if green integrity of bond questioned Limited scope for legal enforcement of green integrity Lack of standardisation can lead to complexities in research and a need for extra due diligence that may not always be fulfilled
Infrequently cited	
<ul style="list-style-type: none"> Engagement and private dialogue with issuers on ESG topics related to green bond issuance results in information that enhances credit analysis, through more comprehensive credit profiles of borrowers (BlackRock, 2015) 	

<ul style="list-style-type: none"> • Added transparency of proceeds use and reporting requirements provides informational advantage otherwise unavailable (on spending efficiency, project details and updates, impact performance) which gives green bond investors a significant information advantage (Nikko, 2014) • Tracking of proceeds use and reporting leads to improved internal governance structures and a positive feedback loop which improves the overall credit quality of the issuer (Nikko, 2014) 	
FOR ISSUERS	
Advantages	Disadvantages
Commonly cited	
<ul style="list-style-type: none"> • Demonstrating and implementing issuer’s approach to ESG issues • Strong investor demand can lead to oversubscription and potential to increase issuance size • Improving diversification of bond issuer investor base, potentially reducing exposure to bond demand fluctuations • Evidence of more “buy and hold” investors for green bonds which can lead to lower bond volatility in secondary market • Reputational benefits (e.g. marketing can highlight issuer’s green credentials and support for green investment) • Articulation and enhanced credibility of sustainability strategy (“money where your mouth is”) • Access to “economies of scale” as majority of issuance costs are in setting up the processes 	<ul style="list-style-type: none"> • Up front and ongoing transaction costs from labelling and associated administrative, certification, reporting, verification and monitoring requirements (cost estimates vary) • Reputational risk if a bond’s green credentials are challenged
Infrequently cited	
<ul style="list-style-type: none"> • Tracking of proceeds use and reporting leads to improved internal governance structures, communication and knowledge sharing between project side and treasury side of business (Nikko, 2014) 	<ul style="list-style-type: none"> • Investors may seek penalties for a “green default” whereby a bond is paid in full but issuer breaks agreed green clauses (KPMG, 2014)

Green bonds are an attractive financial tool, able to diversify the investor base and enlarge the share of “responsible investors” characterised by long-term investment profile. In terms of features, green bonds size is usually larger than conventional bonds and also maturities tend to be longer, as a consequence of the type of project or assets they finance. An increased length of the terms for green bonds is also possible through the stability gained from the increase and diversification of the investor base. Moreover, issuers’ credentials and credit risk is a factor that could lead investors to purchase again from them (GIZ, 2018a).

In many cases, green bonds are issued with credit advantages that lowers the cost of financing, which is initially higher because of the additional procedures involved with their issuance, among which the development of a green bond framework, of internal processes for the screening and identification of eligible projects, for the management and track of the use of proceeds, for reporting and for external review practices. A decrease of such costs would occur as international and local guidelines enhance clarity and best practices spread.

While issuers' reputation can result to be improved by demonstrating to be actively sustaining climate-friendly projects, the lack of unified standards can give birth to reputational risk if green bonds' credentials are questioned. Moreover, brown sectors are moving towards green and are experiencing environmental benefits. Whilst green bonds satisfy ESG requirements and enable for the establishment of climate policies aiming and achieving the targets set by the Paris Agreement, investors can resolve to obtain comparable financial results and differentiation. There is evidence that green bonds attract investor demand and a kind of investors willing to buy-and-hold.

The introduction of a green bonds label gave incredible boost to the market, signalling climate sustainable features, enhancing the meeting of demand and offer, enabling for more long-term green financing and for maturity matching with projects lives. The growth of the market also depended on benefits linked to a more diversified investor base and on the incentives provided in some jurisdictions.

Finally, it also emerged the need for benchmark indices, i.e. metrics tracking performances of a selected group of securities. Provided by banks and rating agencies, they enhance the spread of information and point out risk-return data. Indexes requires projects and activities to be qualified as eligible for being included, and several institutional investors are obliged to invest only in "benchmark-eligible" securities (OECD, 2015).

1.3 Green Bond Principles and Climate Bond Standard

The difference between labelled and self-labelled bonds stands in the certification provided by independent professional organizations who refers to official principles and guidelines. The importance of a labelled bond stands in the evidence of its low-carbon asset financing nature, which allows for easy identification by investors, satisfying disclosure and transparency requirements, and also for improved and broadened investor base. Furthermore, transaction costs can be reduced with the label, as the due diligence and research attached to the unlabelled bonds evaluation is no more necessary. Nevertheless, it has been already remarked that labelled green bonds represent only a small percentage of the overall bond issuance.

Guidelines allow to fulfill multiple goals, from the mere regulation of market processes of issuance and verification, to the achievement of climate targets as those set in the Paris Agreement. Moreover, they can limit greenwashing risks, defined as those activities that are environmental-friendly only by name but not in fact, and implementing targeted policies that requires a clear identification of eligible green assets of projects (SBN, 2018a). The development of common agreed guidelines and standardised definitions would not only enhance transparency and help the meeting of investors and issuers with common objectives, but also lower the costs associated as a consequence of increased efficiency of the market and security designs, thus allowing for improved flow of capital and higher volume of investments, which in turn would increase markets liquidity and foster the transition to a low-carbon economy. Transparency is a critical feature for green bonds, since the green quality is directly linked to the use of proceeds and type of projects financed. Transparency requirements for green bonds lead to specific benefits in the green bond market, as a result of the design of specific processes and information tracking systems. As different standards and principles are currently co-existing in the global market, the higher the level of convergence, the greater would be the effectiveness, efficiency and integrity of the market, as barriers would be reduced together with bureaucratic burdens. Guidelines and standards developed first in the form of voluntary international guidelines that have been adapted to local realities. However, standardization for green bond framework is essential for the market, as it would allow for cross-border trade and enhance development of the market itself, lowering uncertainty for both issuers and investors. Harmonisation is currently being pursued by public deliberations and industry sector actions (OECD, 2015). Between the tools available to move towards harmonisation of green bonds framework, in 2016 the European Commission suggested the usage and sharing of best practices, enhancing compliance and transparency, stimulating cooperation and accounting and disclosure practices. Anyway, standardisation should not become highly detailed as it would lead to increased issuance costs to new countries or issuers linked to particular green investments. Not to obtain this opposite result, an harmonized framework should leave sufficient room for local adaptation (Cochu et al., 2016).

Two main voluntary processes were developed and reached international acknowledgement, namely the Green Bond Principles from the ICMA and the Climate Bonds Standard and Certification Scheme of the CBI. The Principles provide a framework concerning issuance and disclosure procedures, while the Standard comprehends the provision of criteria to identify the assets and projects conforming with the Paris Agreement objective to keep global

temperature under the 2-degree growth. For what concerns individual countries, many governments or regulators issued national guidelines to boost domestic markets and to develop processes of issuance and reporting aligned with GBP and CBS that could be shaped upon local markets conditions. In some cases also private parties as Stock Exchanges established similar frameworks, as in the cases of China and India, and the naissance of Sustainability and Social bonds required regulations to extended to cover also these instruments. Certified green bonds follow international standards by the CBI and have been adopted by numerous countries all over the world, with the US representing the largest market for green bonds aligned to such international regulations. With respect to 2017, in 2018 the volume of Certified Climate Bonds did not increased, remaining almost at the same share of 14% of total volume, corresponding to \$23.3 billion. The size of Certified bonds were of \$1 billion or above for approximately 50% of the deals, while it was at 25% in 2017. The largest Certified Climate Bond was issued in 2018 by ING bank (Netherlands), for \$2.95 billion (CBI, 2019a).

1.3.1 Green Bond Principles, ICMA

The first standards of the International Capital Market Association have been published in June 2014 under the ICMA secretariat, as the result of the work of the Executive Committee of the Green Bond Principles, to which also the IFC makes part. The last update of the GBP was made in June 2018. The ICMA is an organization accounting for 550 members located in over 60 countries focusing on issues of regulatory and market nature which have consequences on the international market functioning. GBP are defined as a “*voluntary process guidelines that recommend transparency and disclosure and promote integrity in the development of the Green Bond market by clarifying the approach for issuance of a Green Bond*” (ICMA, 2018a). The Principles give in first place a definition of green bonds, which are characterised by the exclusive use of proceeds to “*finance or re-finance, in part or in full, new and/or existing eligible Green Projects and which are aligned with the four core components of the GBP*” (ICMA, 2018a). These are the use of proceeds, the process for project evaluation and selection, the management of proceeds and reporting.

- 1. Use of Proceeds:** proceeds must be used for Green Projects which should provide clear, appraised and, whether possible, quantified environmental benefits. These projects are explicitly recognized in eligible categories which include (but are not limited to) renewable energy, energy efficiency, pollution prevention and control,

environmentally sustainable management of living natural resources and land use, terrestrial and aquatic biodiversity, clean transportation, sustainable water and wastewater management, climate change adaptation, eco-efficient and/or circular economy adapted products, production technologies and processes and green buildings.

2. **Process for Project Evaluation and Selection:** it indicates the behaviour the issuer should conduct, such as the clear communication of the environmental sustainability objectives and the assessment method for the eligibility of a project as Green and the related criteria applied. Moreover, issuers are suggested to make explicit any green standard or certification referenced for the project. Transparency support by an external review is highly recommended.
3. **Management of Proceeds:** the amount equal to net proceeds should be tracked, periodically adjusted to meet criteria for eligibility for Green Projects and formally attested by the issuer. Also in this case the Principles encourage transparency and third party verification of the internal tracking.
4. **Reporting:** information regarding the use of proceeds should be provided annually and be readily available. It should include a list and a description of the projects and of their material impact. The elements disclosed should include qualitative and, where feasible, quantitative performance indicators as well as the methodology and assumptions used. Once again, transparency is a fundamental characteristic also of this component.

A further section of the GBP analyses the external review recommendations. The scope of the review should be made explicit and, in order to promote best practice, Voluntary Guidelines for External Reviewers have been settled by the GBP. They are “*market-based initiative to provide information and transparency on the external review processes for issuers, underwriters, investors, other stakeholders and external reviewers themselves*” (ICMA, 2018a). While issuing a green bond or a programme, the appointment of one or more external review providers enables the assessment of the bond or bond programme alignment with the four core components of the GBP. Independent consultancy, advisory and review are suggested. External review may be partial, full, or covering only certain aspects of the green bond or its associated framework. Given that independent external reviews vary in their scope, they are broadly divided with respect to their service in:

- **Second Party Opinion:** institution with environmental expertise, independent from the issuer and from the issuer’s adviser for its Green Bond Framework and procedures, which verifies the compliance with the GBP. Its assessments can also encompass objectives, policies and strategies of the issuer, its environmental sustainability-related projects, and the environmental features of the projects included in the Use of Proceeds.
- **Verification:** it is constituted by the independent verification of alignment with internal or external criteria and by the evaluation of environmentally sustainable features and issuer’s internal tracking methods, processes and reporting.
- **Certification:** recognised external green standards and labels are used to assess that a green bond, a framework or the usage of proceeds meet specific criteria tested by qualified and accredited third parties.
- **Green Bond Scoring/Rating:** the qualifications by third parties for Green Bonds, frameworks and use of proceeds are evaluated through established scoring/rating methodology by specialised research providers or rating agencies. The output is evaluated on a benchmark.

Finally, the Appendix I of the GBP contains a classification of green bonds in four types, although it leaves room for future inclusion of new types of bonds as they could possibly emerge. They are:

- **Standard Green Use of Proceeds Bond:** standard recourse-to-the-issuer debt obligation, aligned with the GBP. In a recourse-to-the-issuer debt, if the borrower fails to pay back the loan, the lender can go after the borrower’s assets or pursue legal action, as opposed to foreclosing to a particular property as collateral.
- **Green Revenue Bond:** a non-recourse-to-the-issuer debt obligation aligned with the GBP. A non-recourse-to-the-issuer debt is secured by a collateral and, in case of borrower’s default, the lender can seize only the collateral and no action can be made to obtain any additional compensation from the borrower, even if the collateral does not cover the full value of the defaulted amount. *“The credit exposure in the bond is to the pledged cash flows of the revenue streams, fees, taxes etc., and whose use of proceeds go to related or unrelated Green Project(s)”* (ICMA, 2018a).
- **Green Project Bond:** a bond dedicated to a single or multiple Green Projects and aligned with the GBP. The investor, with or without potential recourse to the issuer, has direct exposure to the risk of the projects.

- **Green Securities Bond:** the collateral of this bond, which is aligned with GBP, is one or more specific Green Projects. The cash flows of the assets represents in general the first source of repayment (ICMA, 2018a).

The GBP does not define the categories which would qualify a project type as green. Anyway, it addresses to already existing independent sets of criteria than can be used as guidance. Moreover, they do not provide material requirements and thresholds for the assessment of the type of the activity or environmental benefits originated from the chosen use of proceeds, as they represent voluntary guidelines only.

1.3.2 Climate Bonds Standard and Certification Scheme, CBI

The most recently updated version of the Climate Bond Standard issued by the Climate Bonds Initiatives has been published in January 2017 and is called *Version 2.1*. The CBI “*is an investor-focused not-for-profit organisation, promoting large-scale investments that will deliver a global low carbon and climate resilient economy*”(CBI, 2017). It is currently working to *Version 3.0*, which would include feedback from green finance markets stakeholders, the most recent GBP, and smaller changes that would increase international consistency in the green label. Between these changes, the number of requirements for disclosure would arise to be closer to the GBP of 2018, clarity would be enhanced in bond issuance and reporting requirements, and issuers with staged allocation of proceeds would enjoy additional flexibility. The CBS&CS want the market to reach scale through instruments like green label and transparency, which ensure trust and enhance participation. Its objective is the provision of “*clear criteria and robust approach to verify green credentials of a bond or other debt instrument*” (CBI, no date, a: online) used to fund projects devoted to enhance lower carbon employment and apply adaptation goals. The Certification Scheme is a voluntary instrument used to label the bond as Climate Bond Certified, assuring that the requirements and eligibility criteria, called CBS, are respected. Standards, Sector-Specific Criteria and Verifiers are approved by the Climate Bonds Standard Boars, composed of independent members.

The CBI provides a distinctions between bonds types based on the financial structure of bonds and other debt instruments which can be Certified under the CBS&CS, which merely coincide with the categories described in the Green Bond Principles by ICMA. The CBS&CS include a reference to the website for the latest version of the List of Debt Instrument of CBI in which other forms of debt instruments are represented.

The requirements, named Standards, needed by a bond in order to receive the Certified label are divided between Pre-Issuance and Post-Issuance Requirements. Pre-Issuance Requirements aim is to ensure that proper internal processes and controls have been applied before the issuance of the Certified Climate Bond. They concern the selection of Nominated Projects and Assets and the determination of their eligibility, the internal processes and controls for proceeds tracking, the management of unallocated proceeds and the allocation of funds to Nominated Projects & Assets (NP&A) and, finally, the reporting activity and disclosure documentation necessary prior to the issuance. On the other hand, Post-Issuance Requirements have to be applied to all Certified Bonds after their issuance. These requirements are divided in three sections:

- **General Requirements:** for the determination of the continuing eligibility of NP&A, for the use of proceeds, for the non-contamination of proceeds, for confidentiality and for reporting.
- **Eligible Projects & Assets:** a two-step process to determine the eligibility of such projects and assets. Climate Bond Taxonomy defines the investment areas that could be considered for mitigation and adaptation objectives. Then sector-specific technical criteria are used to assess eligibility of projects and assets falling into the previous areas described in the Taxonomy (see Appendix A).
- **Requirements for Specific Bond Types:** they make reference to the initial distinction of bonds and are summarised in Table 5.
 - o *Project Holding* indicates that the “*issuer of the bond shall continue to hold Nominated Projects & Assets which have Fair Market Value at least equal to the original principal amount of the bond at the time of issuance*”.
 - o *Settlement Period* indicates that the issuers should demonstrate that the “*Net Proceeds of the bond have been distributed to the Nominated Projects & Assets within 24 months of the issuance of the bond*”.
 - o In *Earmarking* “*the Issuer of the bond shall maintain the earmarking process to manage and account for funding to the Nominated Projects & Assets as disclosed under Clauses*” (CBI, 2017) mentioned with respect the management of unallocated proceeds and earmarking funds to NP&A in Pre-Issuance Requirements.

Table 5: Requirements provided per bond types
 Source: Climate Bonds Standards & Certification Scheme, (CBI, 2017)

Bond Types	Applicable Requirements
Use of Proceeds Bond	11 Project Holding 12 Settlement Period 13 Earmarking
Use of Proceeds Revenue Bond	11 Project Holding 12 Settlement Period 13 Earmarking
Project Bond	
Securitized Bond	11 Project Holding 13 Earmarking
Other Debt Instrument	11 Project Holding 12 Settlement Period 13 Earmarking

In the same way Climate Bond Certification is regulated distinguishing in Pre-Issuance and Post-Issuance Certification. In particular, it describes the Verifier figure, an independent third party assurance provider or auditor assuring the conformity of the proposed bond to the Standard according to an agreed Protocol in the Pre-Issuance stage, and conforming to all of the Post-Issuance Requirements of the Climate Bonds Standard. The Post-Issuance Certification includes also a Programmatic Certification option and a non-conformance line of action (CBI, 2017).



Figure 13: Map of certified debt instruments
 Source: CBI (CBI, no date, c:online)

From October 2014 to April 2019, 156 Certified Climate Bonds have been issued with a great degree of geographical diversification (Figure 13).

1.3.3 External Review

Between the variety of tools able to assess the green credential of a bonds, external review represents the most common practice. Ever since 2015, the use of *external assurance* has been recommended in the Green Bond Principles, referring to *external review* from 2016. Through this mechanisms, investors can be sure that proceeds are invested in projects or assets which can be defined green, even without a commonly agreed standardization. According to the CBI, it is the issuer that “label” the bond as green while the independent party has the role to assess the qualification. The issuer should provide the eligible criteria for the use of proceeds suggesting the use of a framework and the engagement of an external review with the goal to enhance transparency. In 2009, the CBI started keeping track of the green labelled market, providing information and regular reports, as the annual State of the Market report. The CBI illustrates different types of reviews in Table 6:

Table 6: CBI External review description
Source: CBI, External Review table (CBI, no date, d: online)

Pre-Issuance Review		
TYPE OF REVIEW	WHAT IT COVERS	SERVICE PROVIDERS
Third party Assurance	Assurance reports state whether the green issuance is aligned with the Green Bond Principles and the Climate Bonds Standard	Audit firms
Second Party Opinion	Provide an assessment of the issuer’s green bond framework, analysing the “greenness” of eligible projects/assets. Some second party opinions also provide a sustainability rating, giving a qualitative indication (e.g. CICERO rates green bond frameworks according to three grades – light green, medium green, dark green – that reflect the alignment of the framework to a low-carbon economy)	Environmental Social Governance (ESG) service providers (Oekom, Sustainalytics, Vigeo), DNV GL and scientific experts (CICERO, CECEP Consulting)
Green Bond Rating	A number of rating agencies assess the bond’s alignment with the Green Bond Principles and the integrity of its green credentials	Rating agencies (Moody’s, RAM Holdings, R&I, S&P Global Ratings)
Pre-issuance verification of the Climate Bonds Certification according to the Climate Bonds Standard	The Climate Bonds Standard is the only Paris Agreement aligned standard available in the market. Third party verification confirms that the use of proceeds adhere to the Climate Bonds Standard and sector specific criteria (e.g. Low Carbon Transport)	Verifiers approved by the Climate Bonds Standard scheme: audit firms and ESG service providers

Post-Issuance Review		
Second party or third party assurance report	Assurance of allocation of proceeds to eligible green projects.	Audit firms, ESG research service providers (Oekom, Sustainalytics) and scientific experts
Impact reporting	Reporting that seeks to quantify the climate or environmental impact of a project/asset numerically	Issuer, Audit firms, ESG research service providers (Oekom, Sustainalytics) and scientific experts
Post-issuance verification of the Climate Bonds Certification according to the Climate Bonds Standard	Assurance against the Climate Bonds Standard, including the allocation of proceeds to eligible green projects and types of green projects	Verifiers approved by the Climate Bonds Standard scheme: audit firms and ESG service providers

As already mentioned, Guidelines for Green Social and Sustainability Bonds External Review are published by the ICMA, whose last version was released in June 2018, which recommends the appointment of an independent external review provider. The aim of the document is the endorsement of best practice, and it broadly divides the types of the external reviews in Second Party Opinion, Verification, Certification and Green, Social and Sustainability Bond Scoring/Rating.

The Principles allow for both partial and full external review and take into consideration possible constraints from business confidentiality requirements. For what concerns the types of firm that can provide external reviews, they're not all subject to professional standards and regulations. While accounting firms and regulated credit rating agencies usually are, the others should at least satisfy the five fundamental ethical and professional principles of Integrity, Objectivity, Professional Competence and Due Care, Confidentiality and Professional Behaviour according to these voluntary Guidelines, however, there is plenty of alternative professional standards and regulations to which adhere (ICMA, 2018b). In 2018, 89% of total volume of green bonds received at least one external review, with second party opinion remaining the most exploited option and followed by the CBI Certification. CICERO – the Center for International Climate and Environmental Research located in Oslo – is the leading institute for interdisciplinary climate research in Norway, provider of international standards and second opinions. With a share of 28% deals by volume and 8% by number, CICERO represented the main provider of external reviews in 2018. Sustainalytics followed with 23% of total deals volume (CBI, 2019a). Another main actor in the external review field is Moody's Investors Service, which edited the first public methodology for green bond rating assessment in March 2016 – Moody's Green Bond Assessments (GBA). It consists of the

evaluation of issuers' adherence to best practice process regarding the use and management of proceeds and reporting. Finally Standard & Poor's Green Evaluations, published in 2017, cover a broader scope than GBAs and is mostly in line with the GBP.

1.4 The Green Bond Market in EMEs

Once having clarified under which circumstances and for which reasons the green bond market developed, it is necessary to include a presentation of the common features of the EMEs in order to understand how the green bond market developed there and which specific barriers it encountered in those countries.

1.4.1 Characteristics of EMEs

Emerging market economies are countries characterised by a stage of development pretty near the advanced condition, presenting features like liquidity in local debt or equity markets and instituting regulatory bodies. The level of market efficiency and of regulation standards remains lower than in advanced economies, but EMs possess elements of robust financial infrastructures such as banking institutions, stock exchanges and unified currency. Local conditions generally allows for a structured and fast growth of the economy and, in fact, these countries are usually rushing to increase their level of industrialization.

Generally EMEs are characterized by lower-than-average per capita income, and this factor is triggering and incentivising the higher rate of growth they are experiencing: in 2017 the economic growth expressed in terms of GDP in China, Turkey and India was approximately 7%, in Egypt, Poland and Morocco it was slightly higher than 4%, whilst the average of developed countries was around 3% or lower. EMEs' high rate of growth brings consequently higher returns for investors, which come, however, at some risks. Risky factors are linked to the high volatility of currencies, in particular when heavily linked to the US dollar, and to the vulnerability to commodities swing and price shocks, like oil or food, especially when the degree of control and power exercised on such resources is low. Moreover, EMEs usually present higher probability to suffer harder damages when hit by natural disasters, notably when historically relying on agricultural sector and natural resources. Furthermore, EMEs are generally characterized by domestic political instability, infrastructure problems, immature capital markets in strong need of heavy investments, lack of a solid track record of foreign direct investments, difficulty in finding information on trading companies and difficulty in selling debt in secondary market – whose cost is higher due to the higher risk beard by

investors and for the burden of researching information about those companies themselves. Although local debt or equity markets of EMEs countries are typically liquid, they don't usually present high local demand and, for this reason, they develop strategies heavily relying on export (Kimberly A., 2019: online). Many EMEs countries' GDP composition is characterized by a large contribution of services sector, usually greater than the industrial or the agricultural ones. Naturally, however, each country accounts for historical, economic, political, environmental and social conditions which create proper individual conditions, different from case to case.

In order to identify which nations can be appointed as EMEs, currently there exist five institutions providing their own lists of EMEs countries, which are the International Monetary Fund (IMF), Morgan Stanley Capital International (MSCI), Standard and Poor's (S&P), Russel and Dow Jones. The lists comprehend from 26 (for MSCI) to 19 (for Russel) countries, and fifteen of them are commonly agreed to be appointed as EMEs, i.e. Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, Thailand and Turkey. Countries can be upgraded as developed countries or downgraded as frontier nations as the economic conditions are subject to some changes. Such countries are located in different geographic areas and displaying proper and varying environmental, social and governmental conditions. In this way, they also represent different investing opportunities.

1.4.2 Characteristics of the Green Bond Market in EMEs

As a matter of fact, EMEs do not always have the availability of established markets and large capitals or credit worthiness that would allow for a rapid and robust green bond market development, as happened for developed countries. Public sector played a remarkable role in green bond issuances and investments in developed countries, whilst the naissance of the green bond market in EMEs is mainly the result of the contributions from development banks. The market was able to expand and grow in developed economies through the work of regulators and policymakers who understood the criticality of providing guidelines, standards, disclosure requirement and incentives. Last decade saw increasing private financing in infrastructures and renewable energy, but this growth was much slower for EMEs, as a consequence of the presence of additional risk factors that private investments face when it comes to political, regulatory, macroeconomic, business and climate change risks (Figure 14). For this reason, between the main objectives of green bond policies it also stands a major

involvement of private capital to finance low-carbon projects. Incentives and actions aimed at mitigating such risks would help to overcome some of the challenges faced, and financial instruments like green bonds are exceptionally suitable for this purpose.

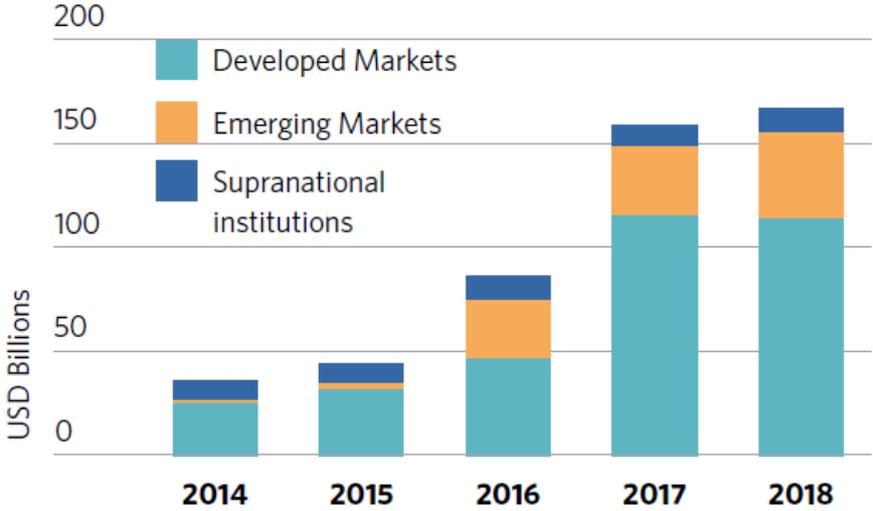


Figure 14: Issuances from Emerging Markets
Source: CBI State of the Market 2018 (CBI, 2019b)

The development of country-level clear guidance concerning green bonds issuance is a critical element able to boost local green bond markets growth. Local issuances would align, enabling the achievement of national climate and infrastructure targets and market scale which, in turns, reduces transaction costs. Moreover, market integrity would be granted by high-quality standards for processes linked to the issuance of green bonds, enhancing transparency and relying on clear qualification criteria for a project to be “green”. The first between the EMEs to publish mandatory national guidelines was China, in 2015 (SBN, 2018a). The first green bond issued by an EME country dates back to 2012, and was issued in South Africa. Since then, several EMEs countries entered the market, increasing the degree of differentiation. In the 2018 State of the Market report,⁵ the CBI disclosed that the share of EM green bond issuance with respect to total issuance is increasing and, up to date, it stands at one quarter of total issuance. Of this share, China leads the market accounting for more than 70% of EM issuances, corresponding to 18% of total global issuance, second only to the US. India represents the second largest EM green bond market, with cumulative issuances for \$7.2 billion against the \$30 billion from China.

Excluding China from the analysis for the rest of the paragraph, the state of the market for EMEs pictures a well-diversified set of issuers, with the prevalence of non-financial

⁵ CBI’s reports follow the list of EMEs provided by the MSCI.

corporates, which accounts for almost one third of cumulative issuance. Almost 50% of them belong to the energy sector, while forestry and paper companies account for a share of 27%. The second most common issuer type, with a share of 22%, is represented by government-backed entities, while local governments and sovereigns together account for approximately 18% by total volumes. Also development banks' share is substantial, at 20% of EM total issuances. Financial corporates instead stands at 10% and ABS issuances are still sporadic when not taking China into consideration.

With respect to the use of proceeds, renewable energy sector stands in the first place with a share of 52%, followed by buildings, transport and land use (respectively at 13%, 11% and 10%). Minor shares include water at 5%, waste at 4%, adaptation at 3% and industry at 2%. On the contrary, when considering solely sovereign bonds' proceeds allocation, this results more equally distributed than the general average, resulting in equal shares of 25% for finance renewable energy, transport and land use sectors, followed by both buildings and adaptation at 10%, then waste at 5% and water at 0.2%.

Green bonds benefit from a great coverage of external review also in EMEs, where 80% of issuances by number had at least one external review. 60% of EMEs green bonds by volume are interested by a second party opinion, and almost 35% of them was reviewed by Sustainalytics, 16% by CICERO and 5% by Vigeo Eiris. For 2018, 18% of EMEs green bonds by volume (excluding China) has been Certified under the Climate Bonds Standards and Certification Scheme, which ensures assets and projects' compliance with the Paris Agreement. However, this share in EMEs is higher than the global average, which account instead for 14% of Certified bonds over total issuance for the year. The greatest amount of Certified green bonds between the EMEs goes to China, at \$10.5 billion, followed by India at \$3.9 billion. In addition, when excluding China, post-issuance reporting accounted for 86% of green bonds issued prior to November 2017, and when including the country the percentage increases at 91%. Notwithstanding the lack of transparency generally associated to EMEs, it is relevant to highlight that the market for green bond is instead associated to higher degree of transparency.

Figure 15 makes reference to the structure of EMEs green bonds, with a majority of unsecured bonds followed by equal percentages for sukuk issuances from Malaysia and Indonesia and for private placements. Sovereign deals have also been set by Seychelles and Fiji. This degree of diversification represents EMEs' ability to adapt the green label to local market conditions and investors' preferences.

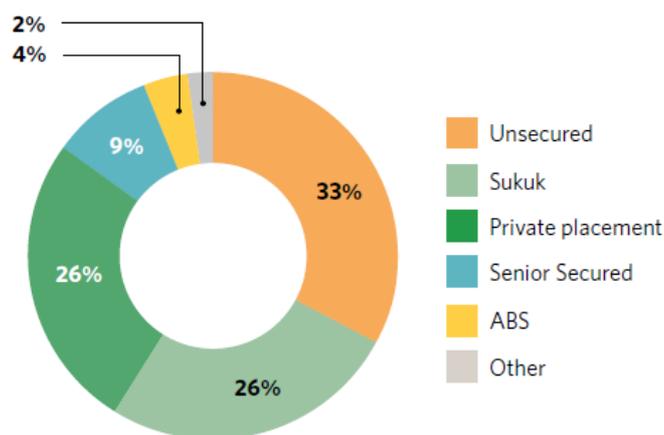


Figure 15: EMEs green bond structure
Source: CBI State of the Market 2018 (CBI, 2019b)

Finally, an analysis of currency denominations highlights the predominance of hard currencies, which can represent an attempt to attract international investments. However, the presence of denominations in local currencies also signals the presence of domestic demand. In fact, also supranationals supported local-currency issuances. Sovereign green bonds are denominated in USD and EUR, with the exception of Nigeria and Fiji (CBI, 2019b).

1.4.3 Barriers faced by Green Bond Market Development in EMEs

Developed countries and emerging market economies face different challenges reflecting the state of the green bond market development reached and the specific constraints arising as a consequence of the characteristics of a selected region. Barriers constitute a greater problem in EMEs, where domestic debt capital markets are likely to lack some of the elements necessary for a steady growth, such as infrastructure projects matching low-carbon objectives, agreed green definitions, and knowledge related to procedures and benefits linked to the green bonds and their issuance, cash flow stability, high credit ratings for potential issuers and, finally, the availability of bonds whose size and maturity is sufficient to match financing needs. Governments' intervention is unquestionably necessary to address such obstacles, whilst supporting the growth of debt capital market for the creation of sustainable, low-carbon and climate-resilient infrastructures.

Even though specific barriers arise, there exist more general barriers common to many of the EMEs, as those concerning the lack of common definition and frameworks, of green projects pipelines and aggregation mechanisms, as well as the absence of clear risk profile of green investments and of information and market knowledge. Further difficulties encountered by

green investments in EMEs generally concern the size of the projects, as the number of small-sized projects greatly overcome that of large-scale ones available. Aggregation and securitization would allow for the financing of projects that individually would be too small for the issuance of a dedicated green bond. However, suitable aggregation mechanisms and model are still missing, as a consequence of the settlement of contracts with non-standard characteristics and of the instability that cash flows sometimes present. Instruments like ABS and covered bonds are used to reach the volume and risk-diversification characteristics typical of green bonds required by large investors (Cochu et al., 2016).

From 2012, more and more developing countries' financial institutions are connecting to the Sustainable Banking Network, a "*unique community of financial sector regulatory agencies and banking associations from emerging markets committed to advancing sustainable finance in line with international good practice*" (IFC, no date, b: online). The IFC acts as its secretariat and it currently accounts for 51 members. Thanks to a survey conducted by the IFC to the 35 SNB members at the time between February and March 2018, 22 developing countries self-assessed which were the challenges they perceived as more difficult to prevail. They are, in decreasing order of impact:

- *Lack of knowledge and capacity within regulatory agencies*
- *Lack of interest among financial institutions*
- *Insufficient demand for green bonds among local investors*
- *Lack of supporting regulation*
- *Lack of local frameworks and guidelines*
- *Lack of qualified local organizations to provide independent verification*
- *Insufficient pipeline of suitable green bond assets*

The survey distinguishes between: nascent markets, markets with no issuance, and emerging markets. In nascent markets, main problems are represented by the lack of interest and insufficient demand from local financial institutions and investors, together with the lack of supporting regulations. In markets with no issuance, main barriers are the lack of local frameworks and guidelines, insufficient demand from local investors and lack of knowledge. The most challenging factors for emerging markets are the lack of knowledge within regulatory institutions and the insufficient demand from local investors, then the lack of local verifiers and the presence of multiple standards, and finally, the need for incentives to boost a still nascent market and the condition of local markets. The SBN efforts are directed toward the development of practical tools for capacity building, so that information sharing and

technical assistance could enhance general market education for regulators, issuers, investors and verifiers (SBN, 2018a).

From the point of view of potential issuers, the lack of awareness of green bonds benefits and risks is one of the main barriers faced, which also entails reluctance in facing the initial costs that must be beard in order to build market knowledge, issuance processes (governance, use of proceeds management, external review and reporting) and internal expertise. Moreover, as clear definitions lack in most jurisdictions, issuers are not able to surely assess a green label and, when they are particularly risk averse to the possibility the green labelling is publicly challenged, they would rather renounce to the green bonds benefits not to bear the risk of suffering reputational damage.

When considering investors, one of the risks they may face is represented by greenwashing, which can arise as a consequence of the absence of clear guidelines and definitions. In fact, the GBP, the most widely internationally accepted set of standards, do not provide clear definitions for eligible projects but only a broad orientation that leave the responsibility of qualifying asset or project as “green” to issuers, verifiers, indices and investors. This type of approach is dynamic, meaning that it leaves room for evolution and adaptation to changing condition, but also for insecurities concerning the greenness of a project. On the other hand, the proliferation of local regulations entails the increase of transaction costs. A solution stands in the development of harmonization initiatives and the increase of transparency of practices through green bond indices and listing, which would help investors to clearly categorize and choose green bonds (GIZ, 2018a). International standards alignment would be critical to learn by other established markets, sharing knowledge to obtain benefits. An integrated approach for standards updates would further direct the market towards other sustainable instruments that are attracting more and more issuers’ and investors’ interest, like social and sustainability bonds (AMMC, 2019). Another risk faced by investors, concerning in particular new market participants, is the fact that credit ratings cannot be usually suitably assessed, thus investors would not be willing to invest in uncertain and risky projects that do not meet their quality criteria. Moreover, uncertainty is linked also to the type of financial product and technology involved, which related risk is even higher in newly emerging green investments than in established sectors. Public sector can intervene in order to absorb part of the risks associated with issuers whose investments do not reach good credit rating. In this way, public investments can provide a signal that investments are reliable, stimulating demand and enhancing private financing (Cochu et al., 2016). For non-domestic investors, major impediments are represented by limited access to local green bond markets, differences in

disclosure requirements and the inadequacy of regulatory instruments for risk mitigation and capital controls. Barriers are also faced by the array of external reviewers, with the absence of harmonized procedures able to foster independence and best practices in the first place. The problem could be faced both indirectly, through increasing education concerning the positive effects their role entails, and directly, through policies requiring obligatory external reviews for labelled green bonds (GIZ, 2018a).

Policymakers are in the position to design the tools necessary to overcome some of these challenges, as the provision of financial insurance that would eventually enhance ratings, or the purchasing of subordinated debt or equity – or the first loss of capital in case of any loss – or the arrangement of tax incentives and policy risk insurances and de-risking tools like guarantees and credits (Coche et al., 2016). Moreover, initiatives from both policymakers and market stakeholders aimed at promoting capacity building and at raising awareness should sustain the provision of technical assistance EMEs green bond markets need to grow. The integration of environmental factors into investment decisions and the standardization of definitions and disclosure requirements is critical at this stage of development. As green bonds education spreads, awareness about their benefits and the opportunities they bring along would increase too. As the investor base widens, the risks related to demand fluctuations would decrease. Consequently, it emerges the necessity to dispose of clear green bond principles and issuance processes which would increase transparency and investors trust, and support the achievement of international standard alignment (LSEG, 2018).

2. The Stage of Development of the Green Bond Market in EMEs

The picture of the state of development of green bond markets in emerging markets economies shows both common characteristics per geographic area as well as country-specific singularities. Depending on the degree of implementation of regulations and guidelines, in fact, different countries come to face different levels of stability and speed in growth. They all present different reasons for developing green bond markets, and specific environmental issues to address. Between their common characteristics, they figure the presence of critical situations for pollution or threats of climate change effects, national commitment to reach ambitious objectives, the need for private sector to join the markets in order to finance targeted amounts, and the key role governments play in boosting markets and promoting regulations to clarify definitions and processes, to increase transparency and, consequently, investors' confidence. In many cases, EMEs are also developing countries presenting serious concerns in environmental and social issues, characteristic that makes them suitable for the establishment of green financial systems which allow for the achievement of sustainable development. Green bonds, in fact, are the most accessible and suitable between the green financing tools that can be used for green capital rising because of the higher stage of development achieved.

In order to be able to provide a more complete understanding of the global picture of the green bond market development in the emerging markets, this section will provide information concerning the stage of development reached by selected countries as of mid-2019. The case studies, organized following a geographical diversification, will start from African countries, moving then to Asia, which presents two main regions: Asia Pacific and Greater Middle East (cobbled together with Russian Federation), moving then to Latin America and Caribbean and finally to Central, Eastern and South-eastern Europe.

Countries interested are those belonging to the list of EMEs provided by the MSCI, to which also the CBI's reports make reference. The MSCI is an independent provider of research, high quality data, analytics, and decision-support tools for institutional investors with the purpose of helping them in assessing risk, managing portfolios more efficiently and delivering better outcomes for stakeholders (MSCI, no date, a: online). As it is possible to observe from Table 7, the list of EMEs of the MSCI comprehends the following 26 countries: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South

Africa, Taiwan, Thailand, Turkey and United Arab Emirates.⁶ The list is further integrated with a series of countries identified as EM by Bloomberg,⁷ i.e. Costa Rica, Fiji, Kenya, Lithuania, Latvia, Mauritius and Morocco.

Table 7: MSCI 2019 Market Classification
Source: MSCI (MSCI, no date, b: online).

MSCI ACWI & FRONTIER MARKETS INDEX									
MSCI ACWI INDEX					MSCI EMERGING & FRONTIER MARKETS INDEX				
MSCI WORLD INDEX			MSCI EMERGING MARKETS INDEX			MSCI FRONTIER MARKETS INDEX			
DEVELOPED MARKETS			EMERGING MARKETS			FRONTIER MARKETS			
Americas	Europe & Middle East	Pacific	Americas	Europe, Middle East & Africa	Asia	Europe & CIS	Africa	Middle East	Asia
Canada	Austria	Australia	Argentina	Czech Republic	China	Croatia	Kenya	Bahrain	Bangladesh
United States	Belgium	Hong Kong	Brazil	Egypt	India	Estonia	Mauritius	Jordan	Sri Lanka
	Denmark	Japan	Chile	Greece	Indonesia	Lithuania	Morocco	Kuwait	Vietnam
	Finland	New Zealand	Colombia	Hungary	Korea	Kazakhstan	Nigeria	Lebanon	
	France	Singapore	Mexico	Poland	Malaysia	Romania	Tunisia	Oman	
	Germany		Peru	Qatar	Pakistan	Serbia	WAEMU ⁸		
	Ireland			Russia	Philippines	Slovenia			
	Israel			Saudi Arabia	Taiwan				
	Italy			South Africa	Thailand				
	Netherlands			Turkey					
	Norway			United Arab Emirates					
	Portugal								
	Spain								
	Sweden								
	Switzerland								
	United Kingdom								
MSCI STANDALONE MARKET INDEXES ⁹									
						Americas	Europe & CIS	Africa	Middle East
						Jamaica	Bosnia Herzegovina	Botswana	Palestine
						Panama	Bulgaria	Zimbabwe	
						Trinidad & Tobago	Malta		
							Iceland		
							Ukraine		

2.1 Africa

The MSCI list of EMEs comprehends only two African countries, Egypt and South Africa. Nevertheless, Bloomberg provides data on green bonds concerning also Mauritius and Nigeria. Moreover, there are at least other two African countries which reached relevant stages of green bond market development for the continent and which are worth mentioning: they are Kenya and Morocco, classified as frontiers and standalone markets by the MSCI and

⁶ Argentina and Saudi Arabia have been reclassified from Frontier and Standalone markets respectively to EM in May 2019 (MSCI, no date, b: online).

⁷ Bloomberg provides its own country classification, diversifying between Emerging and Developed countries with respect to Equity, Bonds and Currency. Costa Rica, Fiji, Lithuania, Latvia and Mauritius have been selected from this source and included in the case studies because they have issued active green bonds up to May 31st, according to the data available in the platform, whilst Kenya and Morocco are worth being included because of their efforts in entering the green bond market.

as developing countries by the IMF. Furthermore, Bloomberg classifies all of these countries as Emerging Markets.

Africa geographical location, together with its limited adaptation capacity, let the continent particularly exposed to climate change negative effects. Financial instruments like green bonds can boost the achievement of the amount of investment needed to edge and handle these risks, but many challenges must be addressed in order to make it possible. Green financing is particularly suitable for infrastructure projects, as it allows for low-cost and long-term source of capital, and Africa is plenty of industries that can take enormous advantage from it. Local green bond markets are still relatively underdeveloped with respect to those in other continents' emerging markets. In fact, researchers conducted by the African Development Bank (AfDB) highlight how renewable electricity generated in Africa is 20 times lower than that produced in similarly sized continents, including Asia (LSEG, 2018). Between the local initiatives implemented with the purpose of enhancing the development of the green bond market, institutions like the AfDB and the IFC worked together to create funds to invest in green assets. The AfDB is a banking group devoted "*to spur sustainable economic development and social progress in its regional member countries (RMCs), thus contributing to poverty reduction*" (AfDB, no date: online). The institution participated to the green bond market issuing a \$500 million triple A investment grade green bond in October 2013. Although AfDB bonds were usually bought by central banks and other official institutions for about 75%, the green bond accounted for 84% of socially responsible investors (SRI) – 43% asset managers, 28% central banks and other official bodies and pension funds, 1% retail and private banks. Geographically speaking, investors belonged for 52% to the Americas, for 39% to the Europe, Middle East, and Africa (EMEA region) – mainly Europe – and 9% to Asia. African green bond market is highly sensible to the size of the deals available (mainly present in the form of small-sized deals in secondary market), to the quality of the pipeline and to the credit rating of issuers. The joint effort of the AfDB, the European Investment Bank, the International Finance Corporation and the World Bank is a significant contribution to the green bond market development. Through informal working groups, they are working on framework harmonization for impact reporting concerning projects financed by green bonds proceeds, with positive consequence of enhancing transparency and comparability (Duru, Nyong, 2016).

One of the main priorities of African countries is to increase citizens' access to basic power services. As most of these countries ratified the Paris Agreement, they must pay attention to work for the achievement of their objective while respecting their commitment for a low-

carbon energy employment, avoiding fossil fuel. As a minor utilization of fossil fuel entails a loss of revenue, it would be necessary to find alternative revenue sources from different sectors. Governments have a delicate role to play in promoting and managing the shift to climate-resilient economy, implementing policies in favour of green assets. In particular, heavy investments in infrastructure, diversification of finance mechanisms and sources of funding and the inclusion of private sector fall between the priorities of most of the continent's nations. Challenges African countries generally need to overcome in order to let the green bond market growth stand for both issuers and investors. For the formers, they are firstly the lack of clear guidelines on green bond issuance, with countries finding themselves at different stages of green bond market development and lacking demand from institutional investors. Secondly, issuers' lack of awareness and understanding of the green bond market itself, which is a consequence of low education and knowledge, implicates the availability of few professionals dealing with green bonds and enjoying the benefits they entail. Capacity building among issuers, potential investors and, more generally, green bond market actors could come as the result of stakeholders cooperation and knowledge sharing. It would entail an adequate assessment of sustainable instruments and management of data and practices (AMMC, 2019). Finally, the fact that African green bond market is still nascent permits only small-sized deals, size which usually is not sufficient to attract a significant investor base. Also the number of available projects is low, preventing the creation and analysis of a yield curve across multiple maturities which would increase knowledge about factors like coupons or subscription ratio for potential issuers, enabling further issuances. In order to ensure a prosperous development of the market, issuers should be able to propose more robust pipelines of projects and to contribute to the standardization of the market, which would allow to cut down transaction costs for investors. When considering investors' point of view, first, the lack of a clear guidance on green bond issuance makes investors perceive limited transparency from the reporting structure and the use of proceeds. Second, the lack of awareness of markets deriving from the previous point leads investors not to trust completely on the information provided. Third, the limited pipeline of projects and the small size of investments prevent the approaching of larger institutional investors, who would incredibly boost market growth. Last, the lack of fiscal incentives further encumbers market expansion. On this purpose, Kenya is the first African country which tried to overcome this obstacle by providing infrastructure bonds with tax incentives, and evidence shows high probabilities for other African countries to introduce similar tax incentives too.

Governments are intervening with local regulations and initiatives, sharing the goal of the enlargement of green capital sources. A main priority is thus the enhancement and wideness of investor participation. Government role in designing regulations, incentives and supportive policies can allow to reach the market scale through which a yield curve for African green bonds can be drawn. This would further increase awareness and investors' confidence. Furthermore, an innovative use of green financing would both boost market development and attract new kinds of investors. Finally, the issuance of international green bonds would allow for raised awareness at global level for domestic opportunities, forcing the respect of internationally recognized best practices and attracting a diversified investor base (LSEG, 2018). Of the capital flow generated at global level, only a small portion is captured by Africa, which aims at increasing its share of international investments.

A table like Table 8 will be presented before the case studies analysed for each region considered, in which information concerning the countries in analysis are summarized. They include official names, currency, total area and population as at the end of 2018 (World Population Review, no date: online), gross domestic product and per capita GDP.

Table 8: Summary of African EMEs

Official name:	Arab Republic of Egypt - EG	Currency:	Egyptian pound - EGP
Total area:	996,603km ²	Population (2018)	99,375,741
GDP, PPP, \$ (2018)⁸	1,219,509.68	GDP per capita, PPP, \$ (2018)⁹	12,390.4
Official name:	Republic of Kenya - KE	Currency:	Kenyan shilling - KES
Total area:	580,367 km ²	Population (2018)	51,392,565
GDP, PPP, \$ (2018)	177,893.89	GDP per capita, PPP, \$ (2018)	3,461.4
Official name:	Republic of Mauritius - MU	Currency:	Mauritian rupee - MUR
Total area:	2,040 km ²	Population (2018)	1,267,185
GDP, PPP, \$ (2018)	29,999.20	GDP per capita, PPP, \$ (2018)	23,709.1

⁸ All data on GDP are based on PPP, current international \$ at July 1st, 2019 and make reference to the most recent value for year 2018. PPP allows to compare different living standards across countries with different currencies, taking into account the exchange rates (World Bank, no date a: online).

⁹ All data on per capita GDP are based on PPP, current international \$ at July 1st, 2019 and make reference to the most recent value for year 2018 (World Bank, no date b: online).

Official name:	Kingdom of Morocco – MA	Currency:	Moroccan Dirham - MAD
Total area:	446,550 km ²	Population (2018)	36,029,093
GDP, PPP, \$ (2018)	314,241.27	GDP per capita, PPP, \$ (2018)	8,586.6
Official name:	Federal Republic of Nigeria - NG	Currency:	Nigerian Naira - NGN
Total area:	923.768 km ²	Population (2018)	195,875,237
GDP, PPP, \$ (2018)	1,171,386.85	GDP per capita, PPP, \$ (2018)	\$5,887.2
Official name:	Republic of South Africa - ZA	Currency:	South African Rand - ZAR
Total area:	1,221,037 km ²	Population (2018)	57,792,518
GDP, PPP, \$ (2018)	789,348.92	GDP per capita, PPP, \$ (2018)	13,661.4

Kenya and Egypt

Kenya and Egypt are two countries that have not issued any green bond yet, however, they are working on standards development in order to create a basis for a forthcoming development of local green bond markets.

Egypt is provided with plenty of opportunities for a green bond market, and it is directing its interest towards infrastructure upgrading and the energy sector. In particular, the country aims to the increase of its capacity to produce, transport and distribute electricity and to achieve a share of 42% of renewable energy by 2035 through a series of reforms enhancing private sector participation (UN, no date, a: online). A main challenge to overcome is represented by water scarcity, with the agricultural sector exploiting almost two thirds of fresh water supply. For these reasons, the government is taking into consideration a green bond issuance in the near future. The Ministry of Finance aims at increasing long-term domestic bonds up to 70% of annual offerings by 2020, and green bonds would align also to this purpose (Enterprise, 2019: online). In order to prepare the market to this new type of financial instrument, since June 2018, the Financial Regulatory Authority of Egypt has been assisted by the IFC to develop a concept paper for national Green Bonds Guidelines. The Guidelines are based on the GBP four core components and have the purpose to promote the naissance of a green bond market in the country.

Also Kenya seems close to a green bond issuance. The country's economy is heavily relying on natural resources and disposes of inadequate infrastructures, factors that put the country under the main threat of changing weather conditions and related environmental risks. The country is thus supporting a sustainable and equitable economic growth through the implementation of several policies aiming at enabling the transition to a green economy. Among these policies, Vision 2030 provides for the usage of instruments like the green bonds market, whilst the Green Economy Strategy and Implementation Plan (GESIP) concerns public sector investments and plans the emission of a sovereign green bond by the National Treasury for the fiscal year 2018/2019. The National Policy on Climate Finance identifies a set of eligible projects which almost coincide with those provided by the Climate Bond Taxonomy, with the exception of Information, Communications and Technology sector which is included in the Taxonomy but not in the NPCF (CBI, no date). The Kenya Green Bond Programme has been established in 2017, coordinated by the KBA, the Nairobi Securities Exchange (NSE), the CBI and the SFI (KBA, 2017). It aims at supporting the issuance of the first Kenyan green bond and developing a domestic green bond market. It plans the development of a pipeline of green investments engaging with both local and international investors, the support of banks and corporates in green bond issuance, the creation of a pool of Kenya-based licensed third-party certifiers, the development of a cooperative fixed income fundraising structures able to pool green assets which do not reach a sizeable issuance of \$30-50 million on their own, which would allow to take advantage of optimized transaction costs and, finally, the promotion of green Islamic finance (LSEG, 2018). Green bonds would help diversify Kenya's capital markets and also provide lenders with opportunity to raise the estimated amount of Sh2.4 trillion required to support green economic activities in areas such as afforestation, renewable energy and public transport. As for Egypt, also in Kenya a local regulatory framework named Green Bond Guidelines was developed. It has been prepared under the guidance of the CBS and following GBP's four pillars, thus resulting aligned with international practices and increasing the potential to attract foreign investments. The guidelines significantly foster the country's capital market product offering, allowing investors to diversify their portfolio. The requirements comprehend the figure of an independent verifier to certify the green features of the bond at pre-issuance stage, and the obligation for issuers to report on a continuous basis. NSE Listing Rules has been amended to include the procedure for listing green bonds on the NSE.

Mauritius

Mauritius is an island country in the Indian Ocean and is highly vulnerable to climate change and sea level rise, and a transition to a LCR economy would be fundamental for the country. The Stock Exchange of Mauritius (SEM) organized a Green Bond training programme with the support of the Ministry of Finance and the United Nations Partnership for Action on Green Economy in May 2018. The goal was to enhance the development of a local green bond market, identifying the characteristics of such financial instruments and training potential verifiers. It is also intended to publish a guidance note concerning green bonds listing on its Stock Exchange, which already launched a SEM Sustainability Index in 2015 (SEM, 2018). In August 2017 the Indian company Azure Power Energy Ltd issued a green bond in the country for \$500 million, Certified by the CBI under the Solar Criteria.

In February 2017, Neerg Energy Ltd, headquartered in Mauritius, issued secured bonds for \$475 million, and used the proceeds to subscribe a Masala bond from the Indian company ReNew Power Ventures (Global Ethical Banking, 2019: online). The Masala bond is a green bond Certified by the CBI under the Solar and Wind Criteria (CBI, no date, e:online)

Morocco

Kingdom of Morocco, located in North West Africa, is taking action to regulate the usage of renewable resources, issuing a law covering energy supply and engaging in the construction of important solar energy farms with the aim of not depending solely on fossil fuels. The country has plenty of projects available for green financing and it is actively participating to the development of the global green bond market, hosting the COP22 summit of 2016 in Marrakech. During the conference, the continental coalition named Marrakech Pledge was established with the objective to foster green capital Markets in Africa to enhance climate finance growth (AMMC, 2019). The coalition is made up of 23 African countries and 19 African markets regulators and exchanges. *“It aims to work collectively to enable the rapid and effective establishment of climate-resilient capital markets and a surge of efficient and innovative climate-resilient Capital Markets System in Africa and the surge of efficient climate finance mechanisms, with the view to allow for a substantial increase of public savings and private capital flows towards low-carbon and climate-resilient investments, particularly in developing countries”* (Marrakech Pledge, no date: online).

When considering the local green bond market, in October 2017 the Moroccan Authority of Capital Market (AMMC) and the IFC published the Green Bond Guidelines, with the

objectives to help the development of a national green bond market and to clarify roles and requirements associated with green bonds, following the GBP and its four pillars. The first green bond of the country has been issued by Masen, the Moroccan renewable energy agency, in November 2016, with the aim of funding solar power projects. The bond raised \$153 million through private placement with four qualified investors authorized by the AMMC (Al Barid Bank, Attijariwafa Bank, La Caisse Marocaine des Retraites and La Société Centrale de Réassurance) and was underwritten by a State guarantee, with the effect that interest cost could be optimised at 10bp risk premium. Alignment with GBP has been confirmed through a second opinion by Vigeo Eris and it also obtained CBI Certification. The funding mechanism used was innovative and, as complying with both GBP and CBS, investors were confident towards Masen projects (Brittlebank W., 2016: online). Other four green bonds have been issued after that. Two of them originated from two banks for energy-related projects, with one of them issuing a green bond with the innovative feature of being denominated in Euros, increasing the Moroccan market borders and complexity. A third bond was issued by the Casablanca Finance City Authority for financing green buildings and the last one by the construction company Al Omrane Holding. In total, the five green bonds issued as a result of AMMC commitment and government's policies implemented were able to raise approximately \$420 million (AMMC, 2019).

Nigeria

Located in West Africa, Federal Republic of Nigeria is called the “Giant of Africa” for being the 7th most populous country at global level. Nigeria is one of the most developed African countries, classified as a mixed economy. It has plenty of natural resource and, provided with the largest natural gas proven reserve in the continent, it is the 8th largest exporter of petroleum in the world. Capital markets, stock exchange, legal and transport sectors are well-developed, whilst human rights remains poorly implemented and poverty is widespread. Most of the main activities performed by the country directly impact the environment, resulting in water pollution and scarcity of resources. Summed up with climate change impacts (as desertification in the north, deforestation and erosion in the south and southeast, flooding and increasing sea levels, population migration towards south and oil pollution in the Niger Delta (Proshare, 2018a: online)) damages to the environment and to the society result substantial. The transition to a more LCR economy must take into consideration the needs of the territory and the impact of infrastructure projects, relying on renewable energy and resources apart

from those of the oil sector, promoting energy efficiency and sustainable land use (FME, 2015). In line with national strategies and regulations concerning climate-related issues, in December 2017 the Federal Government of Nigeria issued a sovereign green bond, representing the first of this kind for the continent and the fourth one at global level. It raised \$29.7 million, devoted to solar energy projects and national afforestation programs. Its issuance has been graded “excellent” by rating agency Moody, thanks to the tracking system designed for the use of proceeds. It has been Certified by the CBS under the Solar and Land Use Change Criteria. In 2018, a 3-year Nigeria Green Bond Market Development Programme has been set up by the FMDQ OTC Securities Exchange, the Financial Sector Deepening Africa (FSD Africa) and the CBI, in order to enhance the development of non-sovereign debt capital and green bond market through awareness and education concerning the principles of green financing. Both national policies and market-related initiatives contribute to the green financing mobilization, with the banking sector promoting several voluntary sustainable initiatives (SBN, 2018b). In addition, the Securities and Exchange Commission of Nigeria (SEC) published Green Bond Issuance Rules on October 12th, 2018. Following international best practice for both GBP alignment and external review, and second party opinion of Climate Bond Certification, these guidelines aim to bring clearer guidance on issuance of green bonds, increasing transparency and monitoring from regulators and attracting foreign investments. Education and awareness are the first challenges the Nigerian green bond market has to face, trying to build capacity within regulatory agencies. The SEC has collaborated more than once with the Green Bonds Market Development Programme and tried to boost corporate issuances despite the fact that market conditions are currently unfavourable for them (Proshare, 2018b: online).

South Africa

Republic of South Africa is the largest country of southern Africa and the second-largest economy in the continent, after Nigeria. The nation is characterised by situations of poverty and inequalities, however, its GDP per capita is relatively higher when compared to other African nations. In most of sectors – from energy and waste management to clean water transportation and climate adaptation – South Africa needs considerable infrastructure financing. The country presents great potential for green bond market development, as witnessed by the increasing demand for renewable energy sources, still not satisfied for the lack of necessary funding. The country’s green bond market is the most developed between

African countries. South Africa has also been the first among the emerging market economies to issue a \$700 million green bond in 2012. The issuer was the state-owned Industrial Development Corporation, “*a national development finance institution set up to promote economic growth and industrial development*” (IDC, no date: online). On June 9th, 2014, the City of Johannesburg issued the first municipal green bond in an EME. It was also the first green bond listed on the Johannesburg Stock Exchange (JSE), a 10 years maturity deal raising \$140 million. It was priced at 185 basis points (1,85%) above the R2023 South African fixed rate government bond issued in 2012. The green bond was 150% oversubscribed and its proceeds are devoted to climate change mitigation projects, and in particular for the use of gas and natural energy (Williams V., Blumenthal M., 2014: online). The positive response obtained by the green bond partially derives from the city’s investment-grade credit rating and its reliance on international guidance. The JSE expressed the need for ESG integration in sustainable investment, while the country’s urgency to move toward renewable energy necessitates further financing. For these purposes, on October 25th, 2017, the JSE launched a Green Bond Segment which could help identify SRI funds and green securities and raising funds for low-carbon projects, and which can only be accessed following a mandatory external review. The JSE was the first exchange in the continent to launch a Green Bond Segment and Green Listing Rules, boasting several kinds of issuers as finance institutions, corporates and municipalities. JSE’s listing regulation is integrated by internationally-aligned requirements which contain distinct rules referring to local economy. These requirements include the disclosure of the proceeds both generated at issuance and used during the maturity of the bond (post-issuance on a regular basis) and the appointment of a verifier, i.e. the figure of an independent review who can use the best practices methodology better suiting the issuer’s business model, which needs to be independent from the issuer and has to demonstrate its expertise. Besides ensuring credibility, the relevance given to external review is also a signal of investors’ need for quality instruments (Mayekiso P., 2017: online). The requirements are a product of capital market expertise and sustainability, and represent a risk-mitigating tool able to enhance transparency, credibility and good governance of corporates, thanks to the characteristic of being able to maintain flexibility without overburdening the issuers (SBN, 2018a). In July 2017 the City of Cape Town issued the first green bond listed on JSE’s Green Bond Segment, a 10 year maturity green bond Certified by the CBI and rated by Moody’s as an excellent GB1¹⁰. It raised \$83 million allocated to projects linked to energy

¹⁰ Moody’s Green Bond Assessment scale: GB1 Excellent, GB2 Very Good, GB3 Good, GB4 Fair, GB5 Poor. See Appendix C to know more about it.

efficiency in buildings, electric buses and water management, this last representing one of the main priorities of the City, after it suffered a severe drought in 2015. The bond got a 4.3 times oversubscription in only 2 hours, with necessary offers covered just by 29 investors, demonstrating their interest for good-quality ESG-focused assets. The issuance of a green bond from a municipality further enhanced political demand for green bond projects at administrative level and highlighted the issue of future infrastructure development plans (Environmental Finance, 2018: online). Investors' demand for African green bond greatly surpasses their supply, showing evidence that the market is not yet exploited at full capacity.

2.2 Asia

Asia is the world's largest continent and it presents substantial heterogeneity between its diverse regions, characterised by a great variety of climate, environmental, social and political extremes. It is also the most populous continent in the world, despite the fact that its population is unevenly distributed, as a consequence of climatic differences across various regions. Rural areas represent the poorest regions, and much of rural inhabitants left for the cities as urbanization increased in the mid-20th century. The situation varies considerably also when considering the state of the economy, being present one of the most developed country in the world, Japan, and many middle-income countries, in particular in the Southwest Asia, and low-income ones, mostly in the North and Central Asia. Russia, occupying the north of the continent, is instead considered a lower-middle-income country. South Asia is characterised by the presence of low-income countries, category to which also China makes part, despite the fact that the country experienced one of the most dramatic growth rate since the late 20th century and it is located in East Asia – the most prosperous region of the continent made for the most part of upper-middle income countries. Asian industrial development had a significant impact in the 1950s. However, the mechanization of industries slowed down the growth in employment, which resulted in the growth of informal sector in the poorer regions. The majority of people are still engaged in agricultural activities, though it represents a diminishing share of GPD, especially in countries like China and India. Moreover, in the mid-20th century the continent was interested by the green revolution, which introduced new high-yielding food grains in developing countries, leading to the intensive utilization of irrigation and chemical fertilizers and pesticides (Hosch W.L., 2009: online). Countries like Indonesia increased the production of phosphate fertilizers, bringing even

greater concerns about the damaging effects this practice would cause to the environment (Britannica, no date, a: online).

Asia presents multiple environmental issues, from air pollution of China to poor waste management in India and forest fires in Indonesia. Because of the diversities between each region, a direct governmental intervention is the only mean to face local problems and to enhance the funding of sustainable projects. Despite diversities, there is general awareness of the need for green financing and capacity-building, and to include ESG factors in investment decisions. Asian green bond market is experiencing a fast growth: in 2015, green bond issuance in the continent accounted for less than 10% of global volume, while in 2017 it reached \$43.4 billion, achieving 36% of global issuance volume, and most of the growth in participation of Asia in the green bond market is due to China.

2.2.1 Asia Pacific

Asia Pacific¹¹ is the region recording the highest increase at global level of green bond issuances for the year 2017, with a rate of growth of 35%. In 2018, it represented the second largest region after Europe in terms of issuance volume, reaching the amount of \$48.5 billion issued. Figure 16 shows the participation to the green bond market of the countries of the region apart from China (CBI, 2019b).

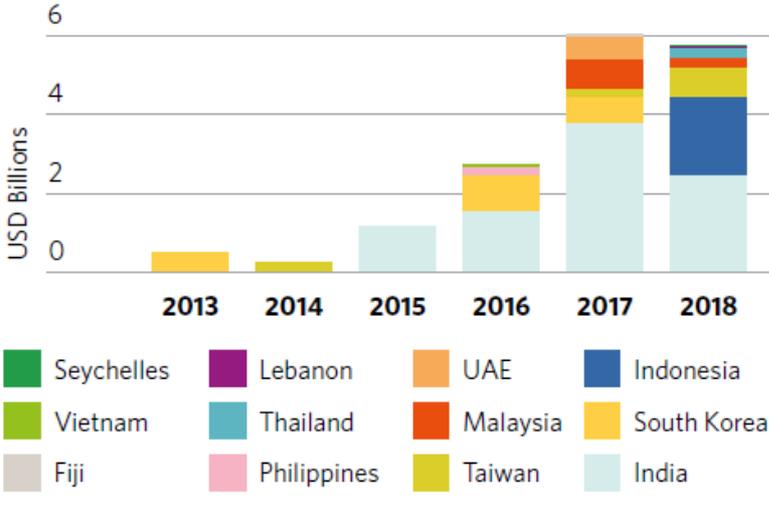


Figure 16: Asia Pacific issuances by country over time - excluding China
 Source: CBI, 2018 State of the market (CBI, 2019b)

The growth of the green bond market in the region is boosted by the suitability of green financing tools to edge climate-related risks that are significantly hitting the continent.

¹¹ The region usually extends from the East to the South of Asia and the countries included varies on the context. The CBI report includes also Australia.

Moreover, the presence of important natural resources in the region is threatened by the rapidly growing economies and expanding middle class populations, a development that did not occur in a sustainable way and caused significant environmental issues. Public sector alone is not able to provide the full financing needed for the continent, which requires, as estimated by the Asian Development Bank (ADB), \$1.7 trillion annually from 2016 to 2030 to close the infrastructure gap for Asia and the Pacific (Ra and Li, 2018). Private sector contribution is thus critical for reaching targeted objectives. Asian countries are progressively realizing the need for capacity building for their financial institutions, which would entail training to increase knowledge and being able to catch the opportunity to develop new sustainable financial products. Initiatives like the Fair Finance Asia Programme¹² arose. Its purpose is the *“reduction of the negative impacts of national and cross-border bank investments on human rights, the environment and climate change across the region through the stimulation of more transparency and accountability in the financial sector, and by encouraging integration of human rights standards and environmental, social and governance (ESG) criteria in financial actors’ policies”* (Oxfam, no date: online). As planned by the FFA Programme, support must be provided by markets stakeholders and organizations like CSR Asia, created in 2004 in Hong Kong, *“designed to help organizations create positive impact for themselves and the wider world through responsible, inclusive and sustainable business and promoting sustainability through a wide range of channels including advisory services, networks, platforms for cross sector collaboration and by providing access to a repository of insights”* (CSR Asia, no date: online). CSR Asia devotes its attention to Asian countries and, in particular, to EMEs, trying to enhance internal capacity of financing institutions.

Support for an accelerated growth of the nascent green bond market also arrived from the Association of Southeast Asian Nations (ASEAN), made up of 10 States (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam), four of which qualify as EMEs according to the MSCI. Of ASEAN green bond market, Indonesia has the largest share, at 39% of total regional issuance, followed by Singapore at 35% and Malaysia at 19%. ASEAN Capital Market Forum, a forum composed by capital market regulators from the Association of Southeast Asian Nations aimed at

¹² The programme operates in seven countries (Cambodia, India, Indonesia, Japan, Philippines, Thailand and Vietnam), it lasts five years (2017-2021) and works with different stakeholders and their networks, governments, financial institutions, financial regulators, investors and development banks. *“The cross-border nature of the industry requires an approach targeting both national and regional levels. The programme will work in close alignment with the Fair Finance Guide International network. It will influence and engage financial institutions and regulators to promote a sustainable financial sector in Asia”* (Ho J., 2019: online).

enhancing integration and connectivity of regional capital markets, released its set of standards concerning green bonds regulation in November 2017. ASEAN Green Bond Standards aim at meeting specific ASEAN’s infrastructure needs, promoting transparency, consistency and uniformity of the region’s green bonds, with the ultimate consequence of lowering due diligence costs and help investors in making informed investment decisions. They are based on the GBP but, instead of providing broad principles like the guidelines from the ICMA do, they provide more specific guidance and criteria. Besides the four core components of ICMA’s GBP, ASEAN Standards include criteria of geographical or economic connection to the region in order to become an eligible issuer, for the exclusion of ineligible projects (such as fossil fuel power generation projects), for the assurance of continuous accessibility to information, for the encouragement of more frequent reporting and for the usage of external review, which remains on voluntary basis (ASEAN, 2017). External review can take full or partial form, and requires the external review provider to have the relevant expertise and experience, and to disclose the related credentials. The patterns of external reviews can include consultant review, verification, certification and rating. The standards would further ease ASEAN countries’ effort in reducing carbon emissions, as settled under the Paris Agreement, through the means of increased transparency and diligence costs reduction. By November 30th, 2018, most deals from ASEAN countries were denominated in foreign hard currencies, primarily in USD, for 49%, and in GBP, for a total of 54% (Figure 17).

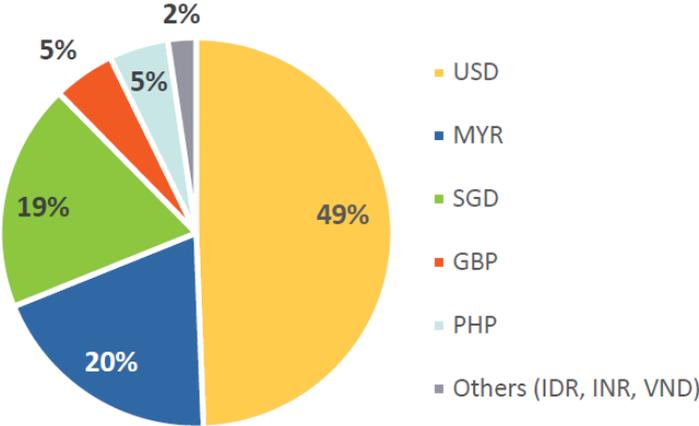


Figure 17: ASEAN issuance denomination by Nov 30th, 2018
Source: CBI ASEAN State of the market 2018 (CBI, 2019c)

With respect to the type of green bond issued, sukuk green bonds owns the largest share of 42%, while minor shares accounts for other types of securities like corporate bonds, bond programmes, private placements and loans (Figure 18).

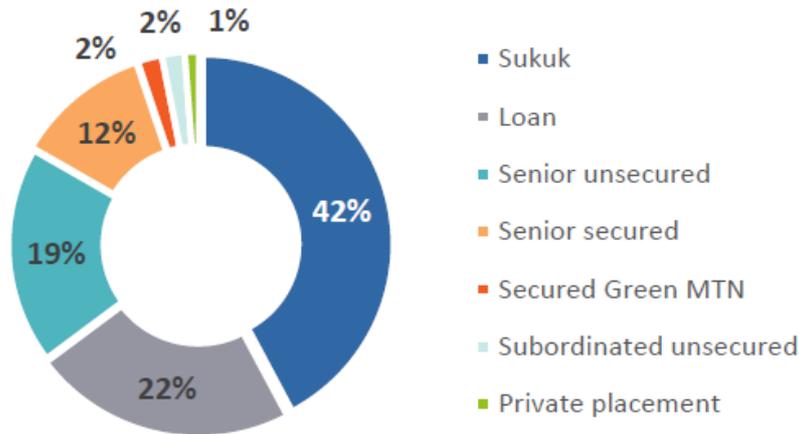


Figure 18: type of green financial instruments in ASEAN region by Nov 30th, 2018
Source: CBI ASEAN State of the market 2018 (CBI, 2019c)

Benchmark size, i.e. at least \$500 million, is reached by 20% of ASEAN green deals. However, in general their size is smaller than the benchmark, meaning that first issuers or entities with lower funding requirements have access to capital markets.

The percentage of ASEAN green deals using external review is high, namely 81% by total volume, of which 72% is from second party opinion, 6% from CBI Certification and 3% from green rating. The compliance with ASEAN Green Bond Standards reaches 51% of deals by volume (and 40% of deals by number). However, as Figure 19 shows, the situation can vary considerably when considering individual countries, as Thailand and Vietnam do not appear to be relying on any type of external review.

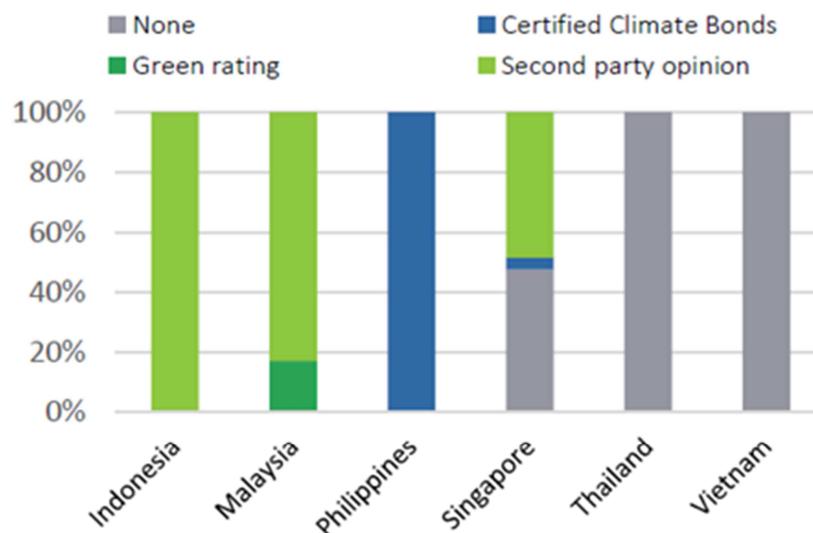


Figure 19: ASEAN external review coverage by Nov 30th, 2018
Source: CBI ASEAN State of the market 2018 (CBI, 2019c)

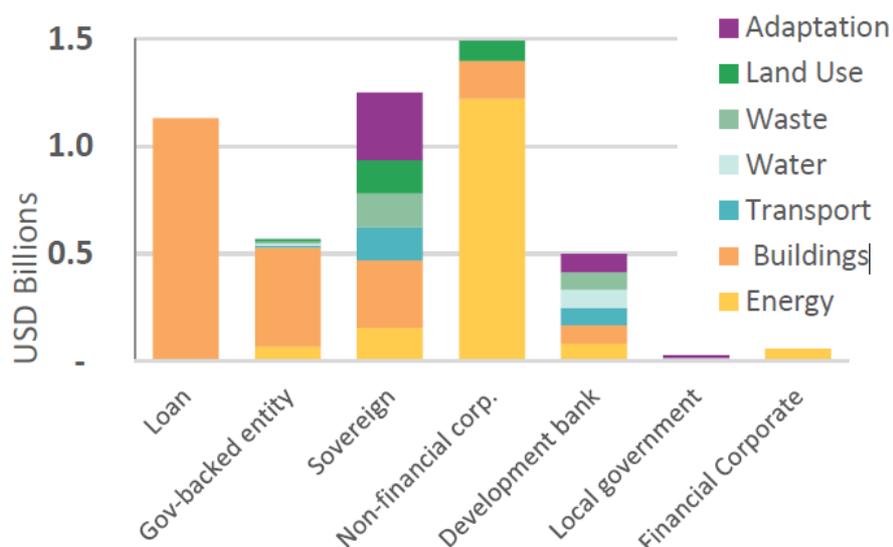


Figure 20: ASEAN issuance by issuer type and sector, by Nov 30th, 2018.
 Source: CBI ASEAN State of the market 2018 (CBI, 2019c)

Figure 20 describes that the sectors most interested by green investments are buildings and energy, at 43% and 32% respectively, followed by adaptation at 8%, land use, waste and transport at 5% each and water at 2%, for a cumulative issuance of \$5 billion. In particular, loans are totally directed towards buildings while non-financial corporations focus the majority of their investments on renewable energy (CBI, 2019c).

Two outstanding countries for the regional as well as the global green bond market are China and India. China is taking action to reduce carbon emissions whilst India plans to enhance the building of renewable energy capacity. They issued their first green bonds in 2015 and, since then, they experienced one of the fastest growth of green bond market, also thanks to the support of national governments. They are both engaged in expressing the importance of green financing, publishing documents emphasising the benefits of such instruments in local markets and actively participating with initiatives and regulations.

Table 9: Summary of Asia Pacific EMEs

Official name:	People's Republic of China – CN	Currency:	Chinese Yuan Renminbi – CNY
Total area:	9,706,961 km ²	Population (2018)	1,427,647,786
GDP, PPP, \$ (2018)	25,361,744.19	GDP per capita, PPP, \$ (2018)	18,210.1
Official name:	Republic of India - IN	Currency:	Indian rupee - INR
Total area:	3,287,590 km ²	Population (2018)	1,352,642,280
GDP, PPP, \$ (2018)	10,498,468.29	GDP per capita, PPP, \$ (2018)	7,761.6

Official name:	Republic of Fiji - FJ	Currency:	Fijian dollar - FJD
Total area:	18,272 km ²	Population (2018)	883,483
GDP, PPP, \$ (2018)	9,721.60	GDP per capita, PPP, \$ (2018)	11,003.7
Official name:	Republic of Indonesia - ID	Currency:	Indonesian Rupiah - IDR
Total area:	1,904,569km ²	Population (2018)	267,670,543
GDP, PPP, \$ (2018)	3,494,761.84	GDP per capita, PPP, \$ (2017)	13,056.6
Official name:	Malaysia - MY	Currency:	Malaysian Ringgit – MYR
Total area:	330,803 km ²	Population (2018)	31,528,033
GDP, PPP, \$ (2018)	999,404.80	GDP per capita, PPP, \$ (2018)	31,698.4
Official name:	Republic of the Philippines - PH	Currency:	Philippine peso - PHP
Total area:	342,353 km ²	Population (2018)	106,651,394
GDP, PPP, \$ (2018)	952,966.94	GDP per capita, PPP, \$ (2018)	8,935.3
Official name:	Republic of Korea - KR	Currency:	Korean Won - KRW
Total area:	100,210 km ²	Population (2018)	51,171,706
GDP, PPP, \$ (2018)	2,090,161.41	GDP per capita, PPP, \$ (2018)	40,479.3
Official name:	Republic of China - TW	Currency:	New Taiwan Dollar - TWD
Total area:	36,193km ²	Population (2018)	23,726,460
GDP, PPP, \$ (2017)		GDP per capita, PPP, \$ (2017)	
Official name:	Kingdom of Thailand - TH	Currency:	Thailand Baht - THB
Total area:	513,120km ²	Population (2018)	69,428,453
GDP, PPP, \$ (2018)	1,320,373.33	GDP per capita, PPP, \$ (2018)	19,017.7

China

People's Republic of China (PRC) is the largest country in the continent, the third one in the world after Russia and Canada, and also the world's most populous country. Its extension comprehends an extremely diversified topography – and related climate conditions – which

provides the country with a rich variety of natural resources. However, access to energy is still limited, preventing full industry capacity development, and the transport system is underdeveloped, with consequential differences in development stage reached among regional economies in the country. Serious challenges are faced as a consequence of the economic slowdown occurring. In 2018, in fact, the country experienced the lowest rate of growth of the last 30 years, and there is no sign of an immediate direction change (Heritage, no date: online). China is characterised by the great influence that central government extends to the economy. Also financial sector and many industries are state-owned, which implicates that transparency may be compromised. A restrictive foreign investment approval system is implemented, and also labor market is strictly controlled. However, in 2001, China joined the World Trade Organization (WTO), with positive effects on economic liberalization and government deregulation (Britannica, no date, b: online). Besides China's importance in global trade, being the world's second-largest economy, its per capita income is below the average. The primary energy source to generate electricity is coal and, despite the fact that about one-sixth of the electricity supply comes from hydroelectric sources, pollution of air, water and land represent a dangerous environmental concern, with the potential to seriously compromise its economic growth. The intensive growth the economy of the country experienced and the rapid urbanization came at an high ecological sacrifice: the country is currently facing an environmental crisis, as statistics highlight that 75% of water resources and 19% of arable land are polluted. This situation brought China to take action in order to build a sustainable economic model.

Green finance reforms started in 2007 with the Green Credit Policy, which represents the basis for sustainable banking and made China one of the first EMEs actively directing efforts towards the sustainability field. Report obligations regarding ESG factors and green credit operations are highly structured, but public disclosure and transparency still lack. In 2012, the China Banking Regulatory Commission (CBRC) formulated the Green Credit Guidelines, enhancing green credit by banking institutions. In 2015 the People's Bank of China (PBoC) and the National Development and Reform Commission (NDRC) released green bond guidelines containing standards and definition, which are in line with the PBoC's Catalogue, namely the China Green Bond Endorsed Project Catalogue. It is a framework developed by the Green Finance Committee, made of regulators, banks, asset managers, issuers and technical expertise, defining six official categories of projects which can be defined as eligible for green bond financing. The criteria used in China to qualify eligible projects recognise the international guidelines set by ICMA and the CBI, but also underline that categorization of

green bonds projects follow singular countries' issues, thus categories appropriate for China may not be the equal to those of other countries (Norton Rose Fulbright, 2016: online). Chinese green bond regulation is complex and fragmented, as it is administered by different organisations, each one providing guidance on, and requirements for green bond issuance, green definitions, management and use of bond proceeds, reporting and incentive measures. They are responsible for specific categories of issuers:

- People's Bank of China (PBoC) for financial institutions,
- China Securities Regulatory Commission (CSRC) for exchange-traded corporate green bonds,
- National Development and Reform Commission (NDRC) for public-sector issuers,
- National Association of Financial Market Institutional Investors (NAFMII), a self-regulation organization concerning OTC¹³ financial market (SBN, 2018a).

The country entered the green bond market in 2015. In August 2015, the first labelled green bond by a Chinese corporate, namely Xinjiang Goldwind Science and Technology, was issued for \$300 million. In October, the Agricultural Bank of China (ABC) issued its first green bond for \$1bn, sold to Asian investors. China soon became the leader between the emerging market economies in terms of green bond market development, becoming the largest driver of Asian green bond market growth, actually owing a share equivalent to 75% of the region's green bond total issuances (Ho J., 2018: online). The launch of official guidelines in 2015 boosted incredibly the green bond market development for the following year, when China's issuances accounted for 39% of global market volume, setting a new annual issuance record greater than \$30 billion (SBN, 2018a). Guidelines for Establishing the Green Financial System were released in August 2016 by seven ministries. The same year, the Green Bond Pilot Scheme at stock exchanges was launched and the country ratified the Paris Agreement. CSRC's Green bond guidelines was launched in 2017, and also the guidelines for green debt financing instruments was released by the NAFMII. Five Green Finance Pilot Zones were established, displaying a set of incentives for environmentally friendly industries. The PBoC and China Securities Regulatory Commission (CSRC) released guidance on green bond external review and verification, introducing regulatory requirements for verifiers for the first time. In 2017, the CSRC issued Guidelines for Green Bond Issuance for Listed Companies and excluded from the eligibility of green bond issuers those whose action causes high

¹³ Over-the-counter (OTC) refers to the trade of securities for companies that are not listed on a formal exchange. NAFMII includes interbank bond market, inter-bank lending market, foreign exchange market, commercial paper market and gold market (NAFMII, no date: online).

pollution or whose industries are not aligned with national industrial planning policy (SBN, 2018c). In 2017, China’s green bond issuances accounted for 15% of global bond issuance, making it the second largest green bond market in the world after US. In March, the PBoC and the European Investment Bank started a green finance initiative aimed at harmonizing the green definitions provided by the respective markets. In November, they released a White Paper to officially compare definitions, in order to create the basis for their harmonization. In 2018 the PBoC released guidance on post-issuance disclosure of green bonds and introduced new supportive measures for green credit, while in September the CSRC issued a revision of its Guidelines for Corporate Governance of Listed Companies”. Between 2017 and 2018 Chinese green bond issuance increased by 33%. When considering internationally-aligned green bond issued, they amounted at \$31.2 billion, while bonds qualifying as green according to China’s local definitions reaches \$42.8 billion (Figure 21).



Figure 21: Chinese green bonds alignment with local and international definitions
Source: CBI China Green Bond Market 2018 (CBI, 2019d)

Chinese green bond definition cannot be accepted by international investors relying on international standards, in particular because of Chinese bonds’ lack of transparency, the general purposes for use of proceeds and the categories of eligible projects not corresponding to those of international definitions. In fact \$10.8 billion of Chinese green bonds – 26% of overall Chinese green bond issuance – are aligned with the PBoC and NDRC catalogues and guidelines but don’t meet international standards. However, in 2017 this percentage was at 38%, meaning that Chinese green bonds are more and more in line with international green bond definitions. Moreover, Chinese green bonds transparency has increased too, especially

in domestic markets, as a consequence of recent regulations requiring stricter supervision of green bond proceeds allocation. Domestic green bond guidelines require post-issuance reporting, with the PBoC obliging market disclosure about the use of proceeds on a quarterly basis (CBI, 2018b). China dispose of the largest climate aligned bond market in the world, also considering the emission of green and climate bonds which has not been labelled. The green bond issuance potential available in transport, energy and water sectors leaves room to the opportunity to label the unlabelled climate bonds as significant volumes will mature in the next 5 years.

Moreover, since 2016, China is trying to attract foreign issuers in issuing RMB-denominated green bonds in China's domestic market, which constitute a specific kind of bond named green Panda bond. Their issuance follow regulations concerning both panda bonds and green bonds, which require earmarking of proceeds for green assets or projects and the issuers' commitment in tracking and reporting on proceeds usage. Five green panda bonds have been issued from 2016 to 2018, for an amount of \$880 million, which accounts for less than 1% of green bonds market in the country. However, their growth potential is high, given that China is further opening up its capital markets (CBI, 2018c).

India

Republic of India is the seventh largest country in the world and, together with China, it is one of the two countries in the world with more than 1 billion population. The fast rate of growth experienced posed challenges to the capacity to achieve a sustainable development, in the form of spreading inequalities between the middle class, poverty in countryside's villages, air pollution threat from intensive coal usages and relative CO₂ emissions, limited access to electricity and resource scarcity, in particular for water. Opportunities for the country stand in renewable energy, especially the solar energy (SEB, 2016: online). However, traditional financing sources are not sufficient to meet the capital needed to fund the sector, and this is the factor that triggered the establishment of the green bond market in the country. India's INDC objectives cannot be satisfied by domestic demand alone, stressing the need for international funding to achieve objective like the instalment of 165 gigawatts of renewable energy capacity by 2022, for which \$200 billion are needed. From its debut year in the green bond market in 2015, the country represented one of the EMEs major issuers. In 2015, the Securities and Exchange Board of India (SEBI) supported the GBP application and issued its Green Bond Guidelines, the main Indian policy regulating green bond market, including

listing requirements of Green Bonds on the Indian stock exchanges. SEBI's Guidelines' purpose is to boost market attractiveness to investors, and they are also supported by regulations from the Reserve Bank of India, the banking sector regulator.

The first Indian green bond was issued by Yes Bank in February 2015, followed by a second issuance in August, for a total of \$125 million raised. This second issuance from Yes Bank was purchased by the IFC through the issuance of the first Masala¹⁴ bond. In September, CLP Wind Farms issued the first green bond by a South Asian corporate, a deal of \$90 million. In February 2016, Hero Future Energies issued India's first internationally Certified green bond, whose proceeds financed wind energy. Climate bond Certification is an increasing trend for the Country, which accounted for 33% of total Certified climate bonds in EMEs by number in 2017 (11 Certified climate bonds out of 27 issuances), in parity with China (at 11 out of 137) and followed by Brazil (at 18%, with 6 Certified climate bonds over 15 issuances). Renewable energy dominates the spectrum of use of proceeds for 2017, with a share of 83.8%, but opportunities also exist for transport, water and adaptation, occupying respectively shares of 12.8%, 1.7% and 1.7% (CBI, 2018d). From the Securities Exchange Board's green bond guidance publication in May 2017, the cumulative volume of green bonds issued reached \$7.1 billion in 2018. In January 2018 the country experienced also the issuance of its first social private placement in international market, a Masala Bond for affordable housing raising INR3.15 billion (Drew, 2018).

Fiji

Fiji is an island and archipelago country in the Pacific Ocean, highly vulnerable to extremes natural events like cyclones and floods, and also to climate change negative impacts, with the consequence that almost 20% of its population is under the threat of being displaced by 2050. Moreover, in the next decade the country would need more than \$4 billion in investments to be able to reduce its vulnerability to climate change (IFC, 2017a: online).

The country has been already mentioned for being the first EME to have issued a sovereign green bond, in October 2017, raising \$50 million in Fijian dollars. The issuance took place in two tranches, and both times the bond resulted oversubscribed. Moreover, the bond was also listed on London Stock Exchange on April 2018, increasing the bond's visibility and potential investors' pool. Fiji's Reserve Bank received support from the World Bank and the IFC for the emission, and the proceeds of the bond were devoted to projects aligned with the GBP and

¹⁴ an Indian Rupee denominated bond sold overseas.

concerning adaptation objectives, in particular for building resilience. Sustainalytics assessed the bond's alignment with the GBP (World Bank, 2017: online). Fijian Government also published a national Green Bond Framework in October 2017 and aligned with the four pillars of the GBP, as assessed by Sustainalytics.

Indonesia

The Republic of Indonesia is a tropical island nation, the world's largest island country (composed of seventeen thousand islands), ranked 4th at global level for population number, and its economy is the largest in South East Asia. As a consequence of the presence of one of the greatest biodiversity in the world, the country is very sensible to climate changes. Moreover, Indonesians greenhouse gases emissions are consistent and the impact of pollution is a huge threat. Indonesia's commitment to decarbonization of energy and infrastructures is expressed by its target to reduce GHG emissions of 29% by 2030 and to account for one-quarter of renewable energy in total energy mix by 2025.-The need for financing to combat climate change is large, estimated in \$64 billion and \$17 billion for adaptation and mitigation activities respectively, for the years 2015-2020 (UNPD, no date). The Republic of Indonesia (ROI) has developed a Green Bond and Green Sukuk Framework through PT SMI and with the technical assistance provided by the World Bank Group, to enhance the financing and/or refinancing of eligible green projects. The Framework is aligned with the basic principles of the GBP and ASEAN Green Bonds Standards and received a second opinion from CICERO, receiving a "medium green" shading (PTSMI, no date: online).

In March 2018, the ROI issued the first green sukuk sovereign bond of the country – and of the continent as well – for \$1.25 billion, with maturity in 5 years. The issuance followed the Green Bond and Green Sukuk Framework and was reviewed by the by international independent reviewer CICERO, obtaining a "medium green" label (NDCS, 2018: online). The proceeds were directed to selected eligible green projects based on the Framework, concerning mitigation and adaptation projects, like renewable energy projects, green tourism and waste management, and for the preservation of biodiversity (Drew, 2018). Further issuances followed in April and July 2018, from Star Energy Geothermal (Wayang Windu) corporate and the government-backed entity PT Sarana Multi Infrastruktur (owned by the Republic of Indonesia through the Ministry of Finance). They raised respectively \$580 million and \$50 million. PT Sarana Multi Infrastruktur devoted 100% of proceeds to finance green projects in energy, transport, water, waste and land use sectors, although its issuance

raised less than expected. In October 2018, the IFC issued an Indonesian Rupiah Komodo¹⁵ green bond for \$134 million, with 5 year maturity and listed on both the London Stock Exchange and the Singapore Stock Exchange. It represents the first offshore Rupiah-denominated green Komodo bond issued by a multilateral development bank. As one of the main environmental problem of the country is represented by deforestation, up to November 30th, 2018, almost 30% of green bonds proceeds were directed towards sustainable land use projects, which include sustainable agriculture, afforestation and rainforest conservation, and change adaptation measures (CBI, 2019c). In February 2019, a second green sovereign sukuk bond has been issued in two tranches (of \$750 million with maturity in 5.5 year and of \$1.25 billion with 10-year tenor) for a total of \$2 billion. It would be registered in the Singapore Stock Exchange and NASDAQ Dubai in the United Arab Emirates (Gorbiano M. I., 2019: online).

Green bond market in Indonesia has great potential for development, but at its current stage is not well-established, yet suggesting that it still lacks the scale that would make it comparable with conventional investments. Challenges to face include a lack of standards and criteria for determining green eligible project and the costs beard by issuers to ensure a proper management of proceeds through external review. They should be overcome by setting green criteria matching investors' definitions and needs, and market education would increase both supply and demand for the market (PEFINDO, 2019).

Malaysia

Malaysia occupies a territory divided in two different region, i.e. West Malaysia, in the southern part of the Malay Peninsula (excluding Singapore) and East Malaysia, on the island of Borneo. The country offers plenty of natural resources, from rubber and palm oil to petroleum and natural gas, whose export was the main economic activity in the 1970s. Malaysia presents extensive forest areas, harmed by deforestation aiming at timber exploitation. In order to accomplish the targeted reduction of 45% of GHG emission by 2030, Malaysia is sustaining the implementation of climate change mitigation programmes through public and private sectors initiatives and incentives. The sectors the most concerned by these actions are renewable energy, sustainable forest and natural resources management. Besides mitigation, also adaptation measures are being implemented, targeting flood risks, water and food security, coastline protection and health sector (Government of Malaysia, 2015). The

¹⁵Komodo bonds are rupiah-denominated bonds sold in the international market, with payments of principal and interest to be made in US dollars.

need for financing led Malaysia to enter the green bond market through the emission of green socially responsible investment (SRI) sukuk bonds. In 2014 Malaysian Islamic Securities Guidelines were revised, and the Securities Commission Malaysia launched the SRI Sukuk framework, which was used as basis for Malaysian green sukuk bond issuances (CBI, 2019c). The government provided a tax exemption for recipients under the Green SRI Sukuk Grant Scheme to sustain issuers while facing external review costs. On July 27th, 2017, the first green sukuk bond in the world was issued by Tadau Energy Sdn Bhd. It raised \$59 million in Ringgit, which were used to finance solar photovoltaic power plant. Another non-financial corporate issuance followed in October 2017, when Quantum Solar issued a green sukuk bond for \$236 million in MYR. A final issuance for the year came in December from the government-backed entity Permodalan Nasional Berhad (PNB Merdeka Ventures), raising \$461 million allocated to the building sector. In January 2018, the first ASEAN Green Medium-Term Note (MTN)¹⁶ Facility was issued for \$104 million by Segi Astana Sdn Bhd. Another green sukuk bond of \$63 million was issued in January by Mudajaya Group Berhad (Sinar Kamiri), and one of \$57 million in April by UiTM Solar Power Sdn Bhd. Quantum Solar Park, Mudajaya Group, Tadau Energy and UiTM Solar Power's green sukuk proceeds were used to finance the energy sector and, in particular, solar (CBI, 2019b).

The role of Malaysian regulators has been fundamental for sustainable investments' growth in ASEAN region, which eventually sustained the development of green and social bond standards. Institutional investors' increased interest towards investments involving ESG issues also led to the development of local green bond certifiers, such as RAM and Malaysian Rating Corp (MARC). Malaysia owns ASEAN's highest share of climate-aligned bond, which amounts at \$6.7 billion up to the end of November 2018, of which \$5.4 billion originating from strongly-aligned issuers and \$1 billion from labelled green bonds. Of its green bonds, 58% of proceeds were devoted to low carbon buildings and the remaining to energy sector. All deals were denominated in local currency and received external review, either in form of second party opinion or green rating. Their tenor falls in the 10-20Y bracket for 89% of deals by volume (CBI, 2019c).

Philippines

Republic of the Philippines is an archipelago of approximately 7,100 islands and islets. The economic growth experienced by the country entailed a huge environmental sacrifice

¹⁶ A note is a debt security requiring the loan repayment at a set interest rate and time period. A Medium-Term Note is a note that usually matures in 5 to 10 years.

concerning soil degradation and forested land exploitation. In 2013, Philippines were considered by the Global Climate Risk Index of Germanwatch as the country the most vulnerable and exposed to natural disasters and climate change risk in the world. In this context, the country identified a series of measures to implement in order to achieve its overriding objectives of reducing poverty and GHG emissions of 70% by 2030 in energy, transport, waste, forestry and industry sectors, while pursuing a sustainable economic development. A series of tools were designed to reach national targets, and the National Climate Change Action Plan of 2011 identified seven thematic areas to be interested by short, medium and long term climate-related objectives, i.e. food security, water security, ecological and environmental stability, human security, climate smart industries and services, sustainable energy, and knowledge and capacity development. The country recognizes the need for huge amount of financing from both public and private sector, for the implementation of its plans and programs for adaptation, resilience and mitigation, and, in particular, the need for external assistance for the development of technologies and capabilities required to manage effectively risks (Republic of the Philippines, 2015).

The first step made by the country towards the green bond market is represented by a non-financial corporate issuance in 2016. The green bond, issued by AP Power Renewables for \$226 million, is the first ASEAN green bond Certified by the CBI and also the only green bond from the country aligned to the Climate Bonds Taxonomy up to the end of November 2018, as well as the first Certified Climate Bond at global level issued under the Geothermal Criteria – proceeds were used to finance geothermal power generation (CBI, 2019c). On June 25th, 2018, the IFC issued a so-called Mabuhay Bond, the first internationally peso-denominated green bond issued by a multilateral development bank institution. The bond raised \$90 million to support the local capital market and renewable energy, is rated Triple-A and has a maturity of 15 years (IFC, 2018a: online). In 2018, also the Sindicatum Renewable Energy Company, based in Singapore, arranged with the Dutch ING Bank N.V. a green bond issuance of 10-years maturity for PHP1.06 billion. The bond was peso-denominated but settled in US Dollars, structure that allows the benefits of greater US Dollar liquidity and a funding at a more competitive price for that tenor (Dumlao-Abadilla D., 2018: online). In August 2018, the Securities and Exchange Commission Philippines adopted the ASEAN Green Bonds Standards guidelines, but in 2019 the Philippine Government expressed its willingness to expand ASEAN Green Bond Framework coverage for sectors as transportation, infrastructure, and commercial banking. On January 29th, 2019, AC Energy issued the second Certified climate bond for the country, with 5-year tenor and amounting at \$225 million. The

Certification was obtained under Solar, Wind and Geothermal Criteria. The issuer reopened the bond consequently to the high demand received, and the IFC provided additional \$75 million as an anchor investment. AC Energy also issued a second Certified green bond with a 10-year tenor in the form of Private Placement, raising \$110 million, of which \$20 million was invested by the Asian Development Bank (Rado G., 2019: online). Also the Development Bank of Philippines plays an important role for the green bond market, implementing a Green Financing Program aimed at assisting strategic sectors, industries and local governments in accomplishing the objectives identified by the country's INDC, by providing both financial and technical assistance (CBI, 2019c).

South Korea

Republic of Korea lies in the southern Korean peninsula. South Korea's commitment to GHG emissions reduction is targeted at a cut of 37% from the business-as-usual in all sectors by 2030. Korea provided legal policies and measures to support mitigation projects, enhancing renewable energy generation and usage, managing efficiency in the building sector, establishing the Green Building Standards Code and expanding infrastructure for environment-friendly public transportation and implementing a National Climate Change Adaptation Plan from 2010 (Republic of Korea, no date). The country entered the green bond market in 2013, with an issuance of \$500 million from the state development bank Korea Export-Import Bank (KEXIM), which used proceeds to finance renewable energy, water and, energy efficiency projects. At the beginning of 2018, besides Korean strong bond market (one of the largest in the world, with \$1.6 trillion outstanding), only six green bonds had been issued by four different issuers. A second issuance from KEXIM followed in 2016 and a third one in 2017 – a deal denominated in Indian Rupee and accounting for \$50 million. In 2016, the first Korean corporate green bond was issued by Hyundai Capital Services for \$500 million allocated to finance leases on hybrid and electric vehicles. In 2017 Korean Development Bank (KDB) entered the green bond market, with an issuance of \$300 million to direct at solar, wind and biomass power facilities. Also Hanjin International issued its first green bond for \$300 million, whose proceeds was used to refinance the costs associated with a LEED (Leadership in Energy and Environmental Design) Gold building in California (CBI, 2018e). By the end of 2017, Korea was the fifth largest cumulative issuer in the Asia-Pacific region, accounting for \$2.05 billion after China for \$47.7 billion, India for \$6.6 billion, Japan for \$6.1 billion and Australia for \$4.6 billion. Other green bonds has been issued by the KDB and Korea Hydro & Nuclear Power Company during 2018. KEXIM, together with the

Development Bank of Korea, accounted for a cumulative issuance of almost 50% of total volume, which accounts at \$3.8 billion at the end of 2018. The second largest issuer in the country is Korea Hydro & Nuclear Power, with a total issuance of \$600 million (CBI, 2019b). In January 2019, the first issuance of the year came from Midland Power for \$300 million and in February KEXIM issued another green bond.

Korean green bond market offers one of the best set of opportunities to develop with respect to the other EMEs considered, from the already mentioned strong bond market to the presence of robust project pipeline, investor base and supportive policies implemented. However, the country also faces some challenges concerning the lack of market awareness from both issuers and investors, linked to the lack of market standards. In this sense, the development of national green bonds guidelines would enhance best practices and awareness. Moreover, foreign currency risk and lack of information available in English contribute to form a barrier to issue internationally, which interest Korean internationally issued green bond. It follows there is room for potential action aiming at market improvement coming from government, as well as regulators and investors (CBI, 2018e).

Taiwan

Taiwan, officially called Republic of China, is an island between the East and the South China Seas. Taiwan separated from China after 1949, when the defeated Nationalist forces established the ROC, as opposed to the Communist's People's Republic of China in the mainland. The People's Republic of China claims it has jurisdiction over Taiwan, however, there is no agreement on the actual status, whilst Taiwan continues acting independently.

Taiwan approached the green bond market in 2014, with the first Asian corporate green bond. It was issued for \$300 million by Advanced Semiconductor Engineering (ASE) public company. The six-year maturity green bond received a BBB rating by Fitch and was oversubscribed six times, signaling the presence of strong demand in the market (Kidney S., 2014: online). The first listing dates back to May 2017, when four green bonds were issued by four domestic banks, raising a total of \$172 million. Then, in July 2017, the first green bond from a foreign bank was listed on Taipei Exchange by Crédit Agricole for \$120 million (Crédit Agricole CIB, 2017: online) and, in September 2017, CPC Corporation issued a green bond for \$93 million. In 2018, issuers diversification increased even more, including the first issuance from a private corporate, Far Eastern New Century, for a \$100 million deal issued in January. In October, Société Générale became the first foreign bank issuing a green bond denominated in local currency, raising the equivalent of \$52 million. Up to November 15th,

2018, 23 green bonds had been issued in Taiwan. They are denominated in local currency for 61% of total volume, while the remaining 39% is USD denominated. Their tenor is well diversified: the main bracket is the 5Y for 52%, followed by 18% at 10Y, 11% at 7Y, 8% at 3Y, 7% at 30Y, 4% at 2Y and a minimum share at 15Y. Government provides tax incentives for green bond issuers in the form of subsidies interesting selected industries, and also for investors as tax exemption concerning only certain green bonds – like those issued by government or state-owned enterprises (Lee, 2018). By the end of 2018, Taiwanese issuers issued green bonds for \$1.2 billion, with non-financial corporates accounting for almost 80% of total issuances by cumulative volume (CBI, 2019b).

Thailand

Kingdom of Thailand, situated in Southeast Asia, is particularly exposed to extreme weather events and climate change risk. Thailand's environment suffered from the negative impacts of the economic growth experienced, which caused problems like deforestation, river pollution, increased demand for electricity (mainly obtained by hydroelectric plants) and fossil fuel (Britannica, no date, c: online). Mitigation and adaptation objectives are thus a priority for the country, which planned a 20% reduction of GHG emissions by 2030. The sector identified as being the most contributing to these emissions is energy, for this reason mitigation efforts would be directed in particular towards energy sector, including transport. Many initiatives concerning energy sector have been implemented, but investment needed and operating costs necessary are substantial. Technologies and infrastructures costs, inadequate capacity of transmission lines and limited support of financial institutions for energy efficiency and renewable energy investments can represent serious barriers to overcome. Adaptation, on the other hand, focus on water management, food security, sustainable agriculture, forestry, coastal rehabilitation, sustainable tourism and climate resilience. The country recognizes the long-term nature of such commitments and the need for significant financing which constitute an additional burden to an already scarce government fiscal budget (Thailand, 2015).

Considering the category of labelled green bonds, the country's first green bond was issued in June 2018 by TMV Bank. It raised \$60 million, with the IFC as sole investor. It took the form of a private placement: proceeds were allocated to private sector's investment projects related to climate change and renewable energy in particular. This type of deal is gaining importance as tool able to support local banks, however, due to their private nature, public disclosure concerning green bond framework or external review is usually limited, and transparency could be questioned. In December 2018, B Grimm Power Public Company issued the

country's first Certified climate bond, in which the ADB invested \$155 million. The transaction occurred in two tranches (of five- and seven-year maturity), and proceeds were used to cover solar power plants (Chito S., 2018: online). The bond is expressly said to be helping in the achievement of the targeted GHG emission reduction signalled in the country's INDC. When considering the broader universe of climate-aligned bonds, instead, a Thai Baht denominated green bond issuance occurred in February 2015 by the non-financial corporate Bangchak Petroleum Plc. However, this emission has not been included in CBI's Climate Bonds database due to insufficient information on use of proceeds to determine its alignment to the Climate Bonds Taxonomy.

By the end of November 2018, Thailand showed the highest volume of climate-aligned bonds in the ASEAN region after Malaysia, with an outstanding value of \$2.9 billion, which accounts for a share of 28% over total ASEAN issuances. Thailand also owns the highest number of fully-aligned issuers in ASEAN region. Such numbers represent a positive signal of country's commitment to its transition towards a low-carbon economy and represent an opportunity for the green bond market development. Several potential fully-aligned issuers have been identified in sectors as transport (railway), energy and water, which are the main areas interested by adaptation objectives (CBI, 2019c).

2.2.2 Greater Middle East and the Russian Federation

Middle East is a transcontinental region occupying Western Asia, from the Arabian Peninsula to Iran, and including countries like Turkey and Egypt, which partially lies respectively in Europe and Africa. Greater Middle East is, instead, a larger region stretching from Morocco to Pakistan, and sometimes including also some countries of Central Asia. The area is increasing its commitment to ESG inclusion into decision making and is taking action to successfully transition to a LCR economy whilst fulfilling individual countries' NDCs, and also investors are demonstrating increasing interest to climate-related financing tools. Middle East countries are making progresses in the creation of a green bond market, with high commitment for the transition to a LCR economy arriving especially from United Arab Emirates and Saudi Arabia. Green finance is becoming an attractive tool, especially when associated with technical assistance support. The first green bond of Middle East region has been issued by First Abu Dhabi Bank in March 2017 and further issuances are expected when considering the number of infrastructure projects that could be targeted by green financing and the opportunity that green sukuk instruments represent.

Three of the EMEs of the region, namely the United Arab Emirates, Saudi Arabia and Qatar, make part of the Gulf Cooperation Council (GCC), further composed by Oman, Kuwait and Bahrain. The GCC is a political and economic union of Arab states bordering the Gulf established in 1981 and which has been directing its attention to renewable energy in the past few years (Netherlands Worldwide, no date: online). Many of the projects in the renewable energy – and solar power in particular – area of interest could potentially be funded by green finance. Climate finance in the Persian Gulf Basin countries¹⁷ is mainly concerning few large projects which receive loans from financial institutions, local governments or multilaterals and funds. However, the green bond market is still nascent, lacking cross-border financing and institutional investors to boost the growth (Kanady S., 2019: online).

Between all of the countries considered in the Chapter, Turkey and Russia are the only two that signed but did not ratify the Paris Agreement yet.

Table 10: Summary of Greater Middle East EMEs plus Russian Federation

Official name:	Islamic Republic of Pakistan - PK	Currency:	Pakistani rupee - PKR
Total area:	881,912km ²	Population (2018)	212,228,286
GDP, PPP, \$ (201)	1,176,498.29	GDP per capita, PPP, \$ (2018)	5,543.9
Official name:	State of Qatar - QA	Currency:	Qatari riyal - QAR
Total area:	11, 586 km ²	Population (2018)	2,781,682
GDP, PPP, \$ (2018)	352,153.74	GDP per capita, PPP, \$ (2018)	126,597.6
Official name:	Kingdom of Saudi Arabia - SA	Currency:	Saudi riyal - SAR
Total area:	2,149,690 km ²	Population (2018)	33,702,756
GDP, PPP, \$ (2018)	1,857,538.20	GDP per capita, PPP, \$ (2018)	55,119.9
Official name:	United Arab Emirates – AE	Currency:	United Arab Emirates Dirham - AED
Total area:	83,600km ²	Population (2018)	9,630,959
GDP, PPP, \$ (2018)	721,770.28	GDP per capita, PPP, \$ (2018)	74,942.7

¹⁷ Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, United Arab Emirates and Saudi Arabia.

Official name:	Republic of Turkey – TR	Currency:	Turkish lira - TRY
Total area:	783,562 km ²	Population (2018)	82,340,088
GDP, PPP, \$ (2018)	2,372,087.03	GDP per capita, PPP, \$ (2018)	28,815.5
Official name:	Russian Federation - RU	Currency:	Russian Ruble - RUB
Total area:	17,098,242 km ²	Population (2018)	145,734,038
GDP, PPP, \$ (2018)	3,986,063.73	GDP per capita, PPP, \$ (2018)	27,147.3

Pakistan and Qatar

Pakistan and Qatar are two countries of Greater Middle East and Middle East regions respectively which did not issue any green bond yet, but which are taking climate-related initiatives, working on regulations and trying to approach the green bond market.

Islamic Republic of Pakistan is a country of Southeastern Asia. The country is vulnerable to adverse impacts of climate change, and climate-related expenditure is planned to increase even though the country's priority areas are education, health and poverty alleviation. Nevertheless, mitigation objectives can be related to almost all sectors and also adaptation has great potential, especially for strengthening and fortifying flood infrastructures and for climate-resilient investment in energy and industrial processes. In October 2017 the State Bank of Pakistan (SBP) published its Green Banking Guidelines to recognize the importance of the support of financial sector in the process of transformation into a LCR economy. The Guidelines concern mainly banking sector and their objectives are those of protecting the environment through the promotion of the transition to a LCR economy and the reduction of the vulnerability of banks and development financial institutions to climate change risks (State Bank of Pakistan, no date). On August 29th, 2018, the IFC and the State Bank of Pakistan (SBP) signed an advisory agreement to support green banking in Pakistan. Environmental risk management practices would be improved from the collaboration between the SBP, Pakistan's banking sector and the IFC. The IFC considers Pakistan as a priority country and already contributed to the development of the country's private sector in power and infrastructure with investment commitments of \$1.2 billion, in order to enable access to financing for small and medium enterprises. However, a green bond market in the country is not born yet (The Asset, 2018: online).

State of Qatar occupies a desert peninsula extending from the larger Arabian Peninsula. The country is well-known for its large reserves of petroleum and natural gases, which allowed its population to achieve high standards of living, and industrialization represents a mean

through which the country tries to diversify its economy. Qatar's socio-economic development is being pursued taking into consideration environmental protection, and the country is indirectly contributing to global efforts for climate change mitigation through the export of liquefied natural gas as clean energy. The country is also directing its attention to the achievement of energy efficiency and to the utilization of renewable energy sources alternative to natural gas, such as solar and wind power, in order to strengthen economic diversification and reduce emissions from fuel combustion. As the country still lacks the necessary related technology, it is heavily investing in research and development in many areas, especially sustainable energy. The country also supports initiatives concerning adaptation measures, whose main areas of interest are water management, infrastructure and transport, and waste management. Awareness programs have been enhanced in order to encourage a sense of shared responsibility towards the environment (State of Qatar, 2015). National objectives of economic diversification and sustainable development could benefit from the green bond market. For this reason, since June 2018, Qatar Central Bank (QCB) is cooperating with Qatar Development Bank to promote green bond issuances (Gulf Times, 2018: online). However, no green bond has been issued up to date.

Saudi Arabia and United Arab Emirates

Saudi Arabia and United Arab Emirates are two countries in the Arabian Peninsula, part of the Persian Gulf basin, whose economies are heavily dependent on oil production and export. They are both taking action to diversify their economies and to increase the role of renewable energy, and a significant number of opportunities and projects related to renewable energy are present in their territories. Green sukuk bonds represent a type of financial instruments that would own great potential in these countries. However, only United Arab Emirates developed a green bond market, while Saudi Arabia is still in the early stage of its path towards a LCR economy.

From 2018, Saudi Arabia increased its commitment to sustain its transition to a LCR economy, submitting its first National Voluntary Report, which examine the status of national SDGs and their alignment with Saudi Vision 2030. Between the areas of interest considered, renewable energy and infrastructure are the most important. The country is planning to invest in projects worth between \$30-\$50 billion by 2030 which would also concern clean energy through wind and solar installations. These types of projects are particularly suitable for green financing, however, the country did not issued any green bond yet.

United Arab Emirates experienced a rapid industrialization that increased considerably energy demand, so that per capita rates of energy consumption are now among the highest in the world (Britannica, no date, d: online). Manufacturing has been boosted by the country as part of its economy diversification strategy to reduce its hydrocarbon production dependence. United Arab Emirates set sustainable goals for national development, and the economic growth is entwined with sustainable initiatives and reforms. Mitigation plans regard clean energy, energy intensive industries and oil and gas sector, energy and water efficiency, transport and infrastructure and waste sector. In the same way, initiatives aimed at adaptation objectives were implemented in water management, coastal and marine environment conservation, food security, innovation, R&D, education, training and public awareness (United Arab Emirates, 2015). First Abu Dhabi Bank (FAB) is actively participating to the green bond market, publishing the FAB Green Bond Framework, which adheres to GBP and also including additional elements from CBI's best practices. In March 2017, the bank issued the first green bond of Middle East region, which raised \$587 million and was allocated to two environmental projects: Abu Dhabi's Shams solar project and Etihad Rail. The deal features a 5-year tenor and is listed on the London Stock Exchange. It has been based on FAB Green Bond Framework, and received a second party opinion by Vigeo-Eiris. Besides green bonds, an alternative green initiative had already been implemented in the country by Dubai's Electricity and Water Authority, which issued the Dubai Green Fund in 2016 to invest in environmental-friendly companies and offer loans to companies in the green sector at favourable interest rates. A second sustainable initiative was taken in October 2018, with the creation of the first green revolving credit facility in the Middle East providing liquidity for general corporate purposes, signed by Masdar, Abu Dhabi Future Energy Company, and arranged with FAB, Societe Generale, Sumitomo Mitsui and UniCredit (Trade Arabia, 2018: online).

Turkey

The area of Republic of Turkey occupies both Asia and Europe. The country owns a great variety of resources, in particular coal deposits and hydroelectric plants. Turkey experienced a considerable GDP growth, accounting for a 230% increase from 1990 to 2012. One of the consequence has been a constant increase of 6-7% in yearly demand for energy but, being energy resources limited, the country heavily depends on energy imports. Renewable energy projects could stem the issue and, in fact, they are increasing both in number and importance, becoming matter of interest for both domestic and international investments. The country

provides mitigation and adaptation plans and policies concerning many sectors, from energy, industry, transport, buildings and urban transformation, to agriculture, waste and forestry. However, it also highlights the presence of financial and technological constraints preventing these plans' full success. The country requires both domestic financial sources and international aid in the form of technology, capacity building support and financing – which include also a mention to the Green Climate Fund's¹⁸ (Republic of Turkey, no date). Although its commitment to combat climate change, the country only signed but did not ratify the Paris Agreement already.

Turkey first approached climate finance in 2016 with a Sustainability bond issued in May by the private investments and development bank Türkiye Sınai Kalkınma Bankası A.Ş. for \$300 million. It received a second review from Sustainalytics, which assessed the bond's alignment with the GBP. It was oversubscribed 13 times, due to the fact that almost 90% of proceeds was used to refinance existing projects, reducing its risk (Kidney S., 2016a: online). Its proceeds were allocated to private sector investments in renewable energy, energy efficiency, GHG emissions reduction and socially responsible investments. Another financial institution, Garanti bank, is being actively engaged in sustainability through instruments like green mortgages and loans. It settled the first Turkish green loan agreement with Zorlu Energy in 2018, for \$10 million, for which the sustainability rating agency Vigeo-Eiris would assess Zorlu Energy ESG performances on a yearly basis (Garanti BBVA, 2018). Turkey is approaching the green bond market but its development is quite low, depending on the macroeconomic and political challenges faced by Turkish markets and on the country's traditional tendency to favour the loan market, dominated by banking sector. However, the green bond market still see the opportunity to grow if the right terms and conditions, including third party guarantees, could be set (Bonds & Loans, 2016: online).

Russia

Russian Federation is the world's largest country, stretching from Europe to Asia. It comprehends a great diversity of environments and climatic regions characterized by extreme features. Moreover, Russia is facing a critical situations from the environmental perspective, and its efforts to deal with it are only at the beginning. The country, in fact, has signed but not ratified yet the Paris Agreement, even though it is taking this action into consideration

¹⁸ The Green Climate Fund has been set up by the 194 Parties of the UNFCCC in 2010 as financial mechanism to support the efforts of developing countries to respond to the challenge of climate change through GHG emissions reduction and adaptation measures. GCF launched its initial resource mobilization in 2014 (Green Climate Fund, no date: online).

(Sauer N., 2019: online). An important step in environmental protection was undertaken by the Environment Ministry in 2018 with the “Ecology” programme, which concerns clean air, waste management and preservation of forest, but does not target GHG emission reduction. The project aims to gather RUB4 trillion from public and private funds, and green bonds represent a suitable tool to fulfill this role. However, considering the country’s consistent amount of emissions,¹⁹ this low level of commitment poses Russia at a great risk for long-term global competitiveness and also for national economy’s exposure to climate change negative impacts. In the light of its position, Russia made a further step towards environmental sustainability with the issuance of its first green bond in the domestic market in December 2018. The bond was issued by a Siberian waste management corporate, Resursosberezhnie KhMAO, for \$16.4 million. It was listed on the Moscow Exchange and its proceeds has been allocated to the establishment of a municipal recycling and refuse processing facility in the Khanty-Mansiysk region. This is the first green bond from a Russian issuer, however, it is not the first green bond linked to the country. In June 2013, in fact, the World Bank had already issued a 10-year green bond in Russian Ruble, listed in Luxemburg Stock Exchange (World Bank, 2013: online). Then, in May 2019, Russian Railways issued the first international green bond, denominated in Euro for €500 million, and with a tenor of 8 years. The bond was oversubscribed for €1.8 billion and obtained the lowest interest rate ever reached by a Russian issuer of Euro denominated bonds, namely 2.2%. Proceeds were allocated to electrification and, in particular, for the purchase of electric trains. However, this issuance was questioned by many investors, concerned by the company’s owning by the Russian state and by its activity in fossil fuel transportation. On the other hand, the company is pursuing an ambitious environmental policy including the monitoring and reporting of emissions, reduction targets for emissions and plastic and water use, a tree-planting programme, recycling and initiatives to increase employees and passengers awareness of environmental matters (Global Railway Review, 2019: online). Considering the environmental challenges the country is facing, green bonds could represent a critical tool to overcome them, with great potential in numerous projects, like afforestation, renewable energy and waste management. However, problems in the development of local green bond market arise from the limited scope of action of sustainable responsible investors, which still represent a minority of market players. Lack of incentives and a fragmented legal framework further

¹⁹ In 2014 Russian Federation accounted for 5% of global CO₂ emissions from fossil fuel combustion and industrial processes, ranking 5th after China at 30%, United States at 15%, EU-28 at 9% and India at 7% (EPA, no date: online).

restrain market growth. Lack of clarity and uncertainty about projects eligibility result in high reputational risk for issuers in case of failure in meeting green requirements. For these reasons, the Central Bank of Russia set up a working group with the purpose of developing a green finance roadmap for the integration of international guidelines with local rules addressing country-specific issues. A significant barrier is still represented by reporting requirements. Disclosure, in fact, is not a well-established practice in the country, and it could represent a heavy cost for potential green bond issuers (Fisher M., Hicks E., 2019: online).

2.3 Latin America and Caribbean

Latin America and Caribbean (LAC) region presents considerable differences in the stage of development reached by the green bond market with respect to the country considered, resulting higher in Mexico – with established regulations and access to international capital markets – than in smaller economies with undeveloped capital markets and still relying on regional and multilateral banks for accessing debt financing.

Besides Mexico, the EMEs countries of the region included in the MSCI list are represented by Brazil, the country contributing the most to LAC green bond emissions by volume, then Argentina, Chile, Colombia and Peru, whilst Bloomberg's EMs also includes Costa Rica. The region, in order to achieve the 2030 Agenda and the Paris Agreement objectives, has to achieve access to resources not available at the current market state, and green bonds are a suitable tool for reaching it. Among its long-term development objectives, Latin America and the Caribbean has been trying to decrease poverty recently, but income inequality remains high. For this reason, IFC is committed in promoting inclusive growth that grants access to finance and to infrastructures, in particular through public-private partnerships, innovation, education, global integration and climate-change investments, enhancing private sector investments intervention. Cities characterized by fast growth present a critical need for power, utilities and transportation, and the IFC is taking action to attract private and long-term financing to devolve to these sectors. As investments reach the scale necessary, also production, logistics and distribution in the agribusiness sector would be fostered and improved (IFC, no date, c: online). For all of these purposes, private sector participation to the market to provide additional funding to traditional financing is fundamental. LAC region also presents a considerable infrastructure gap which needs to be filled in order to allow for economic growth and challenges overcoming. Moreover, adaptation and mitigation projects provide great opportunities concerning the development of renewable energy sector. Besides

the main contribution from public sector, financial institutions like commercial, national, regional and multilateral banks are a key source of additional capital fostering the growth of the green bond market.

At international level, between December 2014 and August 2017, LAC region contribution to the green bond market accounts for 26 climate-aligned bonds, whose proceeds financed projects concerning energy (including wind and solar power), transport, multi-sector (including energy, water management, forest conservation and pollution prevention and control), and agriculture and forestry sectors. The trend for issuance is growing, with \$8.4 billion of green bond outstanding until August 2017. Of them, \$7.1 billion consist of green bonds issued in international markets. However, green bonds represents only 1.6% of the region's total bond international issuances for the same period. Brazil and Mexico are the two major issuers of green bonds in the international market, accounting for more than 70% of climate-aligned bonds issued up to August 2017 (37% from Brazil and 35% from Mexico). Main issuers belong to the public sector and supranational entities. 55% of climate-aligned bonds have maturity of 10 years or more, 25% of 7-8 years and 19% of 5 years. 88% of them have size of \$500 million or higher, and 64% of issuers are investment grade.

For what concerns local green bond markets, Mexico, Brazil and Colombia boost the more developed markets and major issuers, which belong for the major part to private corporates and banks, and are investment grade for a share of 76%. Green bonds issued are generally of small size (72% of the total stands between \$100 million and \$300 million) and the main sector financed is multi-sector (for 73%), followed by energy, water management and sanitation. Maturities are mainly in the range from 7 to 9 years (ECLAC, 2017).

2017 represented a significant year for green bond issuances in LAC. Argentina and Chile joined the market, whilst Colombia, Mexico and Brazil kept the pace with new issuances. Against all odds, 2018 saw a decline in bond issuances from LAC region with respect to 2017. The only supranational green bond for the year 2018 has been issued in August by the CAF-Development Bank of Latin America, for \$30 million and expiring in 2021. Considering the period from January to October 2018, total LAC international debt issued was \$85.8 billion, an amount 33% lower than what was raised in the same period the previous year. The main reasons stand in the increase of US interest rates, the withdrawal of dollar liquidity and dollar appreciation (which reduced the appeal for risky assets), the instability in stock markets and governmental issues, the uncertainty derived from Brazil's presidential elections and Mexico's cancellation of the New International Airport for Mexico City at the end of October, which had a negative impacts on investors' confidence. Consequently, also the green bond

market suffered a setback, mainly due to lower Brazil issuances, which, in 2017, contributed for 60% of total LAC issuances, as clearly visible from Figure 22 (CBI, 2019b).

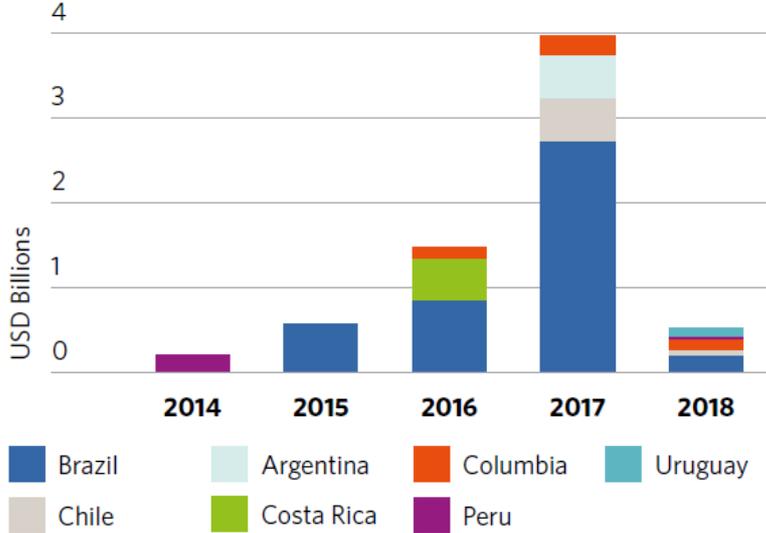


Figure 22: LAC green bond issuances per country over time, ex Mexico
Source: CBI State of the market 2018 (CBI, 2019b)

In order to boost regional increase in international green bond market participation, guidelines promoting transparency and governance over the use of proceeds would represent a critical tool. The main challenge LAC green bond markets have to face is their unavailability in countries where a domestic capital market has not been well-developed yet, factor preventing smaller economies to access the international bond market. In these cases, market actors intervention would be necessary, with local pension funds that could invest in sustainable development projects, and government, regional and multilateral development banks which could provide bonds with guarantees and enhance the use of targeted initiatives (ECLAC, 2017).

Table 11: Summary of Latin America and Caribbean EMEs

Official name:	Federative Republic of Brazil - BR	Currency:	Brazilian Real - BRL
Total area:	8,515,767 km ²	Population (2018)	209,469,323
GDP, PPP, \$ (2018)	1,857,538.20	GDP per capita, PPP, \$ (2018)	16,068.0
Official name:	Argentine Republic – AR	Currency:	Argentine Peso - ARS
Total area:	2,780,400 km ²	Population (2018)	44,361,150
GDP, PPP, \$ (2018)	915,131.85	GDP per capita, PPP, \$ (2018)	20,567.3

Official name:	United Mexican States - MX	Currency:	Mexican Peso - MXN
Total area:	1,964,375 km ²	Population (2018)	126,190,788
GDP, PPP, \$ (2018)	2,519,961.98	GDP per capita, PPP, \$ (2018)	19,969.5
Official name:	Republic of Chile – CL	Currency:	Chilean Peso - CLP
Total area:	756,102 km ²	Population (2018)	18,729,160
GDP, PPP, \$ (2018)	473,546.74	GDP per capita, PPP, \$ (2017)	25,283.9
Official name:	Republic of Colombia - CO	Currency:	Colombian Peso - COP
Total area:	1,141,748 km ²	Population (2018)	49,661,048
GDP, PPP, \$ (2018)	744,702.66	GDP per capita, PPP, \$ (2018)	14,999.4
Official name:	Republic of Peru - PE	Currency:	Peruvian Sol - PEN
Total area:	1,285,216 km ²	Population (2018)	31,989,260
GDP, PPP, \$ (2018)	460,435.81	GDP per capita, PPP, \$ (2018)	14,999.4

Brazil

Federative Republic of Brazil is the largest country in the LAC and its 210 million inhabitants make it the fifth most populous country at global level. It is considered an advanced emergent market economy and it's classified as an upper-middle income economy by the World Bank. The abundance of natural resources favours agriculture and mining activities and, in fact, the country is globally recognized as the largest coffee producer and for its relevant role in oil production. However, Brazil is seriously harmed by problems like corruption, which generates heavy costs for the country, further aggravated by the high level of public deficit, low education level, excessive bureaucracy, high tax burden and undeveloped infrastructures. Climate change is a big threat for the country, from both environmental and social perspectives. Brazil is the continent with the greatest biodiversity variety in the world and the highest hydroelectric power potential in Latin America. Several regulations have been released by Brazilian authorities to address specific ESG issues, like Regulation N°4,327 of 2014 of Brazilian Central Bank, concerning Social and Environmental Responsibility for Financial Institutions. Brazil's INDC targeted a 37% decrease in GHG emissions by 2025, which would turn to a 43% cut by 2030, compared to 2005 levels (SBN, 2018d). Specific targets for energy, land use, forests, agriculture, industry and transportation sectors have not

been set, even though they are all sensible matters for the country. Brazil is concerned by deforestation activities in the Amazon River and Rainforest areas, and presents an extensive road and rail network and a huge number of airports (about 2.500, the largest number after US). Furthermore, the country still heavily relies on agriculture, and the sector's sustainable development has been concerned by several policies and incentives. However, the presence of multiple programmes and the inadequacy of asset eligibility criteria and available credit instruments brought complexity in the funding management, resulting in inefficient allocation of funds (CBI, 2018f). The green bond market offers a solution to achieve the amount of investment needed to finance the country's transition to a LCR economy and in the usage of renewable energy, in particular water. In order to achieve the objective to eliminate illegal deforestation and restore 12 million hectares of forest by 2030, in fact, a significant share of the country green bonds' proceeds were used to finance sustainable forestry and paper projects.

The first labelled green bond was issued in May 2015 by BRF S.A., an investment-grade meat producer company. The deal raised \$549 million and was compliant with the GBP. Suzano Papel e Celulose company followed with green bond issuances in July 2016, November 2016 (which represents the first green bond issued in local currency) and in September 2017. Several issuances from other corporates and from the Brazilian Development Bank (BNDES) followed, further enhanced by the launch of the Guidelines for Issuing Green Bonds in Brazil 2016, developed by the Brazilian Business Council for Sustainable Development (CEBDS) and the Brazilian Federation of Banks (FEBRABAN). In September 2016, together with the CBI, the CEBDS founded the Brazil Council of Green Finance, with the goal of attracting capitals in scale through the creation of a solid pipeline for investment opportunities in the country and the construction of a platform of both public and private sector actors. It would constitute the basis for sustainable investments, in particular towards renewable energy, agribusiness and transport infrastructures projects (GIZ, 2017). The same month, the private Brazilian company CPFL Energia Renováveis issued a \$61 million green bond of 5-year maturity which received the CBI Certification, becoming the first Latin American private company issuing an internationally Certified Climate Bond. Its proceeds were used to finance wind projects. 2017 has been a profitable year for green bond issuance, with non-financial corporates representing the main issuer type accounting for 64% of green bond issuance. In July 2018, the issuance of a Certified Climate Bond by Faro Energy represents the first green bond whose proceeds has been devoted to solar sector. However, in 2018 the green bond

market drastically slowed down, retrained by the high uncertainty arisen for the presidential election.

The implementation of technical assistance and knowledge, robust but flexible standards and national and multilateral development banks intervention – who can provide risk guarantees – represent some of the means that could be used to overcome the barriers present. Agriculture, for example, could fully benefit from the green bond market only if aggregation mechanisms could be put in place and allow to reach a scale that otherwise could not be achieved by small- and medium-size producers themselves. An efficient application of innovative green finance mechanisms to the opportunities present in the country would allow for a robust development of the Brazilian green bond market (CBI, 2018f).

Mexico

United Mexican States represent the largest North American country, the third largest in LAC region after Brazil and Argentina and the second most populous nation in Latin America after Brazil. The economy of the country is fragile. A fast economic growth started in the 1970s and, from 1994 North America Free Trade Agreement, Mexican economy strongly linked to the US market. Mexico is classified as an upper-middle income country by the World Bank. Transports are extended in the whole country, railway and airports are well developed and, when considering energy sector, Mexico owns one of the largest solar potential in the world. However, water scarcity is a problem affecting the north and the center of the country, worsened even more by inadequate water management. Mexico presents plenty of opportunities for its green bond market development, although being still challenged by the presence of several barriers. The green bond market has been further supported in its development by national strategies and sector-specific regulations concerning climate-related issues, established since 2009. Investments are needed in order to enlarge access to energy, ameliorate wastewater management, upgrade natural disaster risks management and respond to the severe threat represented by pollution. As the amount required to reach clean energy target by 2030 amounts at \$75 billion, it seems clear that public investments alone would not be sufficient and that private intervention is necessary. For this purpose, the green bond market found the opportunity and necessity to establish in the country. The development bank Nacional Financiera (NAFIN) issued the first green bond for the country – and third green bond of the region – in October 2015 for \$500 million. It received significant demand (for \$2.5 billion) and its proceeds were devoted to wind energy projects. It represents the first

cross-border transaction in 18 years, bought for 45% by US investors, 25% from European, 5% Mexican and the remaining from Asian investors. The bond, aligned with the GBP, also received the CBI Certification – becoming the first Certified Climate Bond of Latin America. The second green bond issued by NAFIN is also the first green bond issued in Mexican pesos in local market. It was issued on August 31st, 2016, and listed in the newly launched Mexican Stock Exchange (BMV) segment, receiving a Climate Bond Certification by the CBI. As of 30 September 2016, NAFIN was able to raise \$332 million in green bonds devoted to eight wind projects. On December 7th, 2016, Mexico City issued the first municipal bond of LAC region and the fourth green bond of the country. It was denominated in Mexican Peso and raised an amount equivalent to \$49 million, deployed to transport sector and water and waste management. The bond was highly appreciated, as demonstrated by an oversubscription of 2.5 times. The largest green bond issued at that time by a LAC region institution belongs to Mexico City's Airport Trust (connected to Mexico's development bank NAFIN). The bond was issued in two tranches, the first of them in September 2016, for a total of \$2 billion, with maturities of 10 and 30 years respectively. The proceeds was used to finance New International Airport for Mexico City, that aimed to be carbon neutral, utilizing 100% clean energy and being efficient in water usage. The airport planned to be environmentally sustainable and reflect Mexico's commitment to reduce greenhouse gas emission. Bondholders would be paid through cash flows generated from Mexico City's existing airport traffic (cash flows from passenger charges). Afterwards, Mexico City's Airport Trust issued the biggest corporate green bond by the time of September 2017, a two-tranche green bond for \$4 billion which also became the first green bond from an EME to receive an assessment grade by Moody's. However, the facility was already partially build when it was cancelled in late 2018, consequently to a public referendum organized by the newly-elected President. Besides this complication, Mexican green bond market boasts a solid foundation that allowed for a robust development. In fact, all green bonds issued by Mexican institutions up to 2017 hold a second opinion. Moreover, the market was also joined by non-Mexican institutions like the IFC and the World Bank Group's International Bank for Reconstruction and Development (IBRD), which issued green bonds in Mexican pesos. Mexican commitment to ESG requirements also lead to the issuance of the first Latin American sustainability bond in June and first social bond in August 2017 (GIZ, 2018c). Further market initiatives were undertaken, as the Mexico Green Bonds Investor Statement, launched by the Mexican Stock Exchange in May 2017, willing to enhance green energy economy (BMV, 2017). The BMV represented one of the first stock exchanges worldwide to launch a green-bond dedicated

segment, providing a positive signal to the market and benefits in terms of enhanced financial education, disclosure and risk analysis. An index for green debt securities still misses, but the BMV is contributing to the construction of a sustainable and low-carbon economy through the Green Finance Advisory Council and its members (Nicholson P., 2018: online). Investors are willing to include green securities in their portfolio to broaden the related ESG share, but their large demand often faces a lack of green asset and projects of sufficient size from the supply side. To overcome the problem, a securitization programme was developed by the Inter-American Investment Corporation (IIC). A further boost to the green bond market development arrived in 2018, when Mexico City signed the Green Bond Pledge, i.e. *“a joint initiative developed and designed by international climate finance and environmental groups including the Climate Bonds Initiative, which agree that all infrastructure and capital projects will need to be climate resilient and where relevant, support the reduction of greenhouse gas emissions, welcoming the role that green bonds can play in helping to achieve the financing of that infrastructure”* (Green Bond Pledge, no date: online). The Pledge is a useful tool reinforcing the Paris Agreement, supporting public and private financing of long-term infrastructure needs accomplishing low-carbon transformation of the economy, other than achieving mitigation, adaptation and resilience objectives. A fundamental step for local green bond market was taken by Mexico’s Climate Finance Advisory Group (CCFC), which published Green Bond Principles MX in January 2018. The guidelines and are based on international best practice and include the requirements needed for listing green bonds on Mexican Stock Exchange. Mexican green bond market is experiencing a steady growth, and could be further enhanced by measures including the development of a green project pipeline, building capacity within domestic banks and improving access to credit enhancing instruments (SBN, 2018a).

Colombia

Republic of Colombia is the fourth biggest economy in Latin America. Its population is situated for the major part in the mountainous interior, while the equatorial forests and savannas are inhabited by surviving Indian groups. Colombia boasts one of the greatest biodiversity of the world (ranking second after Brazil), including the Amazon Rainforest, tropical grassland and Caribbean and Pacific coastlines. Moreover, it is plenty of both non-renewable resources as gold, coal and petroleum, and renewable resources linked to agricultural lands and rivers, which allow hydroelectric plans to provide three-fourths of the

country electricity (Britannica, no date, e: online). The country's efforts towards sustainability embrace both mitigation and adaptation objectives, which would allow for an innovative, competitive and resilient economic development. Adaptation objectives concern the construction of a resilient economy able to lower its high vulnerability to climate change impacts. In order to achieve such objectives, the country recognises its need to increase and diversify its financial sources and resources. Colombia's Finance Management Committee of SICLIMA (National System for Climate Change) contributed to national green bond market development for the achievement of INDC targets (GHG emissions cut by 20% by 2030), acting as a coordinator of financing activities and identifying sources of finance for such activities. Colombia's spending directed towards construction are between the world's top 20 fastest growing. For this reason, codes and measures to ensure buildings' sustainability through energy efficiency and water conservation have been one of the main priorities of the nation. The private sector demonstrated interest in Colombia's building code initiative, and also the IFC supported the introduction of innovative financing tools, such as green bonds, with incentives (IFC, 2017b: online). In December 2016, Bancolombia issued the first green bond for the country, becoming also the first commercial bank from Latin America to issue a green bond. The bond, issued in Colombian Peso, raised \$115 million allocated to renewable energy and sustainable buildings, and was entirely bought by the IFC. The second green bond of the country originates from Davivienda Bank in April 2017. The bond was, once again, sold exclusively to the IFC for \$149 million. The third Colombian green bond was issued by Banco de Comercio Exterior de Colombia S.A. (Bancóldex) in August 2017, raising the equivalent of \$67 million in Pesos, and represents the first issuance available through the Colombian Stock Exchange (BVC). In July 2018, Empresa de Energía del Pacífico S.A. became the first non-financial institution to issue a green bond. It represents also the first Colombian Certified Climate Bond, which raised \$146 million in Pesos, directed to solar energy projects. Colombian efforts in ESG field also resulted in the issuance of sustainable and social bonds from Bancóldex and CAF-Development Bank of Latin America in Colombia's local market (ECLAC, 2018).

Argentina

Argentina is the second largest country of South America and also one of the largest economies of the region. Its rich biodiversity is particularly threatened by air and water pollution produced by the industrial sector, and also deforestation is a widespread problem.

Energy management is not efficient, but the presence of natural and hydroelectric resources represents a great opportunity for renewable energy and agricultural sectors. The country suffered a downgrade from rating agencies in 2018 (S&P rating from B+ to B in November) due to low growth prospects, economic difficulties brought by inflation and debt level, peso depreciation and investors loss of confidence. Economic growth, in fact, has been historically volatile, and resulted in relatively high urban poverty. Government took action through social and economic reforms, identifying its main priority in health, education, labor market and social protection areas, as well as environment and infrastructure (World Bank, 2019: online). In September 2018, the Argentine Guidelines for the Issuance of Social, Green, and Sustainable Bonds was published as part of General Resolution No. 764/2018 by the Argentine Securities and Exchange Commission (CNV). The Guidelines follows the GBP and CBS (Climate Bonds Standards) general principles. Tax benefits are not provided by the Resolution, but these kinds of bonds are associated with potential reputational benefits and attract companies willing to rely on institutional investors, which are following the trend to include investments creating social and environmental benefits (Beller R.W., Suk D., 2018: online).

Argentina green bond market is still nascent: the first issuance was made by Province of La Rioja in February 2017. The bond raised \$200 million allocated to renewable energy investments, in particular to the wind power generation capacity Parque Eólico Arauco SAPEM. In January 2017, however, Genneia S.A. already issued a climate-aligned bond for \$350 million, a part of which were devoted to wind projects (ECLAC, 2017). In March 2018 the first green bond from private sector was issued by Banco Galicia, for \$100 million, and subscribed by the IFC. With a tenor of 7 years, its proceeds were used to finance energy efficiency, renewable energy and sustainable construction projects (IFC, 2018b: online). The country expanded the market also to sustainable bonds in December 2017, the first of them issued by Banco de Inversión y Comercio Exterior (BICE) of Argentina for \$30 million and subscribed by Inter-American Development Bank (IDB) Group (IDB, 2018: online).

The green bond market presents good opportunities for development in the country, and national regulations and the Guidelines can enhance new potential issuances.

Chile

Republic of Chile extends for a length of 4,300 km which expose the country to different climatic regions. Chile is interested by periodical extreme natural events like volcanic

eruptions, earthquakes, tsunamis, storms and floods in winters, as opposed to summers' droughts (Britannica, no date, f: online). Chile disposes of a great variety of resources, from natural forests to mineral deposits, is the world's largest producer and exporter of copper, and owns plenty of sea fishing resources and energy sources like coal and hydroelectric capabilities. Chile's environmental characteristics provide several opportunities for a green bond market development. Clean energy projects are in the country's interest ever since 2010. The implementation of programmes and initiatives could support a decentralized access to financing, which is mainly concentrated in Santiago metropolitan region, and a green bond market would enhance the mobilization of private capital (NRDC, 2016). Santiago Exchange is responsible for several initiatives supporting national effort regarding sustainability, starting from the creation of the Dow Jones Sustainability Chile Index (DJSI Chile) in 2015, of Santiago Exchange's Integrated Annual and Sustainability Report in 2016, and of its Guide to Responsible Investment in 2017, ending with the development of a Green and Social Bond Segment in April 2018. The Santiago Exchange is trying to enhance market growth integrating internationally-recognized best practices and requiring Third-Party Verifiers to include a set of selected information concerning green and social bonds in their reports. Moreover, project categories officially recognized by the Santiago Exchange and Third-Party Verifiers have to be aligned with the GBP from the ICMA and Social Bond Principles from the CBI (Santiago Exchange, no date: online).

The first green bond of the country was issued by a local pulp paper manufacturer, Empresas CMPC, by the end of March 2017. The bond has a tenor of 10 years and raised \$500 million. On March 2018, the water utility company Aguas Andinas became the first company from the water sector to issue a green and social bond, raising \$68 million. The 7-year tenor green bond was the first of its kind to be listed on the Green and Social segment of the Santiago Stock Exchange, and its proceeds have been used to finance water supply, resilient infrastructure and wastewater management in the country. A second party opinion was implemented by Vigeo Eiris, and demand for the bond exceeded the amount offered to the market by 3.6 times. In January 2019, the first long-term green bond was issued in the Santiago Exchange. The bond, issued by the water utility company ESVAL, has a maturity of 25 years, raised \$61 million, is aligned to the GBP and received a second party opinion from Vigeo Eiris. Also in this case, demand surpassed the amount offered by three times. More recently, the Minister of Finance made explicit the willingness to issue Latin America's first sovereign green bond in the near future, with the intention to raise between \$1.5 and \$2 billion from international market for the year. It would be part of the nation's environmental strategy

and help widen the investor base. However, an evaluation of upfront costs deriving by this first issuance still has to be taken into consideration (Kilby P., 2019: online).

Peru

Republic of Peru is located in the West of Latin America. The country's economic growth enhanced poverty reduction and social inclusion whilst pursuing mitigation and adaptation objectives. However, the UNFCCC recognizes the country as “particularly vulnerable” to the adverse impacts of climate change. Many rural areas inhabited by indigenous people highly depend on primary sector activities, which are continuously threatened by cyclical climatic events, among which “El Niño”, causing low-pressure areas, drought and floods. Priority areas identified to be concerned by mitigation and adaptation objectives are water, agriculture, fishery, forestry and health (Republic of Peru, 2015). Peruvian Government approved 2014 National Strategy on Climate Change, with the intention to manage the impacts of climate change in an integrated and multi-sectorial way. A 2018 framework law on climate change, aligned with the National Strategy, made Peru's Paris Agreement pledge legally binding. The law does not provide specific measures concerning the reduction of GHG emissions, however, it indicates how each sector should try to achieve mitigation, like “*carbon sequestration in forests, sustainable transport, waste management, switching to renewable energy, and energy efficiency in industry*”(Climate Action Tracker, no date: online).

The first Peruvian green bond was issued from the private windy energy producer Energía Eólica in December 2014 for \$204 million. It is guaranteed by the company's earnings and assets, and was acquired for 80% by Peruvian pension funds and issuers, while the remaining part went to international investors (NRDC, 2016). Earlier that year, the IFC had already issued a green bond denominated in Peruvian Soles for domestic investors, raising the equivalent of \$42 million. The sole investor was a local insurance company, RIMAC Seguros. Besides the first kick-start issuance by Energía Eólica, however, the second emission from a Peruvian issuer only came in October 2018, from Protisa Peru. Protisa is a Chilean company part of the CMPC group and operating in Peru since 1995. The proceeds deriving from its \$30 million green bond were directed towards sustainable water management and energy efficiency projects (CBI, 2018: online). The British Embassy in Peru collaborated with Lima Stock Exchange (Bolsa de Valores de Lima, BVL) in order to support the launch of a domestic green bond market through the publication of a Green Bonds Guideline on April 30th, 2018. It was developed by MEXICO2 of the BMV Group, which already released the

Green Bond Principles MX (GOV.UK, 2018: online). It promotes international best practice with the ultimate goal to assist issuers in the green bond emission phase, further enhancing transparency through the use of a third-party verifier, together with monitoring and timely reporting. In May 2019, Peru's Development Finance Corporation (Cofide) issued an inaugural green bond on the BVL. It was worth \$30 million and denominated in local currency, with maturity in 3 years. It represents also the first green bond from a financial Peruvian institution. Moreover, in April 2019 the power transmission company Consorcio Transmantaro, an affiliate of the Group in Peru, issued an unsecured green international bond for \$400 million.

Costa Rica

Republic of Costa Rica is a Central America country that owns approximately 5% of global biodiversity. In the past it suffered from extensive deforestation, which became the main environmental problem of the country. Costa Rica commitment to climate change issue is remarkable and globally recognized. The government, in fact, is particularly active in dealing with environmental issues, implementing programs and legislations and creating a deep link between its economy, its culture and environmental sustainability. The country owns hydroelectric plans able to fulfil a large share of domestic energy demand. Moreover, also the presence of geothermal, wind, biomass and solar power plans is contributing considerably to clean energy production, supporting the national objective of becoming the first carbon neutral country in the world by 2021. The country already reached outstanding results, being able to produce nearly 93% of its electricity from renewable resources (Visit Costa Rica, no date: online).

In April 2016, the country approached the green bond market. Banco Nacional de Costa Rica issued the first green bond of the country, a \$500 million green bond, whose proceeds were directed towards wastewater and renewable energy projects. With a tenor of 5 years, the bond was rated BB+ by Fitch, but did not received an independent review, although the bank's commitment to publish online report concerning the use of proceeds. According to the CBI, this is the fourth green bond from Latin America (Kidney S., 2016b: online). No further issuances are highlighted up to date, but national Green Bond Guidelines has been published by the Costa Rica Stock Exchange (BNV) for national issuers, based on the GBP signalling the opportunity that green bonds represent to help national climate-related objectives. They

concern especially clean energy but, also forest conservation owns great potentiality for the country (CBI, 2019b).

Moreover, in February 2019, a National Decarbonisation Plan (2018-2050) concerning transportation, energy, waste, and land usage, as well as construction and agriculture was launched. Its objective is the complete elimination of GHG emissions by 2050 through measures and plans concerning relevant public and private sectors.

2.4 Central, Eastern and South-eastern Europe (CESEE)

The countries of Central and Eastern Europe generally share a common past as communist states. The post-communist period, started in 1989, brought a series of reforms aiming to a more free-market oriented economy and entailed a general trend of privatization of industries. The reforms implemented also attracted foreign capital investments, even though following heterogeneous patterns between the various zones of the region, and GDP grew thanks to improved productivity. Countries experienced a significant economic growth in the last decades, until 2008 financial crisis. They used to rely mainly on foreign capital inflows to finance investments and this represented the prime reason for the capital markets growth slowdown occurred during the recent financial crisis, as a consequence of the decrease in foreign capital inflows. Summed up with volatility of investments, these countries generally resulted in insufficient level of public and private investments needed to sustain the pace of growth experienced until that moment. Moreover, the economic models made up to sustain the growth resulted not being solid, lacking of significant domestic financing, investments aiming at growth and sufficient innovation. They used to invest mainly in utilities and transport and less in health infrastructure when compared to EU average. Furthermore, the growth of GDP per capita was restrained by the combined effect of increased population aging and outward migration, together with a contraction in working age population which resulted in a decline in total population. In order to build more robust economic models and financial markets, the reliance on domestic savings for investments should increase, competitiveness could be boosted by the mean of reforms and policies aimed at making up for the shortages of skilled staff, and an alignment of R&D with business needs, focusing in particular on innovation, might increase productivity. Also investments in utilities, transport and communication infrastructures could enhance a stronger development of such economies (R. L. Bubbico et. All, 2017).

A survey conducted in the region by the CFA Institute between February 26th and March 18th, 2018, highlighted some of the specific barriers preventing the growth of some of these capital markets.²⁰ As agreed by 67% of respondents, it emerged the need for a common EU regulatory body which would allow for increased regulatory and supervisory powers to the European Securities Markets Authority. The purpose would be that of smoothing the differences in liquidity between European countries, creating common standards across local markets. In order to achieve such objective, additional action should be undertaken in the form of reduced investment costs, increased foreign direct investments, enhanced transparency and investor protection, still perceived low in some of the CEE countries. On the other hand, the states not favourable to this approach believe that harmonization would hamper the abatement of specific barriers and that it would be possible only through a lower EU-level regulation. A second issue recognized in the survey as main barrier concerns investors' declining level of confidence in local financial markets. This factor could result in even higher questioning for green bond investors concerned about greenwashing, preventing the green bond market to develop at its full potential.

In the light of such circumstances, green bond market development has to face some challenges related to market liquidity where capital markets are less developed, or greenwashing risk hampering investments' attractiveness, further aggravated by a lack of investors' confidence. An increase in awareness and standards development could enhance the creation of more solid basis for local green bond markets development. The first green bond of the CEE region was issued in June 2015 by the Estonian Renewable energy company Nelja Energia, for EUR50 million, and whose proceeds financed renewable energy sector in solar, wind, hydro and biomass projects (CBI, 2018g).

CESEE region includes four of the MSCI's EMEs countries, namely Czech Republic, Greece, Hungary and Poland, plus Latvia and Lithuania, which are recognized as EMEs by Bloomberg. These countries do not present a homogeneous economic condition, resulting in different characteristics and stages of development of capital markets and, ultimately, of domestic green bond markets.

²⁰ CFA Institute is an independent organization providing services to core investment management professionals. The survey received answers from 263 investment professionals (predominantly portfolio managers, senior executives, risk managers, consultants, and analysts) from eight CEE countries, i.e. Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Poland, Romania and Slovenia (Silvestri R., 2019: online).

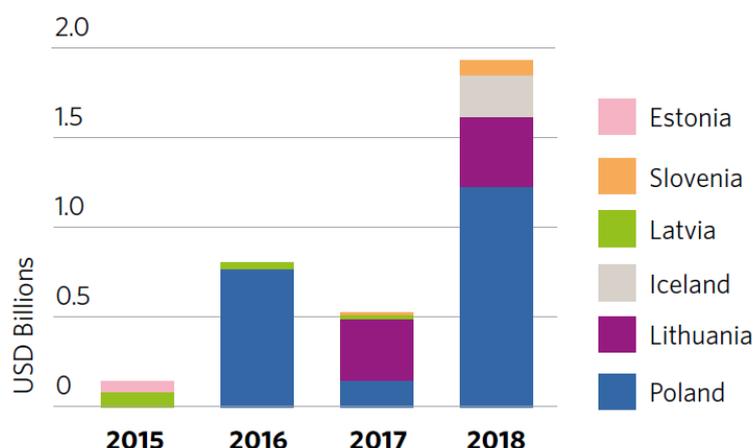


Figure 23: Europe EM green bond issuance over time by country
Source: Green Bonds, The State of the Market 2018 (CBI, 2019b)

The largest economy of the region is represented by Poland, already mentioned for its sovereign green bond issuance which, as of Q1 of 2018, accounted for 74% of total Central and Eastern Europe (CEE) total issuance. However, in general, issuances from CESEE region are characterized by smaller size whilst two of the EMs considered, namely Czech Republic and Hungary, have not issued any green bond yet (Figure 23).

Table 12: Summary of Central, Eastern and South-eastern Europe EMEs

Official name:	Republic of Poland - PL	Currency:	Polish złoty - PLN
Total area:	312,679km ²	Population (2018)	37,921,592
GDP, PPP, \$ (2018)	1,228,853.73	GDP per capita, PPP, \$ (2018)	32,356.5
Official name:	Hellenic Republic - GR	Currency:	Euro - EUR
Total area:	131,990 km ²	Population (2018)	10,522,246
GDP, PPP, \$ (2018)	320,473.59	GDP per capita, PPP, \$ (2018)	29,873.6
Official name:	Republic of Latvia - LV	Currency:	Euro - EUR
Total area:	64,559 km ²	Population (2018)	1,928,459
GDP, PPP, \$ (2018)	55,086.06	GDP per capita, PPP, \$ (2018)	28,362.0
Official name:	Republic of Lithuania – LT	Currency:	Euro - EUR
Total area:	65,300 km ²	Population (2018)	2,801,264
GDP, PPP, \$ (2018)	94,051.97	GDP per capita, PPP, \$ (2018)	33,252.7

Official name:	Hungary – HU	Currency:	Hungarian forint - HUF
Total area:	93,028 km ²	Population (2018)	9,707,499
GDP, PPP, \$ (2018)	302,626.10	GDP per capita, PPP, \$ (2018)	30,978.9
Official name:	Czech Republic - CZ	Currency:	Czech Koruna - CZK
Total area:	78,865km ²	Population (2018)	10,665,677
GDP, PPP, \$ (2018)	425,011.11	GDP per capita, PPP, \$ (2018)	39,998.4

Poland

Poland has implemented a socially and territorially sensitive development, aiming to achieve its SDGs concerning in particular the sustainable management of water resources, an effective waste management, air quality improvement in the urban areas, soils protection and noise pollution impact reduction. First of all, Poland aims at strengthening the efficiency and effectiveness of the state itself and of its institutions, so that plans and policies can be successfully implemented and goals achieved (United Nations SDG, no date, b: online).

In order to realize its decarbonisation strategy, the country entered the green bond market in December 2016 with an innovative type of security, a sovereign green bond. It was positively accepted by the market, with a pre-issue demand of €1.5 billion and, able to raise €750 million, it opened the gates to this new powerful kind of issuance. It features 5-years maturity and its proceeds concerns the categories of eligible projects outlined in the Green Bond Framework developed by the State Treasury (Whiley A., 2016: online). The Framework recognizes six categories of eligible criteria: renewable energy, clean transport, sustainable agriculture, afforestation, national parks and reclamation of heaps projects. A second-party opinion was provided to the Framework by Sustainalytics, which confirmed its alignment with the four pillars of the GBP and defined it transparent, robust, and credible (Sustainalytics, 2016). A second sovereign issuance took place in February 2018, raising €1 billion, with maturity of 8.5 years and listed on the Luxembourg Stock Exchange. It was rated GB2 (Very Good) by Moody's for its exclusive allocation of proceeds in the six eligible sectors and its alignment with the GBP (Moody's, 2018). An annual Review was carried by Sustainalytics in February 2019, confirming the alignment of the projects and programmes with the Green Bond Framework's Use of Proceeds and Eligibility Criteria and the reporting of at least one KPI per Use of Proceeds Criteria (Sustainalytics, 2019). In March 2019

Republic of Poland issued a €2 billion dual tranche of 10 and 30 years, whose proceeds were allocated to environmental eligible projects as qualified by the Green Bond Framework.

Poland issuances received some criticism related to the country's extensive use of coal, which accounts for 80% of national electricity mix – according to the IEA. However, the development of national guidelines for green bonds, the increasing amount of debt issued and the allocation of proceeds towards renewable energy projects demonstrate the country's strong commitment towards decarbonisation goal achievement. The country is aiming at becoming the first nation constructing a debt yield curve through the means of several green bond issuances of different maturities, among which investors could choose.

Greece

Hellenic Republic is a country of South Eastern Europe composed by a main peninsula and more than 2,000 islands. It boasts a strategic position, at the intersection between Europe, Asia and Africa, and its landscape is quite complex. Economic development experienced a fast growth after World War II, but its shortage of natural resources, slow industrialization process and its trouble with its balance of payments resulted in a stage of development lower than in the other countries of European Union. Almost one-fifth of the land is covered by forests, which suffer from fires problem. Greece, because of its position, is threatened by climate change especially for what concerns its 16,300km of coastline, of which 58% are highly vulnerable to sea level rising, extreme wave events and other local factors. Atmospheric pollution represents a serious concern for urban areas, in particular for Athens. For this reason, adaptation objectives have been set considering the reinforcement of country's resilience and supporting the exploitation of opportunities and the addressing of risks arising from climate change (Hellenic Republic, 2018). The country is already in an advanced position with respect to the achievement of its targeted GHG emissions reduction objectives, as a result of government's commitment in the actualization of strategic approaches and coordination mechanisms. Greece was interested by a bond issuance in July 2017. The renewable energy producer Terna Energy raised €60 million (almost \$70 million) selling 60,000 bonds at €1,000 each. The offer resulted oversubscribed for 2.57 times and proceeds were used to finance renewable and waste management projects. However, the bond is not labelled as green (Shumkow I., 2017: online).

Latvia and Lithuania

Latvia and Lithuania are two of the three Baltic states in North-eastern Europe. They both approached the green bond market with a small number of issuances.

Latvia has great potential for renewable energy and for hydropower in particular, thanks to the multitude of rivers in its territory. As of 2016, Latvia renewable energy accounted for 37% of the country energy mix, mostly generated from hydropower. It represented the third highest share of renewable energy in the EU. Besides social objectives, climate change adaptation, GHG emissions cut, renewable energy and recycling are all targets included in the country's SDGs. Rail improvements are being considered for close future investments by the Ministry of transport for €5.1 bn. Many available projects could be qualified as eligible for green financing, from EV charging stations to Riga airport improvement of environmental credentials. The first green bond of the country has been issued by a government-backed energy company, Latvenergo, a grid operator connecting renewable energy to the grid with the purpose of efficiency. It issued a €100 million green bond which was initially sold in June 2015 for €76 million, and further tapped in April 2016 for €25 million. Then, in October 2017, also the financial investment company Altum issued a €20 million green bond, whose proceeds financed companies active in the sectors of renewable energy, green buildings and low carbon transport (CBI, 2018g).

Similarly to Latvia, Lithuania's 2030 Agenda is focused on social sustainable development. However, also "innovative solutions and smart energy" are considered as a main priority for the country. In fact, a National Energy Independence Strategy has been set up, and renewable energy made up a consistent share of energy consumption (26%) and for heat source (46%) (United Nations SDG, no date, c: online). Whilst air and water quality show good results, and a National Climate Change Management Policy was introduced to deal with EU GHG emission reduction targets. Transport is the sector accounting for most of cities' air pollution, and also waste management is a major concern for the country, which is currently making progress in dealing with it. Targets for the year 2019 with respect to waste management has been recommended in the forms of economic incentives through policies and mandatory targets, the promotion of prevention and support to municipalities. (European Commission , 2019). Thanks to the use of biomass power, Lithuania was able to achieve its 2020 targets concerning renewable energy early in 2013. However, household energy consumption, car traffic and railway sectors still have room for improvement. In July 2017, Lietuvos Energija issued the first green bond of the country for €300 million. The bond would have been

originally worth €200 million, but it was upsized as a consequence of the significant demand received. Moreover, the bond is listed on several European stock exchanges. The company became a repeat issuer in 2018, achieving a value of cumulative issuance of \$695 million. Both issuances' proceeds were directed towards renewable energy, waste, low-carbon buildings and other sectors. Republic of Lithuania issued the first sovereign green bond from a Baltic country and the second in the CEE region. In May 2018, the government closed a first tranche for €20 million (\$24 million) of a sovereign green bond programme of €68 million. The bond has a 10 year tenor and its proceeds financed a loan allocated to its Public Investment Development Agency for a project concerning energy efficiency upgrades of buildings. With this transaction, the country became the second sovereign issuer of Central and Eastern Europe region and the seventh at global level (CBI, 2018g).

Czech Republic and Hungary

Czech Republic and Hungary are both located in Central Europe. Besides Czech Republic's advanced economic condition when compared to the other states of the region and Hungary's commitment to prioritize climate-related objectives, the two countries have not issued any green bond yet.

Czech Republic presents numerous mineral springs, groundwater reserves and several minor and larger rivers, which are important from an economic point of view but also constitute a source of hydroelectric power. From an economic point of view, Czech Republic adopted a free market after the Velvet Revolution of 1989, when the communist control was deposed. A series of reforms allowed for privatization of industries, liberalization, foreign trade and investments. However, banking industry was characterized by poor management and corruption and financial market lacked of transparent regulations. In spite of the instability experienced, the economy grew very rapidly, and Czech Republic reached the highest standards of living between the former communist countries of eastern Europe. The state ratified the Paris Agreement in 2017 and published its Long-Term Climate Change Strategy. It concerns GHG emission reduction targets in sectors: industry, energy, final energy consumption, transport, agriculture and forestry, and waste. The instrument chosen by the country for financing are mostly bilateral and multilateral foreign development cooperation of the Czech Republic (MoE, 2017). The CBI individuated opportunities for green issuers in the country, in particular with respect to low-carbon buildings, which seems to be suitable for Certification of Commercial Buildings, whose emissions intensity is at or below a calculated emissions intensity target (Whiley A., 2019: online).

Hungary, instead, has been more active than Czech Republic for what concerns environmental sustainability and recognizes climate finance as a critical matter, making mitigation objectives a priority for the country and linking adaptation goals to local conditions. Its economic growth was hampered by many obstacles but privatization, foreign direct investments, the modernization of telecommunications, the emergence of new industries and the contribution from tourism allowed for a sustained economic growth. The country implemented a Green Investment Scheme aimed at increasing the energy efficiency of residential buildings whilst fulfilling GHG emissions reduction targeted objective (40% reduction by 2030 compared to 1990 level). The country also presented energy-related targets, like reaching a share of 14.65% of renewable energy within total gross energy consumption until 2020. Energy sector is of critical importance for the country's ability to reach its goal, as in 2013 GHG emissions already reached a reduction of 36% with respect to 1990 level (UNFCCC, no date, c: online). Even if no green bond has been issued, the CBI reports mention Hungarian Enefi Energy as an unlabelled climate-aligned issuer (CBI, 2016).

3. The Green Premium

In recent years several studies interested the topic of green bond pricing, questioning whether green bonds have been priced at premium on average with respect to conventional bonds on the basis that such premium could be derived from a “greenness” factor.

The existing literature concerning green bond premium presents mixed evidence, with several hypothesis tested through different approaches and leading to opposing results. These studies concentrate on both primary and secondary markets and the samples considered in the analyses remarkably vary with respect to the subset of green bond type selected and the database used. Each platform gathering data on green bonds, in fact, presents slightly different criteria for bonds selection, also depending on the relative valuation of green bonds alignment with the GBP. This is a consequence of the lack of an universally accepted standard defining greenness and also of the absence of potential enforcement mechanisms which would prevent the diverseness among green bonds definitions and selection (Hyun S., Park D., Tian S., 2018). Moreover, also the availability of data and the approach preferred for the analysis create substantial divergences and can considerably limit the scope of the analyses.

Therefore, this Chapter serves the purpose to clarify whether greenness is a factor that significantly affects the bonds pricing, presenting an overview of the results obtained from the existing literature and conducting an analysis which focuses, in particular, in the market for green bonds in EMEs.

3.1 Literature Review

There are many suppositions concerning the rationale behind the presence of a green bond premium or discount, and the consequences this would entail. It has been observed that in several cases the demand for green bonds exceeded the supply and, whether it produces a discount, it can be a sign of a market that did not reach efficiency yet (Hyun S., Park D., Tian S., 2018). The CBI states that whilst a new issue premium is likely to emerge in a bond market as a mean to attract new investment, a discount seems not logically explainable (CBI, IFC, 2019). Other authors, like Karpf and Mandel (2018), considered the presence of environmental-friendly and ethical investors as additional demand when comparing green bonds with the conventional bond market, which should support the presence of higher price and lower yields for green bonds.

The existing literature concerning green bond premium is relatively recent and explores both the primary and secondary market, with opposing results about the presence of a green bond

premium, and this section presents an overview of the results obtained. Between the analysis concerning the primary market, Ehlers & Packer (2017) and Baker et al. (2018) found evidence of a negative premium, whilst various studies from the CBI conducted between 2016 and 2019 resulted in mixed evidence. For what concerns secondary markets, a green premium was identified by Karpf and Mandel (2018), whilst researches conducted by Preclaw and Bakshi (2015) and Zerbib (2018) highlighted a green discount in the market. On the contrary, Bachelet, Becchetti and Manfredonia (2019) and Hyun S., Park D., Tian S. (2018) did not find any significant green premium.

3.1.1 Primary Market

Ehlers & Packer (2017) analysed whether the green label could create any price effect in the market concluding that, on average, the spreads at issuance identified whilst acquiring green bonds were lower than those identified for conventional bonds. The analysis consisted in the comparison of the credit spread at issuance of a sample of 21 green bonds matched with conventional bonds for the period 2014-2017, selected on the basis of the same issuer and the closest issue date available. The average spread for green bond was of -18 bps, and with 5 out of 21 green bonds pricing at higher spreads than their associated conventional bonds. The green bonds selected are compliant with the Green Bond Principles, whilst conventional bonds must have similar maturity. The sample is only composed of fixed rate bonds – in order to be able to control for factors as debt seniority, risk characteristics and the uncertainty related to floating rates. Only USD and EUR denominated bonds are considered, whilst the exclusion of bonds issued in EMEs currencies is justified by the instability of their spread over local benchmark rates.

Baker et al. (2018) expanded the green bond sample including in the selection Bloomberg identification of green bonds,²¹ other than considering solely green bonds aligned with the GBP. It comprehends US corporate green bonds whose yield data were available in Bloomberg platform and US municipal bonds data obtained from Mergent for the period 2010-2016. The analysis highlights that green bonds are issued at an after-tax yield spreading from -5 bps to -7 bps when compared to their associated ordinary bonds, resulting in a -7 bps

²¹ According to Bloomberg's definition, labelled green bonds must direct their "*proceeds towards projects or activities that promote climate change mitigation or adaptation or other environmental sustainability purposes*". Only green bonds whose 100% of proceeds are allocated to such activities are included. Moreover, the issuer must demonstrate his effort in its intention to meet certain criteria related to the management of proceeds, transparency and/or reporting. Bloomberg's definition is derived but is not limited to that from the GBP, including also those of others organizations (BNEF, 2015).

premium. The result is obtained through a regression run on after-tax yields of green bond indicators and controls, as the authors described pricing in the US municipal market as sensitive to tax features. Chosen controls concern maturity, rating, month fixed effect and liquidity – for which the issue amount is used as proxy. Moreover, also size category, potential insurances, tax features, bank qualification status, new money, general obligation collateralization and use of proceeds are factors considered in the model. The analysis further extends to some observations concerning ownership concentration of green bonds, which is higher especially when the bond is small in size or when risk is low. Finally, the effect of a Certification on green bonds is investigated, resulting in stronger effects for both pricing and ownership of Certified green bonds.

Between 2016 and 2019, the Climate Bond Initiative published several periodical reports with the IFC investigating some characteristics of the green bond market – including whether the oversubscription of green bonds could lead to tighter prices – and the presence of a green discount, labelled Greenium, is put under verification. Market dynamics can affect the pricing of both green and vanilla bonds, and the smaller size usually presented by green bonds with respect to their conventional equivalent may affect demand and lead to consequential pricing difference. Whilst it is common to attach a new issue premium to bonds in order to attract new investments, according to the authors a discount would not be logically explainable. While the price of green bonds would be higher than conventional bonds, the yield would be lower, allowing for a cheaper cost of funding for the issuers. However, the authors claim that green bond issuers usually incur additional costs linked to the certification or third-party reviews, and the absence of credit enhancement to warrant pricing differences from conventional bonds, to which they are equal in all the other characteristics apart from the use of proceeds, would not explain the presence of a discount.

In the reports, the methodology for green bond inclusion is the selection of bonds issued in the period of reference, denominated in USD or EUR currencies, with a size greater or equal to 200 million, rated only investment grade, with a minimum term for maturity equal to 3 years and consistent with the Climate Bond taxonomy, whilst amortising bonds are excluded. These criteria are chosen in order to grant the focus on the most liquid portion of the market. For what concerns comparable bonds, their selection follows the requirements of size, issue date, residual maturity and currency of green bonds, while they must present the same seniority rank and Bloomberg composite rating of green bonds. Zero coupon and floaters/index linked bonds are excluded.

In the report analysing the period between January 2016 and March 2017, the sample is composed by 14 green bonds, namely 10 USD denominated bonds from 7 issuers and 4 EUR bonds. Green bonds selected must have a minimum of 6 comparable bonds for what concerns data on yield on issue date. A comparison of the yield curves is graphically provided, and they display 6 green bonds priced inside their own yield curves, indicating the presence of a discount, i.e. a greenium. Of the remaining green bonds analysed, 4 result priced on their own yield curves, meaning no new issue premium is present, and 4 are positioned outside their yield curves, which signal the bonds own a new issue premium.

In the report covering the period from April to June 2017, a difference in methodology concerns the size for green bonds considered, which is increased to a minimum of \$300 million. The sample for Q2 of 2017 is composed of 10 green bonds, of which 2 present a greenium, 2 are priced on their own yield curves and 6 show a new issue premium (CBI, IFC, 2017).

The third quarter of 2017 is analysed through a sample of 12 green bonds from 10 issuers available for the comparison, resulting in 2 bonds showing a greenium, 4 bonds with no new issue premium and 6 bonds with new issue premium. The whole report analysed a total of 19 green bonds, of which 8 have been upsized at issue, suggesting that demand for green bonds is consistent. Moreover, it is noted that green bonds are chosen by currency and not by country of domicile of the issuer, which entails the inclusion of bonds from developed, emerging and frontier market countries.

The final quarter of 2017 presented only 6 green bonds analysed, half presenting a greenium and half exhibiting a new issue premium.

For the first half of 2018, no green bonds presented a greenium. On the contrary, 5 green bonds (4 EUR denominated and 1 denominated in USD) were priced on the yield curve and 13 display a new issue premium, of which 10 denominated in EUR and 3 in USD. For this report, the inclusion of green bonds in the sample was subject to the presence of a minimum of 4 comparable bonds – a lower threshold than in the previous studies – and the minimum size for bonds selection was further increased to \$500 million. Moreover, this report include some considerations regarding specifically the emerging markets, highlighting the presence of 29 green bonds issued from 10 EMs from 2016 to H1 2018, i.e. United Arab Emirates, Brazil, Chile, China, India, Indonesia, Korea, Lithuania, Mexico and Poland. Of this subcategory of green bonds, 7 were denominated in EUR while 22 in USD, for an amount totalling to \$20,5 billion. It represents slightly more than a quarter of the total of EM issuance over the period, and China is identified as the country contributing the most between the EM issuances,

mainly as a consequence of the clarity of its policy guidelines from the PBoC (CBI, IFC, 2018).

The report concerning H2 2018 includes 14 green bonds in the sample which present a new issue premium (9 denominated in EUR and 5 in USD), 2 EUR denominated green bonds with a greenium and 5 green bonds (3 EUR denominated and 2 in USD) priced on their own yield curves (CBI, IFC 2019).

In conclusion, between 2016 and 2018, according to the described methodology, it was possible to draw a yield curve for 81 selected bonds. Of them, 15 (18,52%) present a greenium, and 20 (24,69%) was on the yield curve. It means that 43,21% of bonds did not present a new issue premium, while 46 (56,79%) show a new issue premium. All reports agree that investors do not have any foundation to expect a greenium, as there exist no evident and consistent pattern for green bond pricing, and their behaviour is similar to the vanilla bond market. However, the samples are small and they do not offer the opportunity to make any inference concerning currency and sector. Moreover, it is not possible to verify whether certification influence pricing granting standards of transparency and integrity, as the comparison of certified and not-certified green bonds is not yet possible with current data, according to the authors.

3.1.2 Secondary Market

Between the first analyses concerning the presence of a green premium in the secondary market, Preclaw and Bakshi (2015) run a regression on the credit spread of seven cross-sectional samples of the Global Credit Index, on a quarterly basis, from 2014 up to mid-2015. The analysis also considered the composition of the option-adjusted spread (OAS), which is the difference between a fixed-income security rate and the risk-free rate of return, after the removal of the effect of embedded options, and distinguishing between common risky factors and green bonds' indicator variable. Variables included in the regression accounts for credit risk, spread duration – for the investment length, issuance time by quartile – for the liquidity premium, and currency – for valuation differences across markets in different countries. They resulted to have a statistically significant effect on the credit spread, and the regression revealed a significant -17 bps for green bonds in OAS. Moreover, the green bond investor premium seems to grow together with the market expansion. In particular, the variables have been statistically significant only in the past three time periods (March-August 2015), and the author attributes this trend to the increase in the sample set. Potential explanations identified by the authors for the result obtained are the mismatch of supply and demand as a

consequence of the interest demonstrated towards green bonds, the possibility for the spread to increase as it accounts for externalities – even though their quantification is extremely difficult – or the preference of benefits for investors over the lowered cash flows – related to psychological benefits, brand value, regulators’ influence and indirect gains. However, none of them is verified by the authors.

Similarly, Zerbib (2018) found the presence of a negative green bond premium of -2 bps in its analysis covering the period between July 2013 and December 2017. He tested for the presence of a green bond premium as an effect of pro-environmental preferences. The purpose of his study was to conduct an extensive analysis with respect to the sample scope and with a proper control of discrepancies between green and conventional bonds. This study on green bonds complying with GBP, in fact, represented the most extensive for what concerns geographical scope, number of bonds and price history at that time. 110 green bonds were matched through the model-free or direct approach, in which two bonds from the same issuer are associated because of their identical factors explaining the yield, except for the one factor on which the analysis focuses. Conventional bonds result equal to green bonds for what concern issuer, maturity, currency, rating, bond structure, seniority, collateral and coupon type, while differences in issue date and size are limited and liquidity is controlled.

An opposite result is obtained in the analysis conducted by Karpf and Mandel (2018), who considered US municipal bond market for the identification of a difference between the yield term structures of green and conventional bonds. With respect to an historically lower trading price of green bonds in municipal market, the authors underline the presence of a positive premium in recent years. Data are gathered from Bloomberg database. The authors claim that green bonds should benefit from a greater demand which includes environmental-friendly and ethical investors, and thus they should result being traded at higher price and lower yields than conventional bonds. A comparison of yield curves of green and conventional bonds shows that on average green bonds pay lower interest rate and the spread between green and conventional bonds yield curves widens as the maturity increases. However, as the Oaxaca-Blinder decomposition is performed in order to determine whether a green premium actually exists, it is explained that, for the average of the period considered, a positive spread of 30,8 bps is attributable to the characteristics of the issuer, while the unexplained part, attributed to the green feature of the bonds, accounts for a negative -7,8 bps spread. The observed average spread is thus 23 bps positive. A “reputational” green premium is identified in the report, linked to the credit quality of the bond, with the unexplained part recording negative for the

first five years of the market and turning positive in the last two years of observations, simultaneously to the improvement of the bonds' credit quality.

Bachelet, Becchetti and Manfredonia (2019) present an article questioning the presence of a green premium and further investigating issuers' characteristics, market features of liquidity and volatility, and the role of third-party verification in secondary markets. Green bonds are selected from the CBI website and a distinction between certified and not certified green bonds is established. Through a matching procedure, green bonds are compared to brown bonds with equal characteristics per issuer, currency, rating, bond structure and coupon type. Maturity of bonds can differ for a maximum of two years, brown bonds amounts allowed are up to four times larger or smaller than those of green bonds, and coupon rates can be at most 0.25 higher or lower than the green bond rates. The sample obtained is composed by 89 bond couples covering the period 2013-2017. The study suggests the possibility for green bonds to display a negative premium, obtaining the opportunity for green investments to be financed at a discount. In general it was found higher liquidity – around 5 bps – for green bonds with respect to brown bonds, and significant lower volatility for green bonds. When distinguishing between private and institutional green bond issuers, the findings indicate for private issuers a significant positive premium in the presence of relatively lower liquidity and slightly lower volatility, and a negative premium for institutional issuers, with higher liquidity and lower volatility. Greenwashing and informational asymmetry are also analysed, as the higher the risk of greenwashing, the more possible it seems that investors require a premium when considering non-Certified green bonds. This affects more private issuers than institutional issuers, which boast higher reputation and creditworthiness. The premium, in fact, requires either an established reputation of the institutional issuer or a green verification to reduce asymmetric information. When focusing on private issuers, a greater positive premium occurs for non-Certified green bonds with respect to the Certified green bonds.

Hyun S., Park D., Tian S. (2018) conducted a study on a sample of 60 investment grade green bonds labelled under the GBP, for which data are derived from Bloomberg platform for the reference period 2010-2017. Each bond is matched with a conventional bond with equal characteristics concerning issuer, currency, credit rating, bond structure and maturity, and excluding noninvestment grade, zero coupon, floating coupon and option clauses bonds. The matching procedure selected is the same of Zerbib analysis (2017). The analysis resulted in an average low negative premium – almost close to zero – and not significant. In order to further investigate the greenness premium, the authors focused on the role played by two important

variables for green bonds: independent reviewer and CBI Certification. The result of the OLS regression indicate how the two variables significantly lower the premium by 6.6 bps and 8.6 bps respectively. The authors conclude that the reason could stand in lower information costs for ethical investor benefitting of the mitigated information asymmetry entailed by the presence of an independent reviewer or a CBI Certification. The costs of these mechanisms could be compensated with lower financing cost deriving from the excess demand for Certified green bonds originating as a consequence of the lower information costs incurred compared to the low volume from the supply side, and also originating from investors' increased confidence. The study proceeds towards considerations linked to market size and liquidity, finding that a discount is present in a small market with low liquidity, while the green bond premium is lower for larger issuers benefitting of better liquidity. Moreover, such premium results positively related to maturity, growing more slowly as the maturity gets longer. Finally, the wider the bid-ask spread the higher the yield, signalling that investors care about liquidity, and a liquidity premium is requested for less liquid green bonds.

In conclusion, the results presented appear extremely mixed, depending on factors like the differences in the sample sets analysed, the heterogeneity among green bonds – mainly due to the lack of universally accepted standards in the market – and on the timing of the analyses themselves. Moreover, most of these studies did not make a distinction between developed and emerging markets. On the contrary, some of them voluntarily excluded emerging markets currencies in the attempt to avoid the volatility of spreads over their local benchmark rates (Ehlers & Packer, 2017). Differently from previous studies, the analysis performed in the following section focuses in particular on the verification of the presence of the green bond premium in emerging market economies, trying to understand how the secondary market reacts to these tools.

3.2 Data Description and Matching Method

In this analysis, the hypothesis of the significance of the green bond premium in EMEs is questioned following the model proposed by Zerbib (2018). Each green bond is paired up with a conventional bond from the same issuer and equal per characteristics. A fixed-effect panel regression is run on the yield differential for each bond couple, using the difference in bid-ask spread (representing a proxy for liquidity) as regressor. Therefore, after identifying the green premium in the unobserved specific effect of the regression, and seeing it results positive and statistically significant, a second regression is run with the purpose to understand

which are the green premium drivers, chosen among the bonds’ characteristics, and whether and which are significantly affecting bonds’ pricing.

Data are gathered from Bloomberg database and include only active²² green bonds whose issuers have an EM country as country of incorporation and/or country of domicile and/or country of risk²³. When the related country of domicile is signalled by Bloomberg as an EM, also Supranationals are included. The period of reference starts from the first active green bond in the market, which results in September 29th, 2010, and ends in May 31st, 2019. The sample obtained is composed of 525 green bonds from 28 EM countries: Argentina, Bermuda, Brazil, Chile, China, Colombia, Costa Rica, Czech Republic, Fiji, Greece, India, Indonesia, Ivory Coast, Korea, Latvia, Lithuania, Malaysia, Mauritius, Mexico, Nigeria, Peru, Philippines, Poland, Taiwan, Thailand, United Arab Emirates, Venezuela and South Africa.

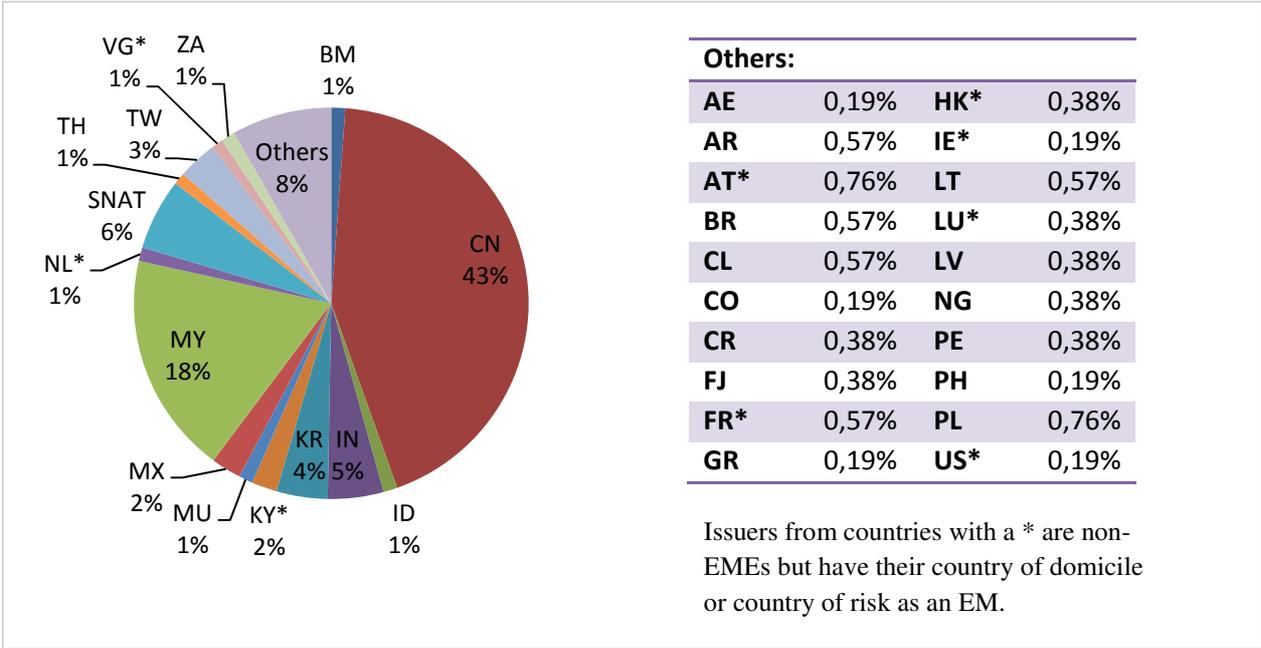


Figure 24: Green bonds in the data set by number by country of incorporation.
Source: created by the author on Bloomberg data

²² At the date of May 31st, 2019.

²³ Country of Incorporation: where a company is incorporated. Supranational (SNAT) will be returned for entities formed by multiple governments and without a single country of incorporation. Country of Domicile: where the company’s senior management is located. Country of Risk: issuer’s Country of Risk – can be assigned by three methodologies. The CoR is a proprietary field value for which Bloomberg L.P. reserves the right of final decision on.

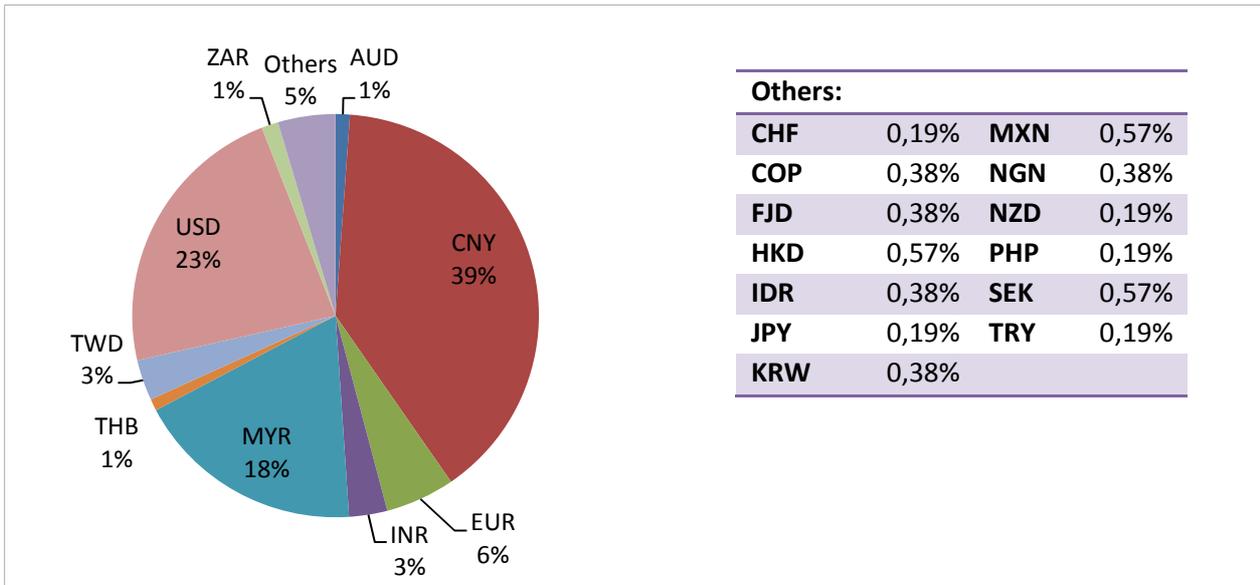


Figure 25: Green bonds in the data set by number by currency.
Source: created by the author on Bloomberg data

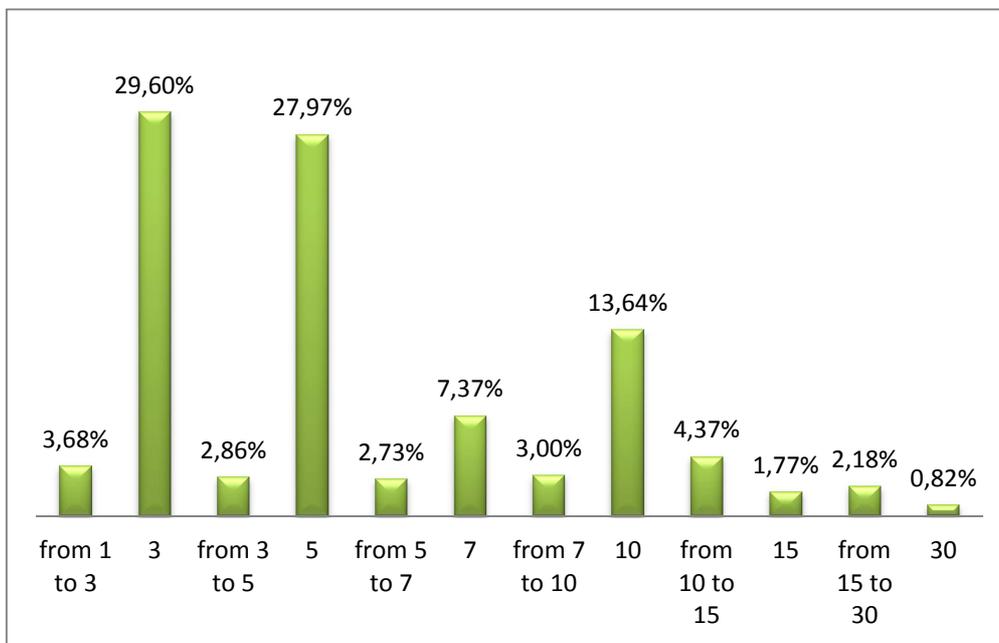


Figure 26: Green bonds in the data set by number with respect to maturity.
Source: created by the author on Bloomberg data

As Figure 24 displays,²⁴ China represents the country of incorporation for 43% of EMs green bond issuers, followed by Malaysia, at 18%. However, besides a share of 6% attributable to Supranationals, the remaining 33% of issuers results scattered between 32 different countries, 20 of which present a share lower than 1% (meaning that they issued less than 5 green active bonds). Similar shares can be found when taking into consideration the currency in which

²⁴ See Appendix B for the complete lists of full names corresponding to country names and currencies.

these bonds have been issued, at 39% for CNY-denominated green bonds and at 18% for MYR-denominated ones. Moreover, a significant share of 23% represents green bonds issued in USD, while EUR-denominated green bonds are only 6% (Figure 25). For what concerns bonds tenor, as it is visible from Figure 26, some ranges of maturities have been clustered in order to direct the attention to the most recurring ones, represented by the 3 years, 5 years, 7 years and 10 years. Moreover, 65% of green bonds have a maturity of 5 years or lower, and a share of almost 14% is represented by 10 year maturity green bonds, while all the other years or ranges of maturities are lower than 10%.

Once having collected data on green bonds, a matching procedure is performed in order to choose conventional bonds that could be paired up with the green bonds in the sample. The conventional bond must have been issued from the same issuer of the green bond and be equal in characteristics such as currency, maturity and rating among the others. A matching method represents an appropriate tool to analyse the intrinsic value of the bonds considered, allowing to focus on the feature of interest, as it requires to compare two bonds equal in characteristics except for the one that needs to be analysed. However, liquidity can still represent a bias in the estimation of the green bond premium when considering the difference in size between the green bond market and the conventional bond markets, the last being characterised by larger size and greater liquidity. Issue amount and issue date represent two features that can be used to control for liquidity and, for this reason, issue date difference in each bond couple has been limited to a maximum of 3 years, while the issue amount is restricted to be less or greater up to four times the green bond's issue amount.

More generally, in order to control for common factors that may affect the bonds yield, original maturity can show only less than 2 years difference, while each bond couple presents equal characteristics concerning currency, rating, maturity type, coupon type and seniority. Considering ratings, Bloomberg provides a composite rating with is described as an average of a security's Moody's, S&P, Fitch, and DBRS ratings, which are evenly weighted. When neither the Bloomberg composite rating nor the rating from one of the four main rating agencies just mentioned are available – for instance as it happens for the great majority of Chinese securities – local rating agencies are taken into consideration. Regardless of the rating agency considered, only investment-grade bonds are included in the sample set. Finally, option clauses bonds, variable and floating rate are excluded, resulting in a sample composed only of fixed-rate securities. Of them, data on daily closure, bid and ask prices are available for 126 bonds. Further constraints are added, involving the selection of bonds whose

observations available covered at least one year and, not to create any bias in the analysis, bonds with less frequent characteristics have been excluded. Finally, after the removal of outliers, a final sample set composed of 26 pairs of matched bonds is presented. The green bonds in the sample represent 4,76% of the green bond market in EMEs by number and 7,85% by volume as of May 31st, 2019.

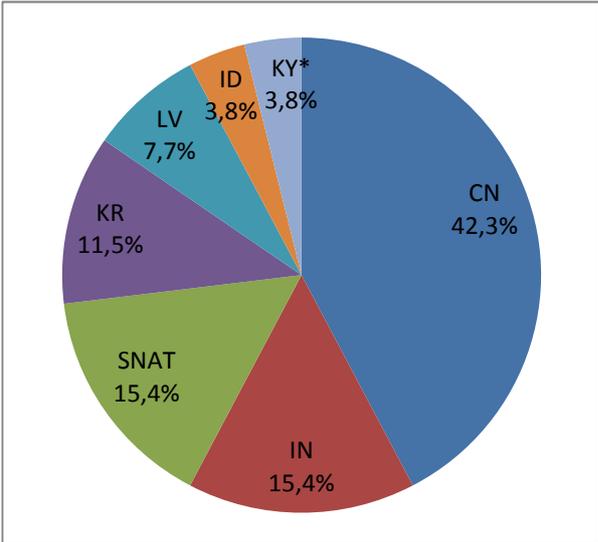


Figure 27: Green bonds in the sample set by number by country of incorporation.
Source: created by the author on Bloomberg data

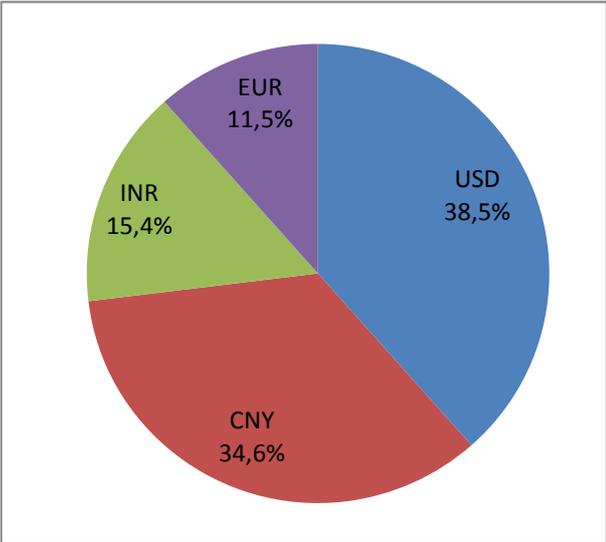


Figure 28: Green bonds in the sample set by number by currency.
Source: created by the author on Bloomberg data

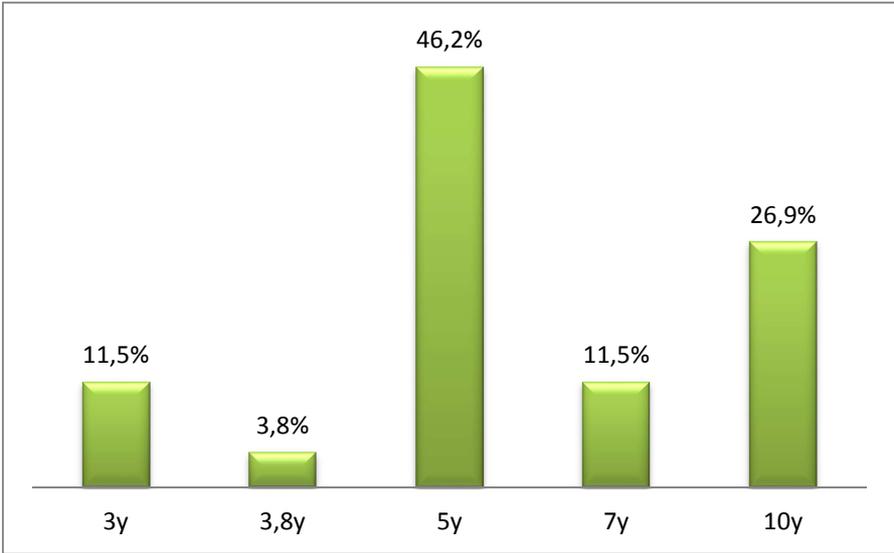


Figure 28: Green bonds in the sample set by number with respect to maturity.
Source: created by the author on Bloomberg data

The country of incorporation from which most of the green bonds issuers come from is China, with a share of 42%. It is followed by India, at par with Supnationals (15,4% each), then by Korea and Latvia, at 11,5% and 7,7% respectively, and finally by Indonesia and Cayman Island, both at 3,8% (Figure 27). Prevailing currencies are USD and CNY, representing approximately 73% of the sample set, while the remaining share of 27% is represented by INR and EUR-denominated bonds, as shown in Figure 28. Finally, Figure 29 illustrates that almost half of the bonds in the sample have a maturity of 5 years, followed by 10 year maturity bonds, with a share of almost 27%, and 3 and 7 year maturity bonds, both at 11,5%.

Comparing data available before and after the matching procedure, it can be noticed how the sample set identified for the analysis is not perfectly representing the whole market for green bonds in EMs, and this must be taken into consideration when analysing the results obtained from the regressions run in the upcoming section.

3.3 Empirical Methodology and Results

The analysis follows the steps and models proposed by Zerbib (2018) in the identification of a green bond premium and on its determinants among green bonds' characteristics.

The first step performed in the analysis concerns the identification of the yield to maturity of the bonds in the sample, which is composed of 26 couples of green and conventional bonds, each with 260 observations (corresponding to a one-year period, starting at June 1st, 2018 and ending at May 30th, 2019) concerning daily bid, ask and closing prices obtained from Bloomberg. Daily yields to maturities have been calculated from closing prices for each bond, then the daily difference in yields between green and conventional bonds in each match has been calculated as follows:

$$\Delta ytm_{i,t} = ytm_{i,t}^{GB} - ytm_{i,t}^{CB} \quad \text{with } i = 1, \dots, N, t = 1, \dots, T$$

Where $\Delta ytm_{i,t}$ represents the difference in yields between each of the green ($ytm_{i,t}^{GB}$) and conventional bonds ($ytm_{i,t}^{CB}$) for each of the 260 observations.

Successively, bid-ask spread has been chosen as proxy for liquidity, in order to control for the residual liquidity bias that may arise. The bid-ask spread is calculated for each bond couple on a daily basis and is captured in the regression variable $\Delta liquidity_{i,t}$, defined as:

$$\Delta liquidity_{i,t} = liquidity_{i,t}^{GB} - liquidity_{i,t}^{CB}$$

Where $\Delta liquidity_{i,t}$ accounts for daily difference between green bonds' bid-ask spread, expressed by $liquidity_{i,t}^{GB}$, and conventional bonds' bid-ask spread, i.e. $liquidity_{i,t}^{CB}$.

The resulting dataset, composed of the differences in yields and differences in liquidity among each bond couple, is organized as a balanced panel data, meaning that the number of observations t is equal across the cross-sectional units N , and no missing value is present. The dataset is thus composed of 26 cross-sectional units for which 260 time-series observations each are available.

In order to identify the green premium, a Fixed Effects model is used to run a regression on the difference in yields $\Delta y\widetilde{m}_{i,t}$ as follows:

$$\Delta y\widetilde{m}_{i,t} = p_i + \beta \Delta liquidity_{i,t} + u_{i,t}$$

where $u_{i,t}$ represents the error term, β is the coefficient of the difference in bid-ask spread between green and conventional bonds $\Delta liquidity_{i,t}$ and, since there is no commonly acknowledged indicator for greenness, the green premium p_i is described as the unobserved fixed effects. The model, in fact, assumes the fixed effects identified are bond-specific and time-invariant – the *within* regression concentrates solely on variation within the individuals and it assumes no correlation of such individual characteristics among different individuals. In this way, individual-specific effects are separated from the error term and identified in the individual intercepts. Moreover, the model also allows for potential correlation between the unobserved specific effects and the regressor and, being the specific effects separated from the error term, this approach enables to identify the net effect of the predictors on the outcome variable.

Table 13: Results of the fixed-effects panel regression on Δytm

Fixed-effects, using 6760 observations Beck-Katz standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.00157353	1.90524e-05	82.5893	<0.0001	***
$\Delta liquidity$	-0.000394792	0.000108278	-3.6461	0.0003	***
LSDV R-squared	0.722087	Within R-squared	0.003566		

Table 14: Summary statistics of the fixed-effects panel regression's variables

Variable	Mean	Median	Minimum	Maximum
Δytm	0.00159884	0.000466502	-0.0151784	0.0131546
$\Delta liquidity$	-0.0641055	-0.00200000	-3.51300	4.21850
p	0.00157353	0.000776996	-0.00331823	0.00767202
Variable	5% Perc.	95% Perc.	IQ range	Missing obs.
Δytm	-0.00311160	0.00882181	0.00431143	0
$\Delta liquidity$	-1.78400	0.653900	0.243000	0
p	-0.00240523	0.00764978	0.00384928	0

In Table 13, the results of the regression are displayed, and they identify a small albeit significant, positive green bond premium of +0.16 bps, significantly different from zero at 99% confidence level. In order to account for the presence of heteroscedasticity, the model is complemented with Beck-Katz robust estimations of standard errors. Although the within R^2 is very low, at 0,38%, the LSDV R^2 stands at 72,30%. The LSDV R^2 is calculated by Gretl, the econometrics package used to run the regression, under the perspective that adding unit dummies would allow to compute the R^2 using both the measured individual effects and the effects of the explicitly named regressors. On the contrary, the within R^2 provided by Gretl in place of the adjusted- R^2 , and is computed under the intention to remove individual effects, and accounts only for the coefficients of the explanatory variable for its computation (Cottrell A., Lucchetti R., 2019).

Table 14 provides the summary statistic for the variables and p_i are described, with values for the green premium ranging from -0.33 bps to +0.77 bps, a mean of 0.15 bps and a median of 0.03 bps, while the frequency distribution of the green bond premium across the bonds included in the sample set show that almost 62,50% of green premium is represented by positive values.

Furthermore, the average premium is calculated for a series of subsamples concerning the characteristics of currency and rating (for what concerns the ratings scales of the various rating agencies involved in the sample set, see Appendix C). The summary of regressions are represented in Table 15 reporting only means, significance of the premium and the number of bonds composing each subsample, while Appendix D presents the complete results of all the regressions run in this section. The premium result significantly different from zero at 99% confidence level for all the subsamples, and higher values can be found for CNY currency, as well as A-rated bonds.

Table 15: Green bond premium in subsamples for currency and rating characteristics.

		Mean (\hat{p}_i) in bps	Significance ($\hat{p}_i \neq 0$)	Nr Bonds
Currency	CNY	0.343	***	9
	INR	0.032	***	4
	EUR	0.121	***	3
	USD	0.051	***	10
Rating	AAA	0.137	***	12
	AA	0.099	***	5
	A	0.547	***	2
	BBB	0.040	***	7

After having identified the green premium, an OLS linear regression is run on the estimates \hat{p}_i in order to determine which characteristics of the bonds can significantly affect the green premium. With respect to the model proposed by Zerbib (2018), sector is not taken into consideration, while rating, currency, maturity and issue amount remains the explanatory variables of the following regression:

$$\hat{p}_i = \alpha_0 + \sum_{j=1}^{N_{rating}-1} \alpha_{1,rating_j} 1_{rating_j} + \sum_{j=1}^{N_{currency}-1} \alpha_{2,currency_j} 1_{currency_j} + \alpha_3 maturity + \alpha_4 \log(issue\ amount) + \eta_i$$

Where η_i represents the error term, rating and currency are treated as dummy variables with AAA rating and USD currency as reference categories, and issue amount is taken as a logarithm to make sure values are linearized in the case they would derive from an exponential function.

The results off the regression are shown in Table 16. Non-linearity tests demonstrate that the relationship is linear, whilst multicollinearity between independent variables does not represent a problem (as the nature of the variables themselves suggest) thus we are sure that the results of the regression are informative. Moreover, the regression has been run controlling for heteroscedasticity through robust standard errors. The R^2 and adjusted- R^2 give good values, at 72,82% and 60,04% respectively.

Table 16: Results of the OLS regression on (\hat{p}_i)

OLS regression					
Heteroskedasticity-robust standard errors					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0.118662	0.05178	2.2917	0.0350	**
Currency CNY	0.000840678	0.00256945	0.3272	0.7475	
Currency INR	-0.0103049	0.00524551	-1.9645	0.0660	*
Currency EUR	-0.0296335	0.0129336	-2.2912	0.0350	**
Rating AA	-0.00396885	0.00340522	-1.1655	0.2599	
Rating A	0.0536863	0.0153182	3.5047	0.0027	***
Rating BBB	0.00575841	0.00361584	1.5926	0.1297	
Maturity (y)	-0.000247403	0.000485794	-0.5093	0.6171	
Log(Issue Amount)(bn USD)	-0.00578744	0.00242897	-2.3827	0.0291	**
R-squared	0.728243	Adjusted R-squared	0.600358		

Considering the results of the regression, AA rated bonds present a lower premium of -0.4 bps with respect to the green bonds rated AAA, which seems reasonable when considering the fact that both of them are good in terms of creditworthiness. On the contrary, the premium rises for A and BBB rated bonds by +5.37 bps and +0.54 bps respectively, reflecting the additional risk beard by lower-rated categories. However, the only significant result is represented by the +0.54 bps increase of A rated bonds.

Considering currencies, CNY-denominated bonds present an higher premium which is not statistically significant, whilst INR and EUR-denominated bonds lower the premium by -1.03 bps and -2.96 bps respectively. Both results are significant, and it seems far more reasonable for EUR currency, whose level of significance is greater than for the INR (5% and 10% respectively).

Finally, whilst maturity and issue amount are both negative at -0.02 bps and -0.58 bps respectively, only the last variable is significant at 5% level, meaning that greater amount would decrease the amount of the premium.

However, when considering the results obtained, one must remember the main limitations of this analysis. They consist on the limited sample set and its inaccurate representation of the whole green bond market in the EMs, and on the restricted number of time-series observations available. Moreover, the analysis itself considers a portion of the market (i.e. the EMEs) that, in some cases, is still taking its firsts steps into the green bond market.

Conclusions

The purpose of this work is to provide an overview of the development of the green bond market, with a specific focus on the Emerging Market Economies and through the analysis of the existence of a green bond premium in secondary markets in those countries.

Green bonds represent one of the most suitable financial tool able to exploit the new business opportunities arising from the criticality of the effects of climate change, financing environmental-friendly projects without having investors to renounce to returns. The green bond market reached the EMEs only five years after its naissance, and encountered several barriers in its development, linked to both generic features of the EMs and to regional- or country-specific characteristics. The green bond market was able to expand at an incredibly high growth rate, reaching a great degree of diversification in terms of issuer types, geographical scope, type of green securities and investor base. The size it reached led to the necessity to set standards and criteria for the definition of green bonds, satisfied by the development of international guidelines. Whilst these try to seek harmonization to uniform definitions across different countries and markets, it remains the necessity to leave some room for adaption with respect to local markets conditions. Frameworks and guidelines had the effect to further boost the green bond market development both in advanced and EM economies. Despite the fact that many of the EMEs countries analysed still present a nascent green bond market and some of them did not issued any green bond yet, the great majority presented the intention to issue green bonds and, more importantly, they were already working and developing local guidelines and framework in order to enhance such issuances.

Finally, the focus is directed to the to the identification of the existence of a green bond premium in the EMs secondary markets. In order to do so, following the model proposed by Zerbib (2018), the hypothesis of the significance of a green bond premium is tested using a sample set consisting of 26 couples of green and conventional bonds sharing the same issuer and characteristics. The regression run on the yield differential highlighted the presence of a significant positive premium of +0.16 bps, but extremely small.

In this picture, it is possible to highlight the critical role governments and the private sector play in the green bond market development for both advanced and EM economies. International cooperation, agreements on common guidelines, implementation of policies and provision of incentives which takes into account country-specific issues and environment are key points for the enhancement of the liquidity of green bond market, a tool that should be widely exploited to help the achievement of the stated climate-related objectives in time.

APPENDIX A

The Taxonomy makes reference to the website for the most updated version available. It results from the researches of the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA).

Table A: Climate Bonds Taxonomy
Source: Climate Bond Taxonomy (CBI, no date, b: online)

Climate Bonds Taxonomy								Climate Bonds <small>INITIATIVE</small>
ENERGY	TRANSPORT	WATER	BUILDINGS	LAND USE & MARINE RESOURCES	INDUSTRY	WASTE	ICT	
Solar 	Private transport 	Water monitoring 	Residential 	Agriculture 	Cement production 	Preparation 	Broadband networks 	
Wind 	Public passenger transport 	Water storage 	Commercial 	Commercial Forestry 	Steel, iron & aluminium production 	Reuse 	Telecommuting software and service 	
Geothermal 	Freight rail 	Water treatment 	Products & systems for efficiency 	Ecosystem conservation & restoration 	Glass production 	Recycling 	Data hubs 	
Bioenergy 	Aviation 	Water distribution 	Urban development 	Fisheries & aquaculture 	Chemical production 	Biological treatment 	Power management 	
Hydropower 	Water-borne 	Flood defence 		Supply chain management 	Fuel production 	Waste to energy 		
Marine Renewables 		Nature-based solutions 				Landfill 		
Transmission & distribution 						Radioactive waste management 		
Storage 								
Nuclear 								



Certification Criteria approved 

Criteria under development 

Due to commence 

APPENDIX B

Table B and Table C identify full names for country codes and currency codes respectively.

Table B: Country codes summary

Country Code	Country name
AE	United Arab Emirates
AR	Argentina
AT*	Austria
BM	Bermuda
BR	Brazil
CI	Ivory Coast
CL	Chile
CN	China
CO	Colombia
CR	Costa Rica
CZ	Czech Republic
FJ	Fiji
FR*	France
GB*	United Kingdom
GR	Greece
HK*	Hong Kong
ID	Indonesia
IE*	Ireland
IN	India
JP*	Japan
KY*	Cayman Island
KR	Korea
LT	Lithuania
LU*	Luxemburg
LV	Latvia
MU	Mauritius
MX	Mexico
MY	Malaysia

Table C: Currency codes summary

Currency Code	Currency
AUD	Australian dollar
CHF	Swiss Franc
CNY	Chinese Yuan Renminbi
COP	Colombian Peso
EUR	Euro
FJD	Fijian dollar
HKD	Hong Kong Dollar
IDR	Indonesian Rupiah
INR	Indian rupee
JPY	Japanese Yen
KRW	Korean Won
MXN	Mexican Peso
MYR	Malaysian Ringgit
NZD	New Zealand Dollar
PHP	Philippine peso
SEK	Swedish Krona
THB	Thailand Baht
TRY	Turkish lira
TWD	New Taiwan Dollar
USD	US Dollar
ZAR	South African Rand

NL*	Netherlands
NG	Nigeria
PE	Peru
PH	Philippines
PL	Poland
SG*	Singapore
TH	Thailand
TW	Taiwan
VE	Venezuela
VG*	Virgin Islands
US*	United States
ZA	South Africa

Counties with * are non-EMEs

APPENDIX C

The following list concerns the rating scales definitions of the rating agencies involved in the rating of the bonds included in the sample set identified in Chapter 3. It also includes Moody's Green Bonds Assessments definitions.

- **BBG Composite (DBRS, Fitch, Moody’s, S&P500)**

DBRS Long-Term Ratings

The following table displays DBRS's long-term debt ratings and definitions. White text indicates investment grade ratings.

Rating	Indicates
AAA	Highest credit quality. The capacity for the payment of financial obligations is exceptionally high and unlikely to be adversely affected by future events.
AA	Superior credit quality and protection of interest and principal is considered high, and unlikely to be significantly vulnerable to future events. In many cases, they differ from bonds rated AAA only to a small degree.
<ul style="list-style-type: none"> • A (high) • AA • AA(low) 	
A	Good credit quality. The capacity for the payment of financial obligations is substantial, but of lesser credit quality than AA. May be vulnerable to future events, but qualifying negative factors are considered manageable.
<ul style="list-style-type: none"> • A (high) • A • A (low) 	
BBB	Adequate credit quality. The capacity for the payment of financial obligations is considered acceptable. May be vulnerable to future events.
<ul style="list-style-type: none"> • BBB(high) • BBB • BBB(low) 	
BB	Speculative, non-investment grade credit quality. The capacity for the payment of financial obligations is uncertain. Vulnerable to future events.
<ul style="list-style-type: none"> • BB (high) • BB • BB (low) 	
B	Highly speculative credit quality. There is a high level of uncertainty as to the capacity to meet financial obligations.
<ul style="list-style-type: none"> • B (high) • B • B (low) 	
CCC	Very highly speculative credit quality. In danger of defaulting on financial obligations. There is little difference between these three categories, although CC and C ratings are normally applied to obligations that are seen as highly likely to default, or subordinated to obligations rated in the CCC to B range. Obligations in respect of which default has not technically taken place but is considered
<ul style="list-style-type: none"> • CCC (high) • CCC • CCC (low) 	

	inevitable may be rated in the C category.
CC	Very highly speculative credit quality. In danger of defaulting on financial obligations. There is little difference between these three categories, although CC and C ratings are normally applied to obligations that are seen as highly likely to default, or subordinated to obligations rated in the CCC to B range. Obligations in respect of which default has not technically taken place but is considered inevitable may be rated in the C category.
	<ul style="list-style-type: none"> • CC (high) • CC • CC (low)
C	Very highly speculative credit quality. In danger of defaulting on financial obligations. There is little difference between these three categories, although CC and C ratings are normally applied to obligations that are seen as highly likely to default, or subordinated to obligations rated in the CCC to B range. Obligations in respect of which default has not technically taken place but is considered inevitable may be rated in the C category.
	<ul style="list-style-type: none"> • C(high) • C • C(low)
D	Bonds in default of either interest or principal.

Note: AAA to BBB (low) are investment grade. BB (high) to D are non-investment grade. "High" and "low" grades are used to indicate the relative standing of a credit within a particular rating category. The lack of one of these designations indicates a rating which is essentially in the middle of the category. Note that "high" and "low" grades are not used for the AAA category.

Fitch International Long-Term Issuer Credit Ratings

The following table displays Fitch's international long-term issuer credit ratings and definitions.

Note: White text indicates investment grade ratings.

Rating Indicates

AAA	Highest credit quality. 'AAA' ratings denote the lowest expectation of default risk. They are assigned only in cases of exceptionally strong capacity for payment of financial commitments. This capacity is highly unlikely to be adversely affected by foreseeable events.
AA	Very high credit quality. 'AA' ratings denote expectations of very low default risk. They indicate very strong capacity for payment of financial commitments. This capacity is not significantly vulnerable to foreseeable events.
A	High credit quality. 'A' ratings denote expectations of low default risk. The capacity for payment of financial commitments is considered strong. This capacity may, nevertheless, be more vulnerable to adverse business or economic conditions than is the case for higher ratings.
BBB	Good credit quality. 'BBB' ratings indicate that expectations of default risk are currently low. The capacity for payment of financial commitments is considered adequate but adverse business or economic conditions are more likely to impair this capacity.
BB	Speculative. 'BB' ratings indicate an elevated vulnerability to default risk, particularly in the event of adverse changes in business or economic conditions over time; however, business or financial flexibility exists which supports the servicing of

	financial commitments.
B	Highly speculative. 'B' ratings indicate that material default risk is present, but a limited margin of safety remains. Financial commitments are currently being met; however, capacity for continued payment is vulnerable to deterioration in the business and economic environment.
CCC	Substantial credit risk. A 'CCC' rating indicates that default is a real possibility.
CC	Very high levels of credit risk. A 'CC' rating indicates that default of some kind appears probable.
	Exceptionally high levels of credit risk. Default is imminent or inevitable, or the issuer is in standstill. Conditions that are indicative of a 'C' category rating for an issuer include:
C	<ul style="list-style-type: none"> • the issuer has entered into a grace or cure period following non-payment of a material financial obligation; • the issuer has entered into a temporary negotiated waiver or standstill agreement following a payment default on a material financial obligation; or • Fitch Ratings otherwise believes a condition of 'RD' or 'D' to be imminent or inevitable, including through the formal announcement of a distressed debt exchange.
	Restricted default. 'RD' ratings indicate an issuer that in Fitch Ratings' opinion has experienced an uncured payment default on a bond, loan or other material financial obligation but which has not entered into bankruptcy filings, administration, receivership, liquidation or other formal winding-up procedure, and which has not otherwise ceased operating. This would include:
RD	<ul style="list-style-type: none"> • the selective payment default on a specific class or currency of debt; • the uncured expiry of any applicable grace period, cure period or default forbearance period following a payment default on a bank loan, capital markets security or other material financial obligation; • the extension of multiple waivers or forbearance periods upon a payment default on one or more material financial obligations, either in series or in parallel; or • execution of a distressed debt exchange on one or more material financial obligations.
	Default. 'D' ratings indicate an issuer that in Fitch Ratings' opinion has entered into bankruptcy filings, administration, receivership, liquidation or other formal winding-up procedure, or which has otherwise ceased business.
	Default ratings are not assigned prospectively to entities or their obligations; within this context, non-payment on an instrument that contains a deferral feature or grace period will generally not be considered a default until after the expiration of the deferral or grace period, unless a default is otherwise driven by bankruptcy or other similar circumstance, or by a distressed debt exchange.
D	"Imminent" default typically refers to the occasion where a payment default has been intimated by the issuer, and is all but inevitable. This may, for example, be where an issuer has missed a scheduled payment, but (as is typical) has a grace period during which it may cure the payment default. Another alternative would be where an issuer has formally announced a distressed debt exchange, but the date of the exchange still lies several days or weeks in the immediate future.

Note: The modifiers "+" or "-" may be appended to a rating to denote relative status within major rating categories. Such suffixes are not added to the 'AAA' Long-Term IDR category, or to Long-Term IDR categories below 'B'.

Moody's Long-Term Debt

The following table displays Moody's long-term debt ratings and definitions. White text indicates investment grade ratings.

Rating	Indicates
Aaa	Highest quality with minimal risk.
Aa	
<ul style="list-style-type: none"> • Aa1 • Aa2 • Aa3 	High quality, subject to very low default risk.
A	
<ul style="list-style-type: none"> • A1 • A2 • A3 	Upper-medium grade, subject to low credit risk.
Baa	
<ul style="list-style-type: none"> • Baa1 • Baa2 • Baa3 	Medium-grade, moderate credit risk, may have speculative characteristics.
Ba	
<ul style="list-style-type: none"> • Ba1 • Ba2 • Ba3 	Substantial credit risk, have speculative characteristics.
B	
<ul style="list-style-type: none"> • B1 • B2 • B3 	High credit risk, considered speculative.
Caa	
<ul style="list-style-type: none"> • Caa1 • Caa2 • Caa3 	Very high credit risk, poor standing.
Ca	Highly speculative. Likely in or very near default with some prospect of recovery of principal and interest.
C	Lowest rated class of bonds. Typically in default with little prospect for recovery of principal or interest.
WR	Withdrawn.
NR	An unrated issuer, obligation, and/or program.

Note: Ratings from Aaa to Baa3 are investment grade ratings. Ratings from Ba1 to C are non-investment grade ratings.

When Moody's places a rating on watch, Bloomberg uses *+ for possible upgrade, *- for downgrade, and * for developing.

Moody's long-term obligation ratings are opinions of the relative credit risk of fixed-income obligations with an original maturity of one year or more. They address the possibility that a

financial obligation will not be honored as promised. Such ratings reflect both the likelihood of default and any financial loss suffered in the event of default.

Moody's appended numerical modifiers 1, 2, and 3 to each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category. Additionally, a “(hyb)” indicator is appended to all ratings of hybrid securities issued by banks, insurers, finance companies, and securities firms.

S&P Long-Term Ratings

The following table displays S&P's long-term ratings and definitions.

Note: White text indicates investment grade ratings.

Rating Indicates

AAA	Highest rating assigned by S&P. The obligor's capacity to meet its financial commitment on the obligation is EXTREMELY STRONG .
AA+	Differs from the highest rated obligations only in small degree. The obligor's capacity to meet its financial commitment on the obligation is VERY STRONG .
AA	
AA-	
A+	Somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher rated categories. However, the obligor's capacity to meet its financial commitment on the obligation is still STRONG .
A	
A-	
BBB+	ADEQUATE protection parameters. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation.
BBB	
BBB-	
BB+	LESS VULNERABLE to nonpayment than other speculative issues. However, it faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitment on the obligation.
BB	
BB-	
B+	MORE VULNERABLE to nonpayment than obligations rated 'BB', but the obligor currently has the capacity to meet its financial commitment on the obligation. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitment on the obligation.
B	
B-	
CCC+	CURRENTLY VULNERABLE to nonpayment, and is dependent upon favorable business, financial, and economic conditions for the obligor to meet its financial commitment on the obligation. In the event of adverse business, financial, or economic conditions, the obligor is not likely to have the capacity to meet its financial commitment on the obligation.
CCC	
CCC-	
CC	Highly vulnerable to nonpayment. The 'CC' rating is used when a default has not yet occurred, but S&P expects default to be a virtual certainty, regardless of the anticipated time to default.
C	Highly vulnerable to nonpayment, and the obligation is expected to have lower relative seniority or lower ultimate recovery compared to obligations that are rated higher.
D	In default or in breach of an imputed promise. For non-hybrid capital instruments, the 'D' rating category is used when payments on an obligation are not made on the date due, unless S&P believes that such payments will be made within 5 business days in

the absence of a stated grace period or within the earlier of the stated grace period or 30 calendar days. The 'D' rating also will be used upon the filing of a bankruptcy petition or the taking of similar action and where default on an obligation is a virtual certainty (e.g., due to automatic stay provisions). An obligation's rating is lowered to 'D' if it is subject to a distressed exchange offer.

NR No rating has been requested, or that there is insufficient information on which to base a rating, or that S&P does not rate a particular obligation as a matter of policy.

Note: Ratings from AAA to BBB- are investment grade ratings. Ratings from BB+ to C are non-investment grade ratings.

Obligations rated 'BB', 'B', 'CCC', 'CC', and 'C' are regarded as having significant speculative characteristics. 'BB' indicates the least degree of speculation and 'C' the highest. While such obligations will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposures to adverse conditions.

Plus (+) or minus (-): The ratings from 'AA' to 'CCC' may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

- **Other Rating Agencies**

CARE Long Term Ratings

The following table below displays CARE's long-term debt ratings and definitions for securities including debentures, bonds, and preference shares.

Note: White text indicates investment grade ratings.

Rating Indicates

AAA	Highest degree of safety regarding timely servicing of financial obligations. Such instruments carry lowest credit risk.
AA+	High degree of safety regarding timely servicing of financial obligations. Such instruments carry very low credit risk.
AA	
AA-	
A+	Adequate degree of safety regarding timely servicing of financial obligations. Such instruments carry low credit risk.
A	
A-	
BBB+	Moderate degree of safety regarding timely servicing of financial obligations. Such instruments carry moderate credit risk.
BBB	
BBB-	
BB+	Moderate risk of default regarding timely servicing of financial obligations.
BB	
BB-	
B+	High risk of default regarding timely servicing of financial obligations.
B	
B-	
C+	Very high risk of default regarding timely servicing of financial obligations.
C	
C-	
D	In default or are expected to be in default soon.

Note: For long term ratings modifiers + and - can be used with the rating symbols for the categories AA to C. The modifiers reflect the comparative standing within each category.

AAA to BBB- are investment grade. BB+ to D are non-investment grade.

Dagong Global Long-Term Ratings

The following table below displays Dagong Global's long-term debt ratings and definitions. Note: White text indicates investment grade ratings.

Rating Indicates

- AAA Least degree of nonperformance.
- AA+
- AA Less degree of nonperformance.
- AA-
- A+
- A Low degree of nonperformance.
- A-
- BBB+
- BBB Moderate degree of nonperformance.
- BBB-
- BB+
- BB High degree of nonperformance.
- BB-
- B+
- B Very high degree of nonperformance.
- B-
- CCC Extremely high degree of nonperformance.
- CC Highly vulnerable to nonpayment.
- C Inability of obligator to perform its obligation of payment.

Note: Ratings from AAA to BBB- are investment grade ratings. Ratings from BB+ to C are non-investment grade ratings. Except AAA and ratings below CCC, each credit rating may be trimmed with plus(+) or minus(-) to express ratings slightly higher or lower than the rating.

Dagong Global Commercial Bank (Unsolicited) Ratings

The following table below displays Dagong Global's unsolicited commercial bank ratings and definitions.

Note: White text indicates investment grade ratings.

Rating Indicates

- AAAp Enterprise is able to provide the best security for its liabilities. Although some change may take place in some liability protection factors, yet the influence from such change shall not harm the relatively steady assurance for the liabilities.
- AAAp-
- AAp+ Enterprise is able to provide good security for its liabilities. However, that reason why its rating is lower than an enterprise of AAA is that the long term risk is relatively higher.
- AAp
- AAp-
- Ap+ Enterprise is able to provide fairly good security for its liabilities. However, on a long

Ap	term basis, there may exist some unfavorable factors.
Ap-	
BBBp+	Enterprise is able to provide sufficient security for its liabilities in normal conditions.
BBBp	However, in unfavorable operation environment, some security factors for the
BBBp-	enterprise's liability repayment ability are not reliable and even give big impact.
BBp+	Enterprise's security for its liabilities is not very reliable and its development is
BBp	confronted with big uncertainty.
BBp-	
Bp+	Enterprise's security for its liabilities is not reliable. However, the enterprise has the
Bp	ability to repay the liabilities at present. However, on long term basis, the ability to
Bp-	repay the liabilities is not powerful enough and there exists higher risk.
CCCp+	Enterprise has quite poor security for its liabilities and there exist some practical
CCCp	default elements.
CCCp-	
CCp+	Enterprise has extremely poor security for its liabilities and such an enterprise
CCp	frequently breaks contact.
CCp-	
Cp+	Enterprise almost has no ability to implement repayment of liabilities, is frequently
Cp	been involved in forced liabilities reorganization, been taken over by the watchdog, or involved in bankruptcy liquidation process.

Note: Ratings from AAAP to BBBp- are investment grade ratings. Ratings from BBp+ to Cp are non-investment grade ratings.

In order to satisfy the requirements of the market to have preliminary understanding of the credit status of an enterprise under credit rating, Dagong conducts positive rating over a commercial bank by using the public information. Positive rating is to make preliminary judgment of the credit level of a commercial bank. The assessment content and method are the same as the credit rating of a commercial bank. However, as access to the information is restricted by various reasons, such grating analysis is not so deep as the credit rating of a commercial bank. These causes include lack of deep communication with the commercial bank at the time of rating, sources of information for rating being restricted in public information; or due to the requirement of serving the construction of the social credit system, the rating result is very much dependent on model calculation but less detailed analysis and practical simulation, etc. have been made on a commercial bank. In order to express the difference from the research depth of commissioned rating, Dagong adds 'p' after each rating sign to show the distinction.

A rating over BBB belongs to "safety"; a rating below BB belongs to "friability"; each rating may be finely adjusted with "+" or "-", which shows a rating slightly higher or lower in credit quality, but not including "AAA+" and "C-".

Lianhe Long-Term Debt Ratings

The following table below displays Lianhe's long-term debt ratings and definitions.

Note: White text indicates investment grade ratings.

Rating Indicates

AAA Obligor is extremely strong in its capacity and is basically not susceptible to the adverse effects of changes in circumstances and economic conditions. Indicates the

	least degree of nonperformance.
AA+	Obligor is strong in its capacity and is less susceptible to the adverse effects of changes in circumstances and economic conditions. Indicates less degree of nonperformance.
AA	
AA-	nonperformance.
A+	Obligor is STRONG in its capacity to meet its financial commitment on the obligation and is not easily susceptible to the adverse effects of changes in circumstances and economic conditions. Indicates quite low degree of nonperformance.
A	
A-	
BBB+	Obligor is moderated in its capacity to meet its financial commitment on the obligation. Indicates moderate degree of nonperformance.
BBB	
BBB-	
BB+	Obligor is weak in its capacity to meet its financial commitment on the obligation and is quite susceptible to the adverse effects of changes in circumstances and economic conditions. Indicates high degree of nonperformance.
BB	
BB-	
B+	Obligor's capacity to meet its financial commitment on the obligation highly depends on favorable circumstances and economic conditions. Indicates very high degree of nonperformance.
B	
B-	
CCC	Obligor's capacity to meet its financial commitment on the obligation extremely highly depends on favorable circumstances and economic conditions. Indicates extremely high degree of nonperformance.
CC	Obligor cannot receive substantial protection in its bankruptcy or reorganization petition and is HIGHLY VULNERABLE to nonpayment.
C	Obligor is unable to perform its obligation of payment.
WR	Withdrawn rating.

Except AAA and ratings below CCC, each credit rating may be trimmed with plus(+) or minus(-) to express ratings slightly higher or lower than the rating.

Pefindo Long-Term Debt Ratings

The following table displays Pefindo's long-term debt ratings and definitions.

Note: White text indicates investment grade ratings.

Rating Indicates

idAAA	Highest rating assigned by PEFINDO. The obligor's capacity to meet its long-term financial commitments on the debt security, relative to other Indonesian obligors, is superior.
idAA+	Highest rated debt only to a small degree. The obligor's capacity to meet its long-term financial commitments on the debt security, relative to other Indonesian obligors, is very strong.
idAA	
idAA-	
idA+	Obligor's capacity to meet its long-term financial commitments on the debt security, relative to other Indonesian obligors, is strong, however, the debt security is somewhat more susceptible to adverse effects of changes in circumstances and economic conditions than higher-rated debt.
idA	
idA-	
idBBB+	Adequate protection parameters relative to other Indonesian debt securities. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity on the part of the obligor to meet its long-term financial commitments on the debt security.
idBBB	
idBBB-	

idBB+	Somewhat weak protection parameters relative to other Indonesian debt securities. The obligor's capacity to meet its long-term financial commitments on the debt security is susceptible to major ongoing uncertainties or exposure to adverse business, financial, or economic conditions.
idBB	
idBB-	
idB+	Weak protection parameters relative to other Indonesian debt securities. Although the obligor currently still has the capacity to meet its long-term financial commitments on the debt security, any adverse business, financial, or economic conditions would likely impair the capacity or willingness of the obligor to meet its long-term financial commitments on the debt security.
idB	
idB-	
idCCC	Currently vulnerable to non-payment, and is dependent upon favorable business and financial conditions for the obligor to meet its long-term financial commitments on the debt security.
idD	In payment default, or the obligor has filed for bankruptcy.
idSD	Obligor which has failed to pay one or more of its financial obligations, rated or unrated, when it came due. An "SD" rating is assigned when PEFINDO believes that the obligor has selectively defaulted on a specific issue or class of obligations but will continue to make timely payments on its other obligations.

Note: idAAA to idBBB- are investment grade. idBB+ to idSD are non-investment grade. The ratings from idAA to idB may be modified by the addition of a plus (+) or minus (-) sign to show relative strength within the rating category.

- **Moody's Green Bonds Assessments**

The following table defines Moody's Green Bonds Assessments (GBAs).

Assessment Definition

GB1	Green bond issuer has adopted an excellent approach to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are excellent.
GB2	Green bond issuer has adopted a very good approach to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are very good.
GB3	Green bond issuer has adopted a good approach to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are good.
GB4	Green bond issuer has adopted a fair approach to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental

objectives are fair.

GB5 Green bond issuer has adopted a poor approach to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are poor.

Green Bonds Assessments are forward-looking opinions on the relative effectiveness of the approaches adopted by green bond issuers to manage, administer, allocate proceeds to, and report on environmental projects financed with proceeds derived from green bond offerings. GBAs are assigned to individual green bonds.

Source: Bloomberg New Energy Finance

APPENDIX D

The following tables presents the complete results of all the regressions run in chapter 3: the fixed-effects panel regression on the yield differential (Table D), the OLS regression on the green premium to identify its determinants (Table E), and the fixed-effects panel regressions run on the yield differential with respect to subsamples for currencies and ratings (Tables F-M).

Table D: Fixed-effects panel regression on Δy_{it}

Model 1: Fixed-effects, using 6760 observations

Included 26 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
ρ	0.00157353	1.90524e-05	82.5893	<0.0001	***
Δ liquidity	-0.000394792	0.000108278	-3.6461	0.0003	***
Mean dependent var	0.001599	S.D. dependent var	0.003542		
Sum squared resid	0.023571	S.E. of regression	0.001871		
LSDV R-squared	0.722087	Within R-squared	0.003566		
Log-likelihood	32882.77	Akaike criterion	-65711.54		
Schwarz criterion	-65527.43	Hannan-Quinn	-65647.99		
ρ	0.933864	Durbin-Watson	0.133508		

Table E: OLS regression on \hat{p}_i

Model 1: OLS, using observations 1-26

Dependent variable: ahat

Heteroskedasticity-robust standard errors, variant HC0

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0.118662	0.05178	2.2917	0.0350	**
DCURR_CNY	0.000840678	0.00256945	0.3272	0.7475	
DCURR_INR	-0.0103049	0.00524551	-1.9645	0.0660	*
DCURR_EUR	-0.0296335	0.0129336	-2.2912	0.0350	**
DRAT_AA	-0.00396885	0.00340522	-1.1655	0.2599	
DRAT_A	0.0536863	0.0153182	3.5047	0.0027	***
DRAT_BBB	0.00575841	0.00361584	1.5926	0.1297	
Maturity	-0.000247403	0.000485794	-0.5093	0.6171	
l_Amount	-0.00578744	0.00242897	-2.3827	0.0291	**
Mean dependent var	0.004222	S.D. dependent var	0.014994		
Sum squared resid	0.001527	S.E. of regression	0.009479		
R-squared	0.728243	Adjusted R-squared	0.600358		
F(8, 17)	3.058232	P-value(F)	0.025090		

Log-likelihood	89.75701	Akaike criterion	-161.5140
Schwarz criterion	-150.1912	Hannan-Quinn	-158.2534

Table F: Fixed-effects panel regression on Δy_{tm} for CNY currency subsample

Model 2: Fixed-effects, using 2340 observations

Included 9 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.0034327	6.01711e-05	57.0490	<0.0001	***
Δ liquidity	-0.000451955	0.000122922	-3.6768	0.0002	***
Mean dependent var	0.003523	S.D. dependent var	0.003879		
Sum squared resid	0.016801	S.E. of regression	0.002685		
LSDV R-squared	0.522499	Within R-squared	0.005713		
Log-likelihood	10537.43	Akaike criterion	-21054.85		
Schwarz criterion	-20997.27	Hannan-Quinn	-21033.88		
rho	0.937121	Durbin-Watson	0.126900		

Joint test on named regressors -

Test statistic: $F(1, 2330) = 13.5187$

with p-value = $P(F(1, 2330) > 13.5187) = 0.000241543$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(8, 969.3) = 315.708$

with p-value = $P(F(8, 969.3) > 315.708) = 8.2912e-264$

Table G: Fixed-effects panel regression on Δy_{tm} for INR currency subsample

Model 1: Fixed-effects, using 1040 observations

Included 4 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.000321621	3.43085e-05	9.3744	<0.0001	***
Δ liquidity	4.46142e-05	0.000157817	0.2827	0.7775	
Mean dependent var	0.000323	S.D. dependent var	0.002973		
Sum squared resid	0.001046	S.E. of regression	0.001005		
LSDV R-squared	0.886118	Within R-squared	0.000089		
Log-likelihood	5705.543	Akaike criterion	-11401.09		
Schwarz criterion	-11376.35	Hannan-Quinn	-11391.70		
rho	0.817782	Durbin-Watson	0.356694		

Joint test on named regressors -
 Test statistic: $F(1, 1035) = 0.0799164$
 with p-value = $P(F(1, 1035) > 0.0799164) = 0.777467$

Robust test for differing group intercepts -
 Null hypothesis: The groups have a common intercept
 Test statistic: Welch $F(3, 433.1) = 6023.55$
 with p-value = $P(F(3, 433.1) > 6023.55) = 0$

Table H: Fixed-effects panel regression on Aytm for EUR currency subsample

Model 1: Fixed-effects, using 780 observations
 Included 3 cross-sectional units
 Time-series length = 260
 Dependent variable: y
 Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.00121347	0.00013083	9.2752	<0.0001	***
Δ liquidity	0.000277273	0.00130349	0.2127	0.8316	
Mean dependent var	0.001191		S.D. dependent var	0.002514	
Sum squared resid	0.003215		S.E. of regression	0.002035	
LSDV R-squared	0.346894		Within R-squared	0.000125	
Log-likelihood	3728.976		Akaike criterion	-7449.952	
Schwarz criterion	-7431.315		Hannan-Quinn	-7442.784	
rho	0.970902		Durbin-Watson	0.064367	

Joint test on named regressors -
 Test statistic: $F(1, 776) = 0.0452481$
 with p-value = $P(F(1, 776) > 0.0452481) = 0.831604$

Robust test for differing group intercepts -
 Null hypothesis: The groups have a common intercept
 Test statistic: Welch $F(2, 384.8) = 557.996$
 with p-value = $P(F(2, 384.8) > 557.996) = 1.88663e-114$

Table I: Fixed-effects panel regression on Aytm for USD currency subsample

Model 1: Fixed-effects, using 2600 observations
 Included 10 cross-sectional units
 Time-series length = 260
 Dependent variable: y
 Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.000505111	2.4939e-05	20.2538	<0.0001	***
Δ liquidity	-0.000217155	0.000325561	-0.6670	0.5048	
Mean dependent var	0.000499		S.D. dependent var	0.002902	

Sum squared resid	0.002497	S.E. of regression	0.000982
LSDV R-squared	0.885969	Within R-squared	0.000314
Log-likelihood	14323.71	Akaike criterion	-28625.42
Schwarz criterion	-28560.93	Hannan-Quinn	-28602.05
rho	0.908368	Durbin-Watson	0.183869

Joint test on named regressors -

Test statistic: $F(1, 2589) = 0.444912$

with p-value = $P(F(1, 2589) > 0.444912) = 0.504821$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(9, 1048.1) = 1149.11$

with p-value = $P(F(9, 1048.1) > 1149.11) = 0$

Table J: Fixed-effects panel regression on Δytm for AAA rating subsample

Model 1: Fixed-effects, using 3120 observations

Included 12 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.00137034	6.40958e-05	21.3796	<0.0001	***
Δ liquidity	-0.000540634	0.000120659	-4.4807	<0.0001	***

Mean dependent var	0.001605	S.D. dependent var	0.003920
Sum squared resid	0.015196	S.E. of regression	0.002212
LSDV R-squared	0.683024	Within R-squared	0.008952
Log-likelihood	14655.35	Akaike criterion	-29284.69
Schwarz criterion	-29206.10	Hannan-Quinn	-29256.48
rho	0.933366	Durbin-Watson	0.135293

Joint test on named regressors -

Test statistic: $F(1, 3107) = 20.0764$

with p-value = $P(F(1, 3107) > 20.0764) = 7.70946e-006$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(11, 1206.2) = 441.425$

with p-value = $P(F(11, 1206.2) > 441.425) = 0$

Table K: Fixed-effects panel regression on Δytm for AA rating subsample

Model 1: Fixed-effects, using 1300 observations

Included 5 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.000995061	0.000181492	5.4827	<0.0001	***
Δliquidity	0.00105905	0.000241111	4.3924	<0.0001	***
Mean dependent var	0.001768	S.D. dependent var		0.002681	
Sum squared resid	0.002601	S.E. of regression		0.001418	
LSDV R-squared	0.721464	Within R-squared		0.016919	
Log-likelihood	6684.740	Akaike criterion		-13357.48	
Schwarz criterion	-13326.46	Hannan-Quinn		-13345.84	
rho	0.922828	Durbin-Watson		0.146266	

Joint test on named regressors -

Test statistic: $F(1, 1294) = 19.293$

with p-value = $P(F(1, 1294) > 19.293) = 1.21271e-005$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(4, 618.3) = 998.145$

with p-value = $P(F(4, 618.3) > 998.145) = 4.72122e-268$

Table L: Fixed-effects panel regression on Δytm for A rating subsample

Model 1: Fixed-effects, using 520 observations

Included 2 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.00546565	0.000139424	39.2017	<0.0001	***
Δliquidity	0.00104343	0.000915809	1.1394	0.2551	
Mean dependent var	0.005326	S.D. dependent var		0.002897	
Sum squared resid	0.001398	S.E. of regression		0.001645	
LSDV R-squared	0.678943	Within R-squared		0.001237	
Log-likelihood	2596.998	Akaike criterion		-5187.996	
Schwarz criterion	-5175.234	Hannan-Quinn		-5182.997	
rho	0.971328	Durbin-Watson		0.064773	

Joint test on named regressors -

Test statistic: $F(1, 517) = 1.29813$

with p-value = $P(F(1, 517) > 1.29813) = 0.255084$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(1, 454.2) = 797.92$

with p-value = $P(F(1, 454.2) > 797.92) = 4.50524e-102$

Table M: Fixed-effects panel regression on Δytm for BBB rating subsample

Model 1: Fixed-effects, using 1820 observations

Included 7 cross-sectional units

Time-series length = 260

Dependent variable: y

Beck-Katz standard errors

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
p	0.000404967	3.39153e-05	11.9405	<0.0001	***
Δ liquidity	-0.000122517	0.000311361	-0.3935	0.6940	
Mean dependent var	0.000402		S.D. dependent var	0.002706	
Sum squared resid	0.004277		S.E. of regression	0.001536	
LSDV R-squared	0.678869		Within R-squared	0.000106	
Log-likelihood	9212.207		Akaike criterion	-18408.41	
Schwarz criterion	-18364.36		Hannan-Quinn	-18392.16	
rho	0.925985		Durbin-Watson	0.150103	

Joint test on named regressors -

Test statistic: $F(1, 1812) = 0.154834$

with p-value = $P(F(1, 1812) > 0.154834) = 0.694005$

Robust test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: Welch $F(6, 696.7) = 10845.8$

with p-value = $P(F(6, 696.7) > 10845.8) = 0$

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