



SHOOTING FOR THE MOON IN A HOT AIR BALLOON?

MEASURING HOW GREEN BONDS CONTRIBUTE
TO SCALING UP INVESTMENTS IN GREEN PROJECTS



DISCUSSION PAPER
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MEASURING HOW GREEN BONDS CONTRIBUTE TO SCALING UP INVESTMENTS IN GREEN PROJECTS

A discussion paper

Includes a case study on the alignment of power sector green bond issuers with the IEA 2D scenario

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**A 2° Investing Initiative report
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PREAMBLE

There is a vast amount of investment needed to tackle the infrastructural and technological requirements to bring about a transition to a low-carbon greener economy. While estimates vary, according to the OECD the total infrastructure investment required for a successful low-carbon transition from 2015 to 2030 is estimated at around \$95 trillion, or around \$7 trillion per year allocated to projects in the water and waste, telecom, energy and transport sectors. In order to ensure such a large investment total a vast mobilization of resources as well as private and public sector engagement, collaboration and funding will be necessary.

New financial instruments and strategies are being developed. Counted among the more visible market-based initiatives is the 'Use-of-Proceeds' Green Bonds that have and are likely to continue to play an important role in raising awareness, catalyzing the creation of dedicated green finance teams and new products by financial institutions, and focus attention on the urgent need for climate solutions. Since their launch, a total of \$350 billion in green bonds has been issued. New green bond issuance has been gaining momentum since 2013 (refer to Fig 1) during which time issuance has expanded by 491%. It is estimated that this year, green bond issuance will exceed \$200 billion for the first time. Yet the current dynamic of green finance does not put us on a path that meets the long-term investment needs. Further innovation and mobilization are needed.

Green bonds were launched by the European Investment Bank (EIB) in 2007 with the issuance of a five-year, €600 million retail oriented equity index-linked '*climate awareness bond*' payable at 100% of the issue value whose proceeds were earmarked for investment in future EIB lending projects within the fields of renewable energy efficiency. The World Bank (International Bank for Reconstruction and Development, IBRD) followed in 2008 with a \$414.3 million offering as part of its "Strategic Framework for Development and Climate Change." The product was designed in partnership with Skandinaviska Enskilda Banken (SEB) to meet the demands of institutional investors by extending the EIB framework to focus on transparency and reporting.

For the first few years green bond issuances were almost entirely sourced to the largest development banks. Terms varied, but these were all Aaa rated issuers whose bonds were priced in line with other offerings of the same size and maturity. Volume picked up a bit starting in 2010 but green bond issuance kicked up substantially in 2013.

This was in large part attributable to the design and development of at least three green bond frameworks promulgated for use by issuers in an attempt to qualify the integrity of bond offerings for the benefit of investors seeking to invest in fixed-income instruments that address climate change. The first of these was initiated by the European Investment Bank (EIB) and the World Bank. EIB pioneered the concept of 'segregation' / 'ring-fencing' the use of proceeds in a separate sub-portfolio to safeguard the correct attribution of funds. Subsequently, the World Bank, working in concert with SEB and institutional investors expanded the concept by establishing criteria for project eligibility and selection, management of proceeds and monitoring, disclosure of project outcomes and reporting. Further, the World Bank's criteria underwent an independent third party review, provided by the Centre for International Climate & Environmental Research (CICERO). This framework served as a blueprint for follow-on issuances of green bonds by multilateral development banks.

This was followed by the release in November 2011 of the *Climate Bond Standard* by the Climate Bond Initiative, an investor focused not-for-profit international organization working exclusively to mobilize capital for climate change solutions by focusing on the development of standards and certifications, policy models and advice as well as collecting and centralizing green bonds market data.

In 2014, a set of green bond best practices was formulated by a consortium of European and U.S. banks, led by Citi, JPMorgan, Bank of America/ML and Credit Agricole, that came to be known as the *Green Bond Principles* (and hence the name Green Bonds), now administered by ICMA. With their emphasis on transparency, disclosure and standards setting, these organizations, working together, catalyzed the green bonds market and expanded the eligible security types and issuer base to include financial institutions, corporations, sovereigns, sub-sovereigns. In the process, external reviewers, firms such as CICERO, Sustainalytics, Moody's and S&P, investors such as BlackRock and Zurich, securities regulators, quasi regulatory bodies, government bodies and central banks reinforced the legitimacy of the instrument and advanced its adoption. This dynamic greatly contributed to the recruitment of dedicated 'sustainable finance' teams by investment banks, asset managers, credit rating agencies, consultants, governments and supervisory authorities.

The near-universal commitment to limit global warming that led to the adoption of the Paris Climate Agreement ushered in a number of public policy and private sector initiatives to support and reinforce the commitments to

keep global warming at or below 2° Celsius above pre-industrial levels. It also served to direct attention on analyzing the risks and opportunities linked to climate change and stimulated demand for investments that are aligned with climate considerations. In this context, Green bonds have been pictured as a first example or a flagship instrument, but it is also recognized that they only represent the opening act in the broader financial transformation that has to take place if we are reach the required scale.

The market is gathering momentum and policy makers have begun to focus on various initiatives and policy incentives designed to support and further stimulate the growth and development of the green bonds market. Now is the right time, with the benefit of available data and analytical techniques, to formally initiate an assessment of the strengths and weaknesses of green bonds as they are today; to encourage debate and consider options to improve the design of this instrument in order to accelerate the financial transformation to a greener economy, both in terms of scale and environmental impact. These options would include improving the assessment of environmental impacts and outcomes, encouraging and placing more emphasis on project finance oriented transactions and expanding green bond assessments to encapsulate an issuers' alignment with overarching climate goals.

It is also important at this juncture to acknowledge that many reputable, innovative and market-leading institutions, operating in good faith, have provided support over the years and contributed meaningfully to the rapid development of the green bonds market in their capacity as issuers, investors, standard-setters, underwriters, verifiers, opinion as well as data providers without whose significant contributions the advancement of this market would not have been possible.

CONTEXT: GREEN BONDS ON THE PUBLIC POLICY AGENDA

HLEG recommendations. In its final report, the European Commission High Level Expert Group on Sustainable Finance (HLEG) has recommended the creation of a EU Green Bond Standard. However, the report highlighted one of the main challenges of the green bond market today: *“doubts on the additionality of certain green projects and their impact, as well as concerns that green bonds have in some cases merely been used to re-label existing investments”*, and stressed the *“insufficient disclosure and data on how green bonds lead to the scaling up of investments in green projects and activities”*. As a response to these challenges, the recommended standard will promote monitoring and reporting on *“how the issuance of green bonds actually contributes to scaling up the investments in green projects”*. The HLEG also recommended to:

- i. *“develop metrics to monitor, evaluate, and verify environmental impact of green bonds in accordance with the EU Green Bond Standard and reporting annually on how they contribute to scaled up investments in green projects and activities,*
- ii. *aggregate information provided by issuers to enable EU institutions and member states to monitor alignment of financial flows with EU policy priorities, including the Paris Agreement,*
- iii. *introduce a measurement framework to track the contributions of green bonds to this objective.”*

EC Action Plan. The Commission will specify by Q2 2019 the content of the prospectus for green bond issuances to provide potential investors with additional information. The EC is also considering the introduction of an Eco-Label for retail investment products that will likely build on the green bond standard.

EC Technical Expert Group. According to the EC action plan, *“As a first step, the Commission's technical expert group on sustainable finance will be responsible, on the basis of the results of a public consultation, for preparing a report on an EU green bond standard by Q2 2019, building on current best practices”*.

International Green Bond Standard. Private markets have worked to develop Green/Climate Bond standards such as those managed by CBI and ICMA. On top of the EC green bond standard, ISO has also started a new Working Group in 2017 that is meant to deliver an international green bond standard in 2020. Finally, supervisors are starting to explore their role in regulating this market, from with the objective of supporting its development, and ensuring consumer protection.

EXECUTIVE SUMMARY

The discussion paper aims to pave the way for the development of a framework for assessing and moving forward the “*contribution of green bonds to scaling up the investments in green projects*”. The paper focuses on the case of ‘Use-of-Proceeds Green Bonds’ (UoP GB) that represent 95% of the market in 2016. It discusses the link between increasing investment in UoP-GB on the one hand, and the growth of investments in green projects by issuers on the other hand, suggesting how this approach can be enhanced to achieve further impact.

The paper shows that we currently lack evidence to conclude that as currently designed UoP GB contribute - or can without further enhancement contribute - to *scaling up the investments in green projects*:

- First, the financial risks specific to earmarked green projects remains on the balance sheet of the green bond issuers, meaning their capacity to invest in more green projects remains the same as with standard bond issuance.
- A key issue is whether increased green investment actually takes place above a business as usual baseline. In effect this is the key issue – do the UoP bonds lead to an overall shift in the balance sheet of the issuer over time?
- Second, the main potential financial incentive for issuers, the ‘green premium’ paid by investors to acquire green bonds, seems structurally limited by the lack of tangible financial benefit for these investors. Will this hold the market back?

This situation creates what I4CE¹ calls “a ‘coherence’ gap between scaling up of the green bond market and ensuring its tangible contribution”: green bonds are subject to inherent limitations that are likely to inhibit green projects from achieving scale. In other words, the booming green bond market might be comparable to a hot air balloons festival: great to raise awareness and turn people’s heads towards the sky, but if the objective is to reach the moon, we will need more than hot air.



Green bonds promoters argue that the ‘soft benefits’ for both issuers (oversubscription, extension of the investor base, behavioural effects) and investors (awareness raising, green marketing, behavioural effects) are systematic and strong enough to eventually influence investment decisions and eventually contribute to scaling-up investment in green projects. However, as yet, we did not find any evidence pointing in this direction.

This conclusion has implications for the potential recognition of UoP-GB investments as ‘climate action’ in the context of the Marrakesh partnership, and the categorization of UoP-GB as ‘green finance’ instruments² in the context of EU policy debate. It questions the rationale for introducing public support to the UoP-GB market and ownership without prior impact assessment and/or introducing changes in the green bond standards.

The paper calls for further research on the topic, and sketches for consideration a proposed framework for assessing the contribution of green bonds. It concludes with recommendations to enhance the GB labelling standards, including introducing the assessment of the issues alignment with climate goals as a core criteria.

¹ *Beyond Transparency: unlocking the full potential of green bonds*, I4CE (2016). From the same author, see also *Green Bonds: What contribution to the Paris Agreement and how to maximize it?* (2017) and *Green Bonds: Improving their contribution to the low-carbon and climate resilient transition* (2018).

² The G20 defines Green Finance as the “financing of investments that provide environmental benefits in the broader context of environmentally sustainable development” (see G20 Green Finance Study Group 2016 G20 [Green Finance Synthesis Report](#)). For a discussion of the various definitions of ‘green finance’ see page 3 of “[The Global Green Finance Index](#)”, Y/Yen, Finance Watch (2018).

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1. WHAT GREEN BONDS ARE AND ARE NOT?

Green project finance. In theory, and as understood by most non-expert observers, green bonds are financial instruments that specifically *‘finance’* green projects such as wind farms, energy-efficiency projects, etc. The designation ensures that only green projects are ‘financed’, or re-financed with the proceeds of the bonds. Many investors who buy green bonds present this as a climate/environmental ‘action’, *‘contributing’* by *‘financing’* the transition to a green economy. Similarly green bonds standard setters suggest that they are associated with ‘environmental benefits’ and should therefore benefit from public incentives³.

‘Virtual’ allocation. Technically, 95% of green bonds (Fig. 1) are ‘use-of-proceeds’⁴ bonds, general-purpose financial instruments that actually re-finance the whole balance sheet of the issuer (company, public entity or bank):

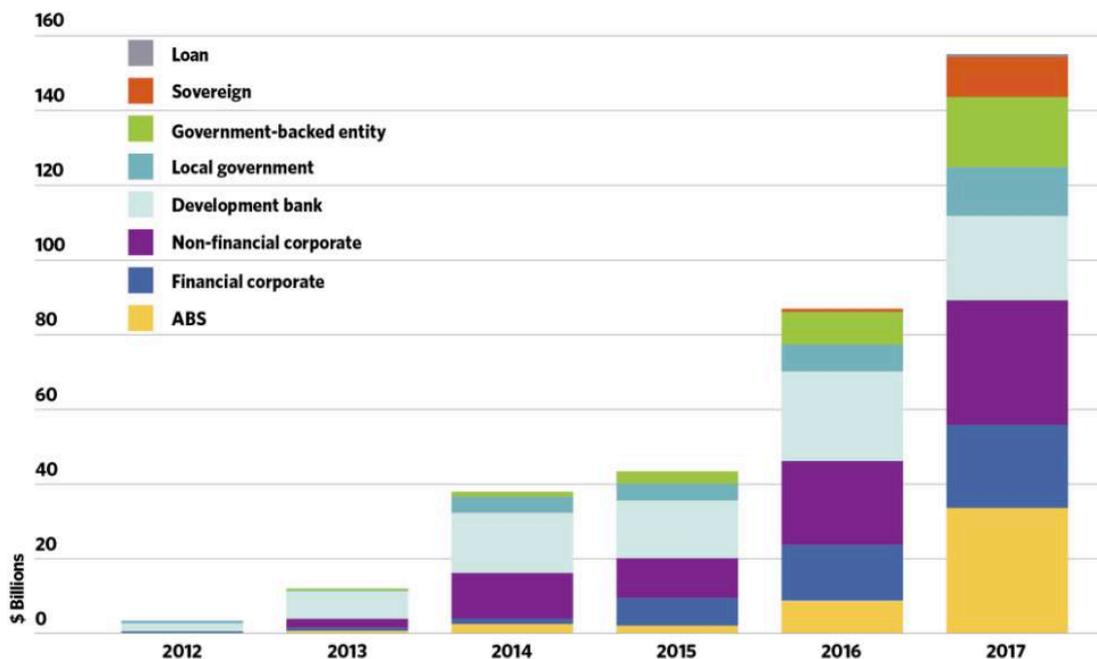
- The bond issuer only ‘virtually allocate’ the proceeds⁵, by earmarking (tag) or ring-fencing (separate accounting) green projects (Fig 2.). The issuer must then show that there are enough (in value) eligible green investments (past or planned) to match the amount of ‘green’ debt raised but the green projects are not used as collateral.
- However, as debt is serviced by the cash flows from the company’s general activity, the credit rating and yield of the bond is therefore based on the risk associated with the whole balance sheet of the issuer, not the specific risk of the projects tagged as green.

Green pledges turned into a financial instrument. Assuming the green taxonomy is relevant and the verification properly conducted, the primary environmental benefits associated with green project green bonds are threefold:

- Ensure that projects tagged as ‘green’ match certification criteria;
- The ‘soft’ obligation⁶ for issuers to invest the amount pledged and provide evidence through reporting (Fig 13);
- A global voluntary accounting system to consolidate the voluntary pledges from bond issuers.

The following pages discuss to what extent there are other, more tangible, environmental benefits associated with green bonds, and notably if they can be categorized as ‘green finance’ instruments and ‘climate actions’ when investors increase their exposure to them.

Fig 1 – Labelled green bond market today



Source: CBI, 2018⁷

³ See notably the public policy position from Climate Bonds Initiative on [tax incentives for issuers and investors](#) (2018)

⁴ For the purpose of this note, we will call these bonds ‘use-of-proceeds’ Green Bonds or « UoP green bonds » (vs. project green bonds and ABS).

⁵ Nb: Most green investments of an issuer are usually allocated to its green bonds, even though technically the proceeds from the bonds only represent a part of the financing, the other part being financed with equity and bank loans.

⁶ Green bond issuance is generally not associated with any penalty if the amount of investment pledged is not met (EC, 2016)

⁷ [Green Bond Highlights 2017](#), CBI, Jan 2018. For 2018, CBI forecast the issuance of \$250-300Bn of green bonds.

Fig 2 - Use of proceeds for labelled green bonds⁸

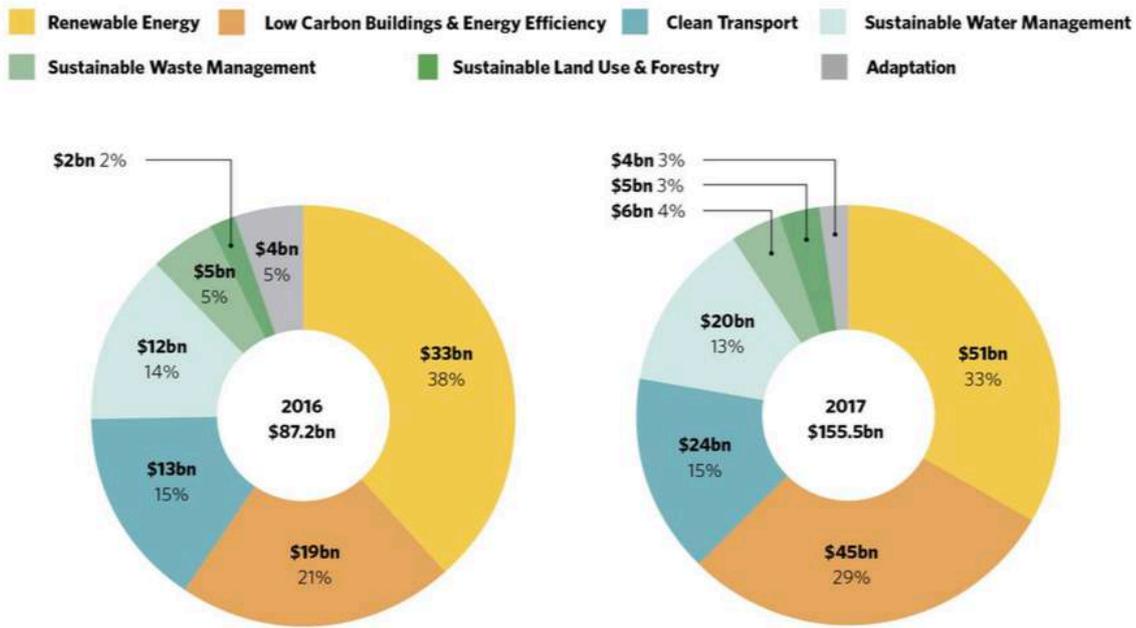
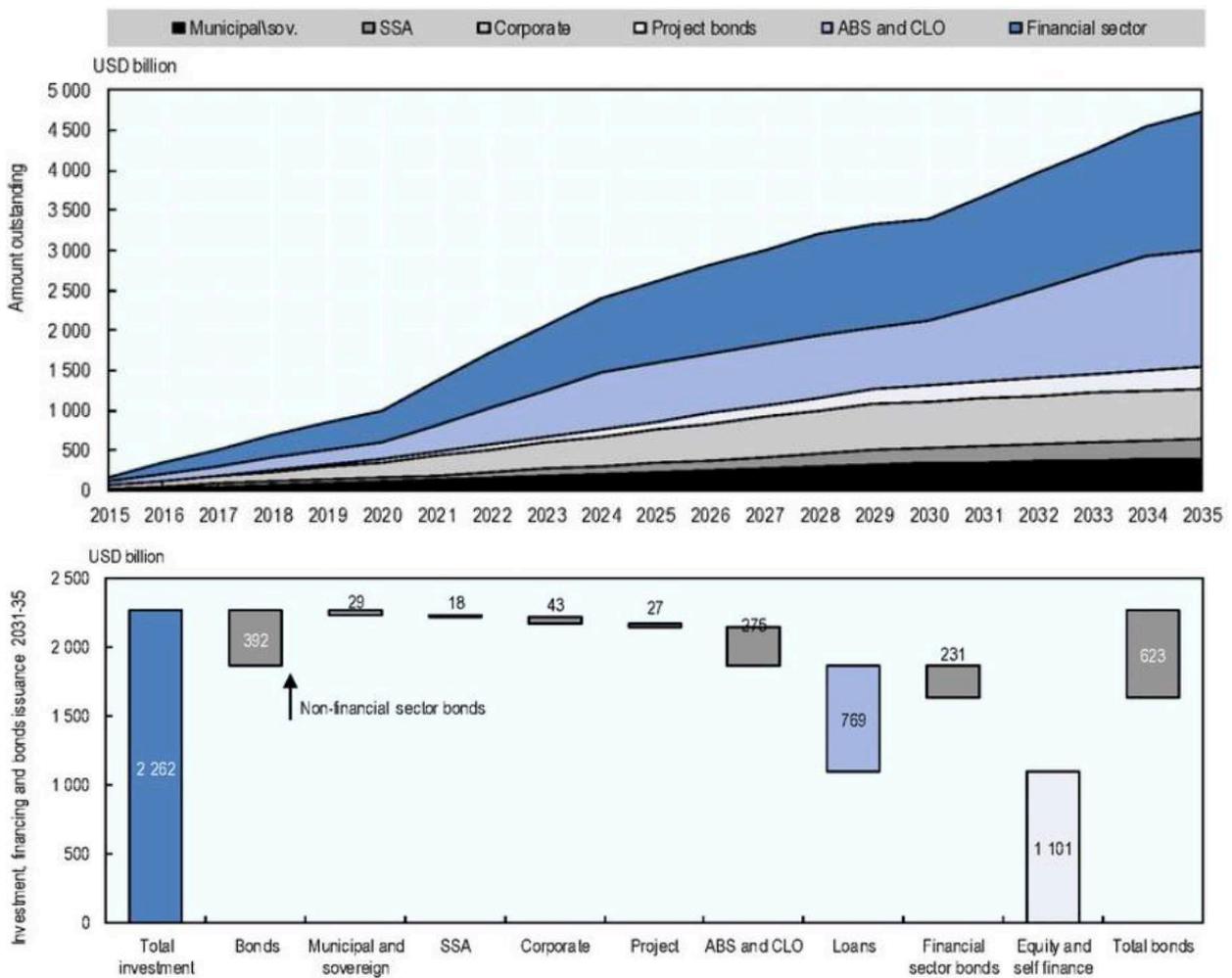


Fig 3 - Potential of various 'green financing' instruments by 2035. OECD baseline scenario⁹



⁸ Ibid. Renewable Energy (focus of our analysis) still represent the first use of proceeds, but dropped from >55% in 2010 to 33% in 2017.

⁹ [Mobilising Bond Markets for a Low Carbon Transition](#), OECD, 2017

2. CAN GREEN BONDS BE CATEGORIZED AS GREEN FINANCE INSTRUMENTS?

2.1. Green bonds associated with climate actions in investors' communication

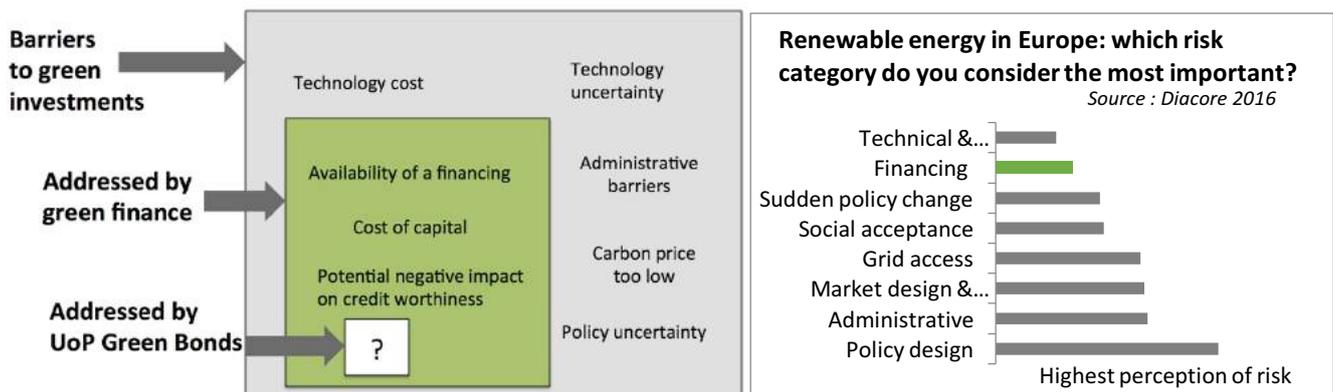
For a non-state actor, a 'climate action' can be defined as an action that 'contributes' to the long-term goals of the Paris agreement (alignment of GHG emissions with 2°C pathways and/or adaptation)¹⁰. Research suggests that 54% of green bond investors have a green mandate¹¹, which involves commitments and claims towards clients/beneficiaries related to either the *impact* of the fund in the real economy (or its exposure to financial opportunities). Furthermore, the review of their public communication¹² provides empirical evidence that many investors present their investment in green bonds as a 'climate action', claiming that they 'finance' the green projects, and suggesting that this action 'contributes' to the achievement of the Paris agreement. More broadly, green bonds are very often referred as one of the tools of 'green finance'¹³.

Categorizing the purchase of UoP green bonds as a 'climate action' or green finance can be challenged for several reasons:

2.2. The purpose of green finance

In the current economic environment, there is no shortage of risk-free financing globally, and even as these have begun to rise in some jurisdictions, given low interest rates, highly rated issuers do not face difficulties to get financed¹⁴. Green investments may, in certain cases, be slowed-down by the lack of financing (among other factors as illustrated in Fig. 1), because of their specific characteristics. For instance, the combination of policy uncertainty and capital intensity creates high cost of capital for some green infrastructure projects, thus limiting the capacity of project developers to invest and/or the willingness of banks to lend¹⁵ (see figure 4 for an illustration on onshore wind in Europe). For renewable power, the financing cost could be up to 50-70% of total cost¹⁶.

Fig 4 – Barriers to green investment scale up and the role of financing: example for onshore wind in Europe.



However, as discussed below, 'use-of-proceeds' green bonds do not necessarily address these issues. There are three reasons for that:

2.3. Transferring the specific asset risk to the investor?

In the context of a contribution of investors to public policy goals, 'financing something' in its common understanding, includes the provision of liquidity but also, and most importantly, risk transfer. Indeed, a key problem that green finance seeks to address is the transfer of financial risks from green project developers to long-term investors, who have long-term liabilities matching the risk profile of these projects¹⁷. This risk transfer allows

¹⁰ See notably Marrakesh Partnership - UNFCCC

¹¹ [CBI 2017](#), study conducted on a limited panel of bonds.

¹² This statement is based on empirical evidence (see [UFCCCC Nazca platform](#)). A formal study would be needed to back it with hard evidence.

¹³ For the purpose of this paper, we aligned the definition of 'green finance' with the one provided by the EBF for *Direct Green Finance*: « financing of activities that directly provide environmental benefits in the broader context of environmentally sustainable development. »

¹⁴ Note in the developing world where risk significantly higher, this can be more of a challenge.

¹⁵ According to interviews conducted by the [Diacore consortium](#), the low cost of debt for onshore wind in Germany and the high cost in Greece is partly driven by the state of competition between banks.

¹⁶ *Analysing Potential Bond Contributions in a Low- Carbon Transition* – Quantitative Framework. OECD (2016)

¹⁷ [Institutional investors and infrastructure financing](#), OECD, 2013. Also see the discussion of 'maturity transformation' by the [EBF](#).

project developers to ‘de-risk’ their balance sheet and therefore increases their capacity to invest in new risky green projects. In this respect green project bonds, covered bonds and perhaps to a lesser extent ABS, are clearly green finance instruments: investors increasing their exposure to these assets simultaneously increase financing flows available for green projects. The same doesn’t apply to ‘use-of-proceeds’ green bonds, since the capacity to finance more green projects remains capped by other factors¹⁸: the balance sheet constraints for corporate issuers, and the fiscal and budgetary constraints for sovereign and municipal issuers¹⁹. In other words, nothing changes when investors increase their exposure to UoP green bonds (see Fig. 4):

- The bond investor *finances* and ‘bets’ on the issuer activities in general²⁰, not the earmarked green projects;
 - The project developers face the same constraints as far as financing is concerned.
- This is why, the long-term potential for corporate, sovereign and municipal green bonds is limited (see Fig 3).

2.4. Financing more green projects?

The communication from many green bonds investors and green bonds advocates suggests²¹ that the investment in green bonds equals more financing going to green projects, and therefore more investments. In theory, if more investors invest in green bonds, issuers will need to issue more green bonds²², and ultimately they will fall short of green projects to earmark and be obliged to ‘boost’ their green investment plans. In such a scenario investors could be able to claim that they boost financing for green projects and thus investments in those projects. However, there are two obstacles to this mechanism:

- **Bonds are primarily refinancing instruments.** Hence, in many cases, green bonds ‘by design’ do not trigger the decision to invest. One can however say that the prospect of ‘easier’ refinancing can be factored in the investment decision. Confirming this would require an analysis of the main factors in the average investment decision, for the various types of eligible green projects.
- **Green bonds issuers are not constrained in their investment practices and do not necessarily invest in a greener way overall.** Based on the current green bonds standards’ requirements, nothing forces the issuers to deviate from their ‘business as usual’ investment plans, when issuing green bonds. Issuers of UoP green bonds

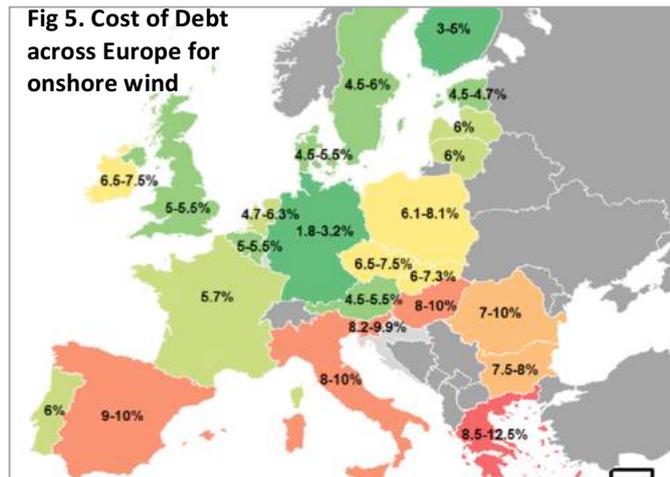
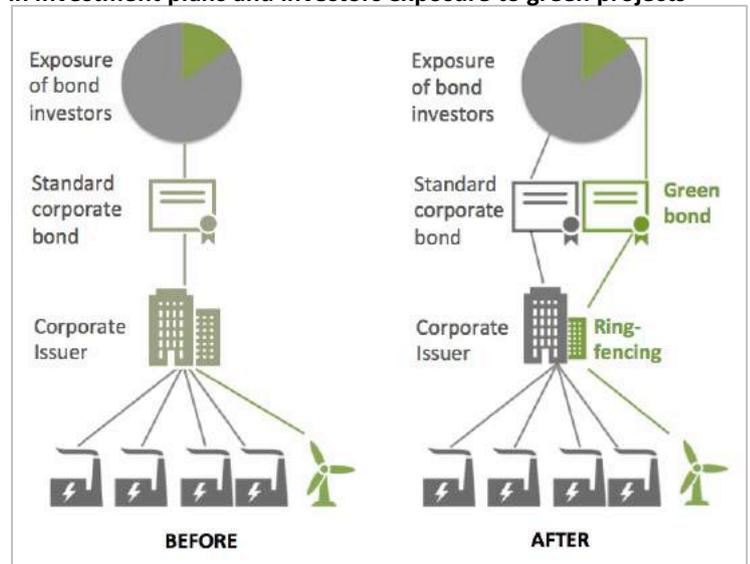


Fig 6 - Green bond issuance does not necessarily involve changes in investment plans and investors exposure to green projects



¹⁸ This conclusion is consistent with the conclusions of I4CE (2018), which notes that « when a pipeline of project opportunities exist, and particularly when this pipeline is tied to a large-scale corporate actor or project developer, there are no specifically climate-related barriers for these actors to access bond financing” and “discussions at the practitioners’ workshop held by I4CE and during interviews for this report suggested that in practice viable LCCR investments suitable for bond financing have presumably no difficulty in finding investors and issuing bonds.”

¹⁹ OECD, Mobilising Bond Markets for a Low Carbon Transition, OECD, 2017

²⁰ With UoP green bonds, the debt is serviced by the cash flow from the activity as a whole. The green bond rating is the same as for other bonds issued by same issuer.

²¹ Based on the sample reviewed, the statements are sometime inaccurate and misleading, sometime only ambiguous, and pro-active disambiguation is almost inexistent. An example of ambiguity is the reporting to the UNFCCC Nazca platform (registry of ‘climate actions’ from non-party stakeholders): the issuance and/or purchase of green bonds is referenced as a ‘climate action’ for 72 financial institutions (representing about 9% of total finance sector climate actions), suggesting that these actions actually contribute to reducing GHG emissions – which is the basic definition of a ‘climate action’ (for mitigation).

²² Market data already suggest that the demand for green bonds already exceed the demand. See page 7.

usually invest in both green and brown projects²³. Thus when an issuer of green bonds allocates the proceeds to its existing green investments, its standard bonds are ‘de-greened’, with their proceeds now virtually being allocated to brown projects only.

Overall, there is limited²⁴ evidence to support the thesis that green bonds issuance is more than a *zero sum game* (Fig 6). For example, in the case of the Power Sector, quantitative analysis (see Appendix 1) suggests that the larger green bond issuers are hardly more invested in renewables than the market as a whole, if not lagging behind. To-date, there is no mandate for organisations certifying green bonds implements measures to track actual changes in issuers’ investment plans, nor the alignment of these investment plans with climate goals. This situation led our colleagues from I4CE²⁵ to conclude that *“most of existing green bonds and their underlying projects were likely to have occurred whether the bond issued to finance them was labelled as green or not. In the future, if green bonds are aimed at stimulating additional investments in the low-carbon transition, they would need to go beyond their current information benefits and help reduce the cost of capital for underlying projects”*.

2.5. Reducing the cost of debt?

Another way to approach the problem is indeed to find indirect evidence that green bonds can boost green investments, by showing that they help to reduce the cost of capital for such investments. In other words, that investors are willing to pay a green premium to issuers or conversely, explicitly penalize them, big enough to influence investment decisions.

Transition risk logic. For green project bonds, ABS and bonds issued by pure-players in green sectors, it can be argued that some investors might be willing to pay a higher rate because they believe green projects are less exposed to long-term energy-transition risks than brown projects. This example can for instance apply to green MBS in countries, like the Netherlands that introduced energy efficiency measures in real estate. This logic can also justify the introduction of a ‘green supporting factor’ (lower capital requirements) as suggested by some voices in the banking sector and the VP of the European Commission²⁶.

However, this logic doesn’t apply to UoP green bonds:

- The debt is repaid from the cash flows related to all the activities of the issuer, including brown projects (exactly like with standard bonds). Investors are therefore exposed to the same risk as with standard bonds. More broadly, corporate green bonds tend to be issued in sectors exposed to energy-transition risks (e.g. power). So increasing the exposure to green bonds can even increase the exposure to climate risks²⁷.
- Bonds are fixed-income instruments, so they are less sensitive to developments in the upside of the green economy like stocks from green sectors are.

As a result investors have no direct incentive to pay a premium beyond the marketing benefit associated with holding a green bond (see discussion below), or potential support (e.g. tax break) from public authorities.

Green premium. If the demand for green bonds increases and a shortage of green projects appears, then investors might eventually start to pay a premium just because the demand exceeds the offer²⁸. Until mid-2017, research on the topic has been mostly focused on secondary markets, and could be summarized as follows:²⁹ *“Research has suggested that premiums for green bonds can be achieved in the secondary market. This is most likely due to the imbalance of supply and demand; currently, there are simply not enough green-labelled bonds available to meet investor demand, and this is driving up the price. In the primary market, there is little evidence of any green premium. Providing that other characteristics are similar, green and conventional bonds trade broadly in line with each other. Market sell-side participants have indicated anecdotally that a two to three basis-point tightening could be achieved with European green bond issuance. But no such tightening has been experienced as yet in the U.S. market, where fiduciary considerations, supply characteristics and demand for environmentally-driven issuance lags behind Europe.*

²³ [Green bond finance and certification](#), BIS - Ehlers/Packer (2017). See also the case studies.

²⁴ We did not find quantitative or ‘hard’ evidence (based on documented verifiable facts). However, the practitioners report anecdotal evidence.

²⁵ *Green Bonds: Improving their contribution to the low-carbon and climate resilient transition* (2018)

²⁶ The EC action plan on sustainable finance plans to collect evidence on this topic to inform potential changes in capital requirements calculations for banks and insurers, based on a risk logic.

²⁷ [Green bond finance and certification](#), BIS - Ehlers/Packer (2017)

²⁸ Other indicators such as the over-subscription compared to similar vanilla bonds can be used. Results from CBI (2017) on a limited panel suggest that green bonds are slightly more over-subscribed. However the limited sample and limited difference lead the authors to conclude that there is no conclusion at this stage on the topic.

²⁹ [The Corporate Green Bond Market Fizzes As The Global Economy Decarbonizes](#). Wilkins (S&P), 2016

(...) We expect that any changes in green bond pricing to reflect the green credentials of a bond will come initially in the secondary market. In the primary market, syndication desks will likely push for similar spreads to conventional bonds as the market develops so as to maintain interest from as large a pool of investors as possible. In the secondary market, such pressures may be muted, so scarcity factors and increased disclosure of the green credentials of a bond could drive demand and influence pricing along with such factors as credit quality, size, liquidity, yield, maturity."

More recent developments (Fig 9) include:

- the publication of the first academic paper dealing with a larger sample of bonds on secondary markets that confirm the existence of a premium on secondary markets, and
- the publication of the analysis of a small sample of bonds by the BIS³⁰ suggesting, for the first time³¹, a premium on primary markets: *"Our results indicate that green bond issuers on average have borrowed at lower spreads than they have through conventional bonds. (...) - in other words, enough investors have a preference for holding green bonds to influence the issue price. (...) At the same time, we also document considerable variation across the individual green bond issues in our sample (...) The standard deviation of the premium is 27 basis points."*
- The analysis of 7 green bonds issuers by NatWest suggests a 'halo' on the price of non-green bonds issuance.

FIG 9. Summary of findings on the green premium

Author, date	Sample	Conclusion
Preclaw, Bakshi (Barclays) 2015	42 bonds, issued between 2014 and 2015	-20 bp on average on secondary markets
HSBC 2016	Limited sample	No green premium
BNEF 2017	Limited sample	-25 bp on average on secondary markets
CBI (2017) ³²	14 issuance in 2016-17	No evidence of systematic green premium on primary market
Zerbib (2017), academic paper	141 bonds on 12/2016	-8 bp on average on secondary markets with considerable variation (-226 to +239)
Ethler, Packer (BIS), 2017	21 green bonds issued between 2014 and 2017	-18 bp on average on primary market with considerable variation between issuers (-75 to +35)

Source: 2Dii

Should the existence of a premium for issuers be confirmed, it would call for research on the following questions:

- Is this trend permanent or will investor stop paying a premium when they will become more aware?³³
- If the trend were to become permanent, would the premium become bigger?
- If yes, will the premium become big enough to materially influence the WACC of green projects, and the issuers' investment decisions? (Fig. 10 and 11)

At this stage the most recent paper³⁴ on the topic concludes that *"there seems to be no significant pricing premium on the primary market (...) The latest research has demonstrated some anecdotal evidence that green bonds are often heavily oversubscribed, and may therefore offer tighter pricing compared to vanilla equivalents thus sometimes providing slightly cheaper debt for issuers (CBI 2017d). However, these benefits might not be sufficient for some issuers to justify the additional time and effort as well as the certification costs – estimated at USD18- 41 thousand per issuance (Bloomberg 2017). Overall, the slight pricing premium is too low for the moment to entail a significant decrease in the cost of financing LCCR [Low Carbon and Climate Resilient] assets sufficiently enough to improve the profitability and bankability of LCCR assets and thus increase the pipeline of LCCR investments."*

³⁰ Green bond finance and certification, BIS - Ehlers/Packer (2017).

³¹ A similar analysis published by CBI mid-2017 concluded that there was no evidence of a green premium.

³² CBI (2017) concludes that Initial Price Talk (IPT) and the level of oversubscription are both roughly in line with the market.

³³ Empirical results from interviews with investors found in the different papers reviewed suggest that investors have a very limited willingness to pay a premium to look 'green' and will likely reduce their appetite for green bonds if the difference in pricing becomes permanent.

³⁴ *Green Bonds: Improving their contribution to the low-carbon and climate resilient transition*, I4CE (2018)

Fig 10 - Illustrative example: impact of an 18 bp green premium on the WACC of onshore wind in southern European countries

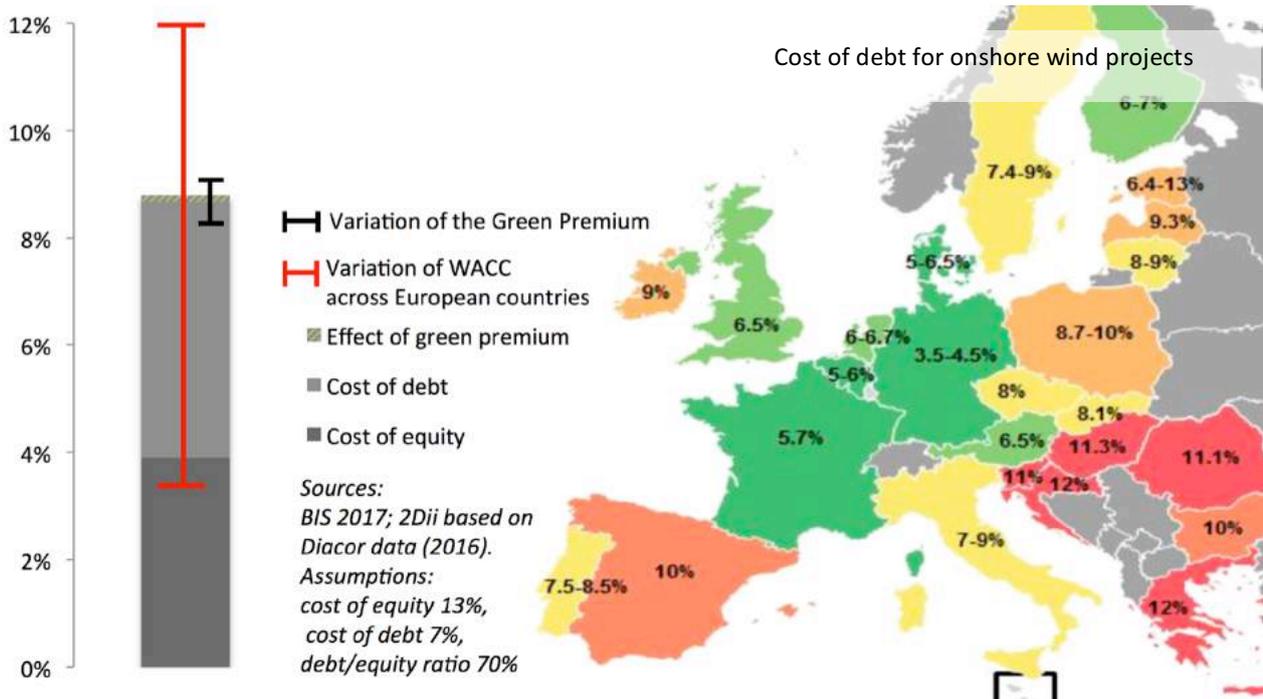
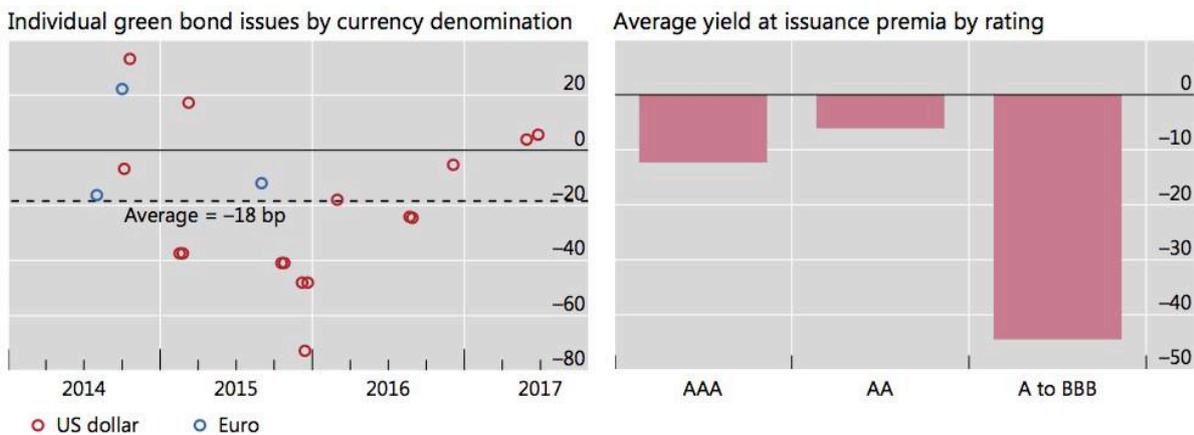


Fig 11 - Credit spreads at issuance of green versus non-green bonds, in basis points³⁵



¹ Relative differences in credit spreads at issuance compared with a non-green bond of the same issuer at the closest possible date. The average closest date of a non-green bond issue by the same issuer is around seven days before the issue date of the green bond. Sample was restricted to pari passu bonds of at least two-year maturity at issuance, at least \$10 million issuance amount and currency of denomination being either euros or US dollars. Credit spreads are calculated as the spreads of yields at issuance over the yield curve of US Treasury securities (for US dollar-denominated bonds) and German Federal Treasury securities (for euro-denominated bonds) of the same maturity at issuance date; if the same maturity was not available, the available points of the respective yield curve were interpolated.

Sources: Board of Governors of the Federal Reserve System; Deutsche Bundesbank; Bloomberg; authors' calculations.

³⁵ Source: Green bond finance and certification, BIS - Ehlers/Packer (2017).

3. THE CASE FOR ASSESSING HOW GB CONTRIBUTE TO SCALING UP GREEN INVESTMENTS

So far the assessment of the environmental outcomes associated with green bonds issuance and ownership has not been on the agenda of standard setters and observers. However, several use cases are emerging and will call for the development of an ‘impact assessment’ framework in the next few years:

Improving green bond standards. With projects at global (ISO), European (EC) and national levels, green bond standardization initiatives are blooming in 2018-2019. They provide an opportunity to fine-tune current criteria, possibly through different sub-categories or stricter criteria, in order to better value the subset of green bonds associated with a higher climate impact. In its report, the HLEG recommends the assessment of GB ‘contribution’.

Governmental endorsement. In several regions, (Europe, China) policy-makers currently envision supporting the development of the green bond market (e.g. endorsement of a green bond standard, public incentives). To allow an assessment of the impact of such policy actions, they will eventually need a quantitative framework enabling the comparison between green bonds and other green finance and transparency tools (see Fig 12).

Energy transition funds. In 2016, France introduced an official ‘Energy Transition Label’ for investment funds. In its action plan, the European Commission envisions the introduction of an Eco-Label. The current criteria of the French label are based on the exposure of the fund to ‘green assets’, based on a broad definition - including equity in projects, equity and bonds of pure players in green sectors and UoP green bonds. So far, the assessment is binary: no ‘shades of green’ are considered in the criteria. Given the above-mentioned caveats associated with UoP green bonds, the question of their eligibility and/or their weight in such funds will sooner or later be on the agenda, especially when the introduction of a tax incentive is discussed.

Green support factor. More specifically, the European Commission is currently considering an evolution of the capital requirements calculation, especially lower capital charges for ‘green assets’. The eligibility of green bonds held by regulated financial institutions will therefore be on the agenda³⁶. If the scheme is based on financial risk logic (as planned in the communication from the EC), the exclusion of green bonds is to be expected – see above. But if the factor is based on the environmental impact, as suggested by the Commissioner Dombrovskis, the impact of green bonds relative to ‘genuine exposure’ (i.e. equity, loans, ABS) to green projects will necessarily be discussed.

Recognition as an investor’s ‘climate target’. More and more investors are setting ‘climate targets’ that involve increasing their exposure to green bonds. The potential withdrawal of the US from the Paris agreement has accelerated the need for ‘official’ recognition of climate pledges by the UNFCCC. Besides, countries are starting to request or ask investors to set climate targets, in the context of the implementation of Article 2.1.c of the Paris Agreement (consistency of financing flows). More specifically, in the context of the implementation of the Article 173 of the Energy Transition Law, the French government is supposed to introduce ‘indicative targets’ for investors in 2018. All these policy actions will call for a clarification of the status of UoP green bonds, impact-wise.

Ensuring fair competition between green finance tools and approaches. As exemplified in Fig 12, a number of ‘green finance’ instruments and approaches are currently being developed and address similar needs as UoP green bonds. The development of an impact assessment – ideally applicable to other instruments – will allow policy makers to compare them and give a preferable treatment to the most impactful instruments and tools.

FIG 12. Examples of other investment instruments ‘competing’ with UoP green bonds

	Commitment to a minimum level of green investments	Green project risks transferred to the investor	Issuers investments aligned with needs in 2D scenario
‘Use-of-proceeds’ Green bonds	✓		
Green savings accounts -allocated to green loans	✓		
Green project bonds	✓	✓	
Green Asset-Back Securities	✓	✓	
Shares in green equity and PE funds	✓	✓	
Shares in green real estate funds	✓	✓	
Engagement on climate target from issuers	✓		✓

³⁶ Position papers from the Banking federations (e.g. [FBF](#), [EBF](#)) do not clearly address the issue of UoP green bonds eligibility. Position papers from green bonds promoters (e.g. [CBI](#)) call for preferential risk weighting of green bonds, without excluding UoP green bonds.

4. TOWARDS AN ASSESSMENT FRAMEWORK

Based on the currently available data and techniques, a number of options are available to develop a framework for assessing the impact of the green bond market as a whole, or even the purchase of specific green bonds. Such a framework can be embedded in existing and emerging green bond standards, and be used by observers and policy-makers to track the efficiency of the green bond market and related policy tools in delivering environmental outcomes.

4.1. Limited relevance of the ‘additionality’ concept and GHG emission reductions allocation

As discussed above, the concept of ‘*additionality*’ traditionally used in GHG accounting for CDM project, to define the eligibility of mitigation projects and the associated emission reductions, is of limited use in the case of GBs.

The reason is twofold:

- Bonds are primarily re-financing instruments, so they do not trigger any new project ‘by design’;
- In any case, the cost and availability of debt financing is one factor in the complex equation of the investment decision-making process, and unlikely to be the only or even the main trigger (Fig 4).

As a consequence, the impact assessment should seek to capture the ‘weight’ of green bond issuance (and associated benefits) as a factor in the decision to invest in new projects, rather than seeking evidence to ‘allocate’ the GHG emission reductions to the financing decision, like in the case of CDM projects³⁷.

4.2. Assessing the influence on issuers’ investment decisions

In this context, several measurement approaches can be mobilized:

- 1) **Tracking the green premium and its impact on projects WACC.** Various observers of the green bond markets have started to assess the premium paid to the issuer for green bonds (relative to vanilla bonds from the same issuer) and differences in oversubscription³⁸. In order to understand how this premium might impact investment decisions, this premium can be compared with the cost of debt and WACC for a range of projects (as exemplified in Fig 10). The quantitative analysis can be complemented with surveys of:
 - *Green bond issuers/project developers*, to better understand the importance of the WACC relative to other factors, estimate the minimum premium necessary to influence decision-making, and understand if the premium paid on corporate/sovereign debt is cascaded into the WACC at project level in internal accounts. Such figure would provide an indication of the financial ‘incentive’ related to green bonds, assuming rational decision-making. The survey can be done by technology and region, for the market as a whole.
 - *Green bond investors*, to better understand their willingness to pay a premium and the associated objectives and perceived benefits. The results would allow a better assessment of the GB market potential, in terms of delivering environmental outcomes. Similarly, this survey doesn’t have to be issuance-specific.
- 2) **Tracking changes in investment plans.** For a few sectors (e.g. power, automotive and some heavy industries,) representing a significant share of the use of proceeds (Fig 2), it is already possible to track how issuers (companies, municipalities, states) change their investment plans over time, using asset-level business intelligence databases³⁹. Such figures can help to identify correlations between green bonds issuance and decisions to scale-up green investment plans. While not providing indications on causality, this approach could provide a first step in the analysis of the topic. It can be complemented with a survey of green bond issuers about the influence of the process on the ambition of their investment plans⁴⁰. An example of such an analysis is presented in Appendix 1, for the power sector.
- 3) **Assessing the alignment of bond portfolios with 2D scenarios.** Several researchers have started to translate the IEA 2° scenario into targets applicable to bond issuers and portfolios:
 - The European consortium SEI Metrics⁴¹ has compared the investment plans of corporate bond issuers (individually or collectively) with the IEA technology deployment roadmaps for key energy technologies;
 - The OECD has ‘translated’ the investment needs estimated by the IEA into bond issuance targets for a range of green energy technologies⁴², and indicative green exposure targets for institutional investors.

³⁷ It is also the conclusion of the panel on Green Bonds Additionality held during the Natixis 2018 ‘[Green assets conference](#)’ (March 8th).

³⁸ See for instance CBI’s annual report on [green premium](#).

³⁹ [Asset level data and climate-related financial analysis : a market survey](#), 2Dii, 2017

⁴⁰ While being cautious about the interpretation of results since issuers have an incentive to exaggerate the impact of the green bonds issuance.

⁴¹ [Sustainable Energy Investment Metrics EU Project](#)

Based on a ‘fair share approach’, scenario analysis can be used to assess the alignment of issuers and portfolios with 2D decarbonisation pathways. The Appendix 1 exemplifies this approach for the power sector.

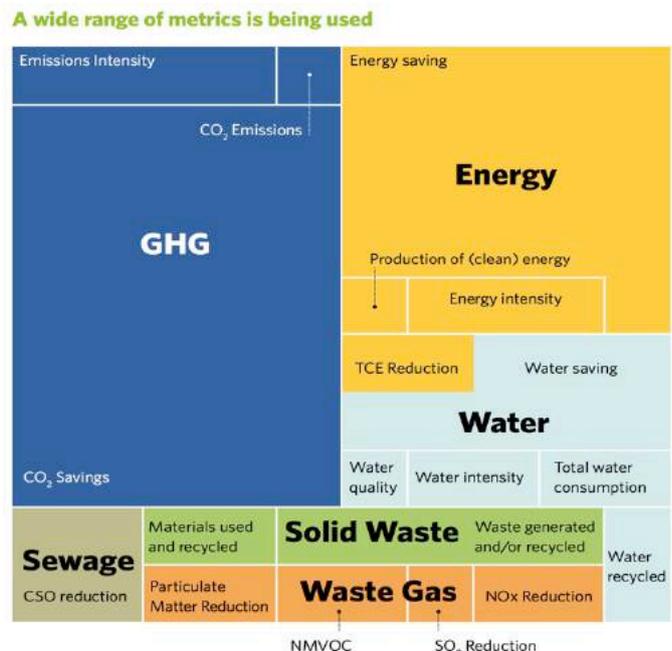
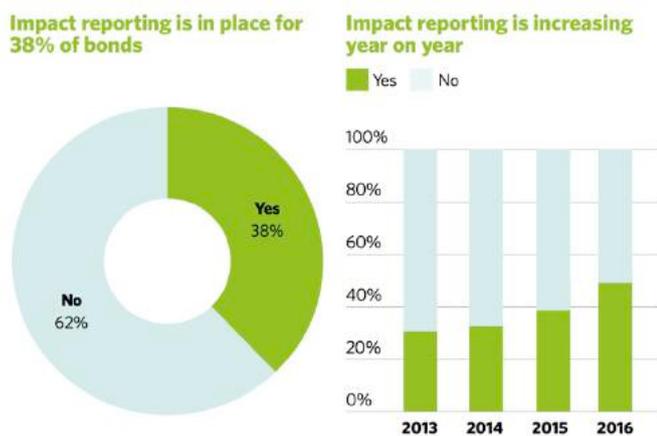
- 4) **Surveying issuers about the other perceived benefits.** Green bonds professionals highlight the various ‘soft’ benefits for issuers, including expanding the base of investors, raising awareness on the green investment opportunities, etc. To better capture the qualitative empirical evidence on these other benefits, it would be possible to survey issuers. Responses suggesting impact could then be subject to qualitative interviews and further requests for hard evidence.

4.3. Expected outputs

The above-described analysis can support the integrity of the green bond market, and more broadly the improvement of green financing tools and policies through several outputs:

1. **Advanced taxonomy of ‘green projects’.** The existing taxonomies of green projects used to inform green bond labelling are *binary*: they do not consider the relative importance of the financing gap among the various barriers to new investments. The analysis can help identify the types of projects (and issuers) for which the availability and cost of debt financing is a critical obstacle. This will also allow creating sub-categories, or ‘shades’ of green in the taxonomy of eligible projects.
2. **Impact measurement indicators associated with green bonds.** Current standards promote ‘impact reporting’ for earmarked projects (Fig 13), but no reporting on how green bonds contribute to scale up investments in green projects. The development of the above-mentioned indicators can help estimate the contribution of the green bond market as a whole, and potentially the ‘contribution’ of green bond investors.
3. **Advanced labelling system.** The development of these indicators will help to distinguish the relative contribution of different types of green bonds (e.g. UoP GB compared to ABS and project bonds), in order to help investors and policy-makers develop more targeted and impactful actions.
4. **Categorization of green finance instruments.** Finally, impact assessment can help to rank green finance instruments and transparency schemes based on their effectiveness in making financial flows consistent with climate and other sustainability objectives, in order to inform the design of policy incentives⁴³ and climate actions from investors.

Fig 13⁴⁴. State of ‘impact reporting’ on projects earmarked for green bond issuance (sample).



⁴² [Quantitative framework for analysing potential bond contribution in a low-carbon transition, OECD 2017](#). The approach is focused on renewables, energy-efficiency and LEVs, in China, EU, US and Japan. It relies on assumption regarding the financing structure for various technologies and the development of securitization.

⁴³ For instance, when recommending a green supporting factor, the [EBF](#) says that « *Only assets contributing to the environment and climate change mitigation should benefit from the green supporting factor to avoid a risk of “green washing”*. A system of checks of adherence to the taxonomy and eligibility of assets as “green” should also be developed (...) ».

⁴⁴ Post-issuance reporting in the green bond market, CBI 2017

5. CONCLUSION : IMPLICATIONS FOR MARKET PLAYERS AND POLICY-MAKERS

5.1. The need to enhance the green bond market standards.

The application of such the above-described assessment framework (or an enhanced version of it) might lead to the conclusion that green bonds are a great tool for raising awareness but need further enhancement to contribute to shifting investments beyond business as usual, towards a 2°C pathway or below. Given that Green Bonds are now on the policy agenda, that policy incentives are being discussed and that the awareness-raising job is largely done, it is probably to right time to start building the rocket. What does it mean for market players and policy makers? The implications are threefold:

Focusing efforts on ABS. Our preliminary conclusions⁴⁵, which are consistent with those of our peers on the topic⁴⁶, suggest that, contrary to ABS and project bonds the UoP green bonds issued by non-pure players, as designed today, and in the current regulatory context, have limited potential for contributing to scaling up green investments. The development of an assessment framework, as recommended above, will eventually lead to more definitive conclusions. If confirmed, the first implication of such a conclusion is to focus the efforts and potential policy incentives on ABS linked to green projects, whether green labelled or not. This category is associated with clear environmental benefits, in terms of risk transfer, and reduction of the cost of borrowing. More concretely, it means that the emerging standards (EU, ISO) and related fund labels (French Energy Transition Label, upcoming EU eco-label) could give ABS and project bonds a higher status.

Introducing 'Green bonds+' Such a development might, however, leave risk adverse green fixed-income investors, those currently investing in UoP green bonds, short of investment-grade options. Not all investors can dramatically increase their exposure to ABS and project bonds, and asset managers will look for new ways to green their general-purpose bond portfolio. For those investors, a 'enhanced' version of current UoP green bonds, associated with more tangible environmental benefits, could be needed. Such an evolution would also allow building on the infrastructure (standard setters, verifiers, investment banks, climate-aware issuers and investors) and current dynamic of the green bond market. Based on the conclusion of this paper and similar papers recently published by our peers, the obvious next step would be the introduction of new criteria related to the climate-alignment of issuers' investments. In other words, the Green Bond+ issuers will not only have to earmark their investment, but also to provide evidence that their overall investment plan is aligned with climate goals.

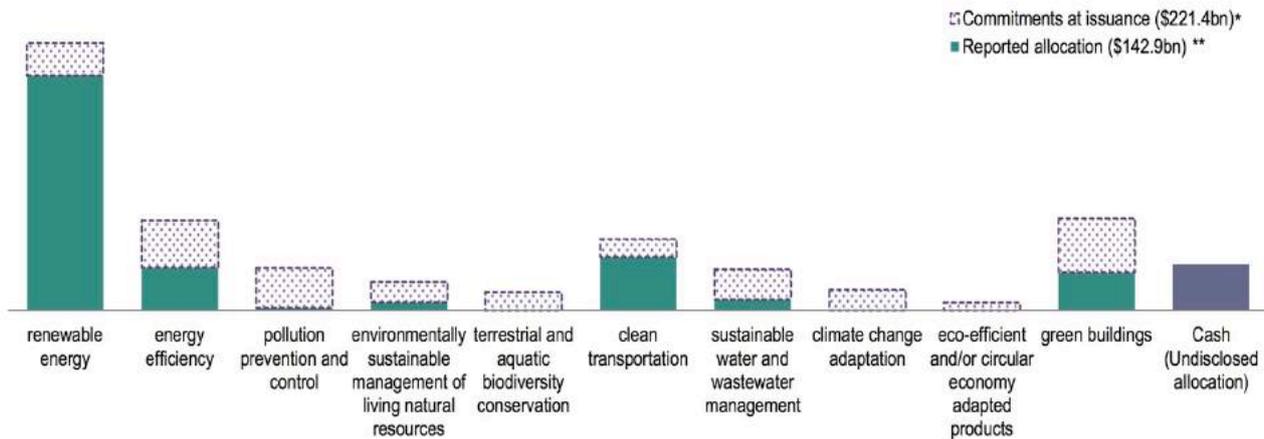
Assessing the alignment of all issuers with a 2D trajectory. The Appendix provides an example of how the alignment of bond issuers with climate trajectories (also called climate scenario analysis) can be assessed for renewable energy, which represents by far the biggest use-of-proceeds category (Fig 14). The analysis shows that it is possible to assess the climate alignment of existing assets and investment plans (over the next 5 years) for all bond issuers, whether they report the use of proceeds or not. Besides, this climate scenario analysis also covers other technologies (hydro, nuclear, gas, oil and coal-fired power), providing the full picture (see fig 15), which is critical to avoid misleading signals. For the power sector, the analysis can be performed without introducing any disclosure requirement for issuers using business intelligence data. Based on existing business intelligence databases, the analysis can be also extended to car manufacturing (subset of 'clean transportation' in Fig. 14), cement, steel, aviation, shipping, oil and gas⁴⁷, covering about 20% of the corporate bond market. As a consequence, for this subset of the bond market, the analysis can be conducted by the UN, the EC, supervisory authorities, or any organisation able to purchase the data without any regulatory change. Extending the analysis beyond these sectors would require the introduction of mandatory disclosure requirements for issuers or changes in the obligations for Credit Rating Agencies.

⁴⁵ This note will be subject to review by peers and the quantitative analysis presented in Appendix 1 will be extended to other sectors before reaching our final conclusions.

⁴⁶ IACE (ibid) notably concludes that "Overall, the theoretical potential of the labelling green bonds to create additional financial flows towards LCCR investments would have limited impact" (...) Green bonds do not currently bring improved financing conditions for LCCR investments and increase the pipeline of 'bankable' LCCR assets. It appears that labelled green bond issuance serves principally to highlight green investments that would have been carried out in any case."

⁴⁷ See [Asset-Level data and climate-related financial analysis](#) : a market survey, 2Dii (2017).

Fig 14. Project categories eligible and reported (Natixis, March 2018)⁴⁸

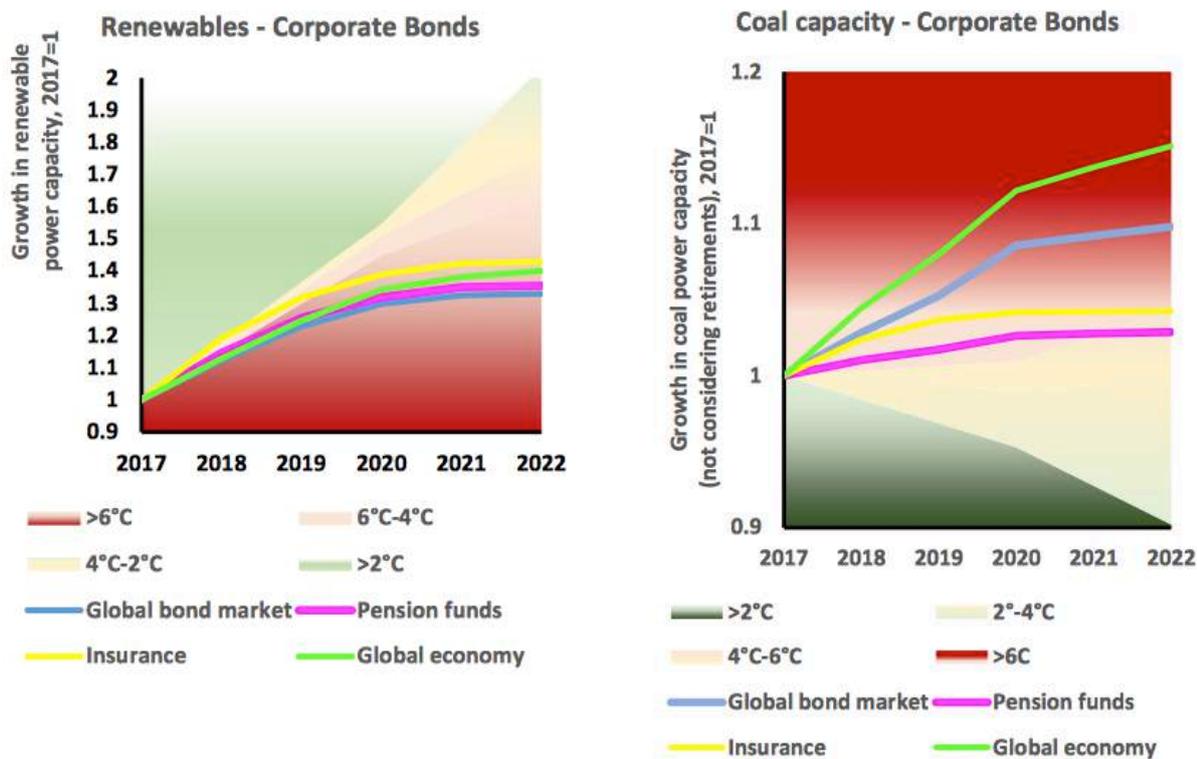


* Data at issuance cover all outstanding green bonds at Feb 28 2018 (> \$200m) i.e. 306 issuances for a total outstanding of \$ 221 bn. At issuance : we assumed that green proceeds are equally split between eligible project categories flagged by the issuer

** Data at reporting phase cover all outstanding green bonds that have already produced a reporting at Dec 31 2017, ie 143 bn. At reporting : allocated to each project category based on issuer disclosure of actual allocations

=> these data don't cover issuances that had not yet produced a reporting on Dec 31 2017, ie \$ 79 bn outstanding as of Feb 2018 which prevents us from comparing before/after reporting allocation scenarios on the same basis.

Fig 15. Example of power bond portfolio climate scenario analysis for Swiss institutional investors⁴⁹.



⁴⁸ Deep dive into Green and credit credentials, Natixis (2018)

⁴⁹ Example of scenario analysis conducted on the aggregated bond portfolio of Swiss insurers and pension funds in the context of an initiative of the Swiss government. See <https://www.bafu.admin.ch/bafu/en/home/documentation/news-releases/anzeige-nsb-unter-medienmitteilungen.msg-id-68482.html>

5.2. Towards convergence with climate scenario analysis?

The rise of climate scenario analysis. Over the past few years, climate scenario analysis experienced rapid development, both in terms of methodological development⁵⁰, adoption by investors and supervisors⁵¹, endorsement by standard setters, and integration into public policies⁵². More precisely:

- the TCFD recommends climate scenario analysis and related target setting for both investors and issuers;
- the Science-Based Target consortium is currently developing 'Finance Sector' guidance for climate target setting, including for bond investors.

Toward target setting requests for bond issuers. This dynamic involves the development of potentially convergent practices that might create opportunities for synergies:

- Increasingly bond investors are assessing the alignment of their bond portfolio with climate goals. In the next couple of years, driven by governmental schemes, supervisors and investor coalitions, this approach is likely to become common practice and create appetite for related actions and target setting.
- In parallel a large coalition of investors (256 with \$28Tn of AuM), Climate Action 100+⁵³ is planning to engage with a list of 150 investee companies to request climate target setting. They primarily plan to leverage their voting rights as shareholders, but most of these investors are also investing in the bonds issued by the same companies.

Towards convergence of practices. These two practices are likely to converge at some point : some investors have already expressed their intention to also leverage their power as bond investors, by not purchasing new bonds from 'non-collaborative' issuers when existing bonds reach maturity. If these practices take off and are extended to a large base of issuers, this might focus the efforts of most 'green' fixed-income investors on this type of climate target setting actions, which are associated with a clear pathway to positive environmental outcomes. Such an evolution would likely generate needs for new measurement and labelling approaches, on top of the ones identified above.

5.3. Implications for climate-related bond assessment and labelling

The above-described evolutions would likely create new needs from investors and lead to new approaches in terms of assessment of bonds and labelling. If the status quo doesn't prevail, we identified three scenarios:

Enhance 'green bond' standards. A first approach for developing climate scenario analysis in the green bond market would be to enhance existing and upcoming green/climate bond standards⁵⁴ with criteria on climate-alignment. The issuers would first be required to confirm (where external analysis exist) or perform scenario analysis on their assets and investment plans, and disclose the results to investors, in order to be able to issue green bonds. As a second stage, the certification could be limited to 'real assets-linked' bonds (ABS, project bonds) and climate-aligned issuers for general-purpose bonds. As discussed below, such an upgrade would be costless, while significantly improving the added value of the verification: indeed investors would finally be able to use labelling as a relevant proxy for calculating their exposure to green assets, and therefore link the approach with climate risk management. However, based on the appetite expressed by established standard setters so far⁵⁵, this scenario seems unlikely: the green bond market is experiencing a triple digit annual growth with its current limitations, and so far most established players seem to prioritize growth over other considerations.

Green bond+ label. In this context, a more likely evolution could be the introduction of a 'green bond +' label, for green bonds issued by organisations aligned with climate goals. Such certification scheme could be applied by existing verifiers on top of the diligence conducted for green bond certification. Green investors, who roughly represent 50% of outstanding green bonds ownership, would likely demand such a label in the near future if the analysis developed in this paper lead to the rise of a controversy in the green bond market.

⁵⁰ See for instance the EU [SEImetrics](#) consortium, the [Science-Based Target Initiative](#), the work of [UC Davis with CERES](#).

⁵¹ The SEImetrics approach has for instance been applied by 220 institutional investors and 4 supervisors.

⁵² The principle of climate scenario analysis and target setting by investors is embedded into the article 173 of the French Energy Transition law, that makes climate disclosure mandatory for investors. Climate Scenario analysis is also integrated in the Action Plan of the European Commission on Sustainable Finance, and in the related recommendations from the HLEG.

⁵³ See <http://www.climateaction100.org>

⁵⁴ More specifically the European standard and the ISO standard.

⁵⁵ In the context of informal interviews and various workshops in 2017-2018.

Introduction of a 2D Bond label. The third scenario is the introduction of a new stand-alone label, recognising the ‘actual’ compatibility of the asset with climate goals. Such a label would apply to ABS, project bonds and pure players, as well as general-purpose bonds issued by organisations with investments consistent with a 2D pathway. Such an approach would ignore earmarking and only focus on the overall activity of the issuer, providing investors with a relevant proxy to calculate their exposure to green projects, from a financial risk perspective. If introduced, such a label would likely both complement and compete with green bond labelling.

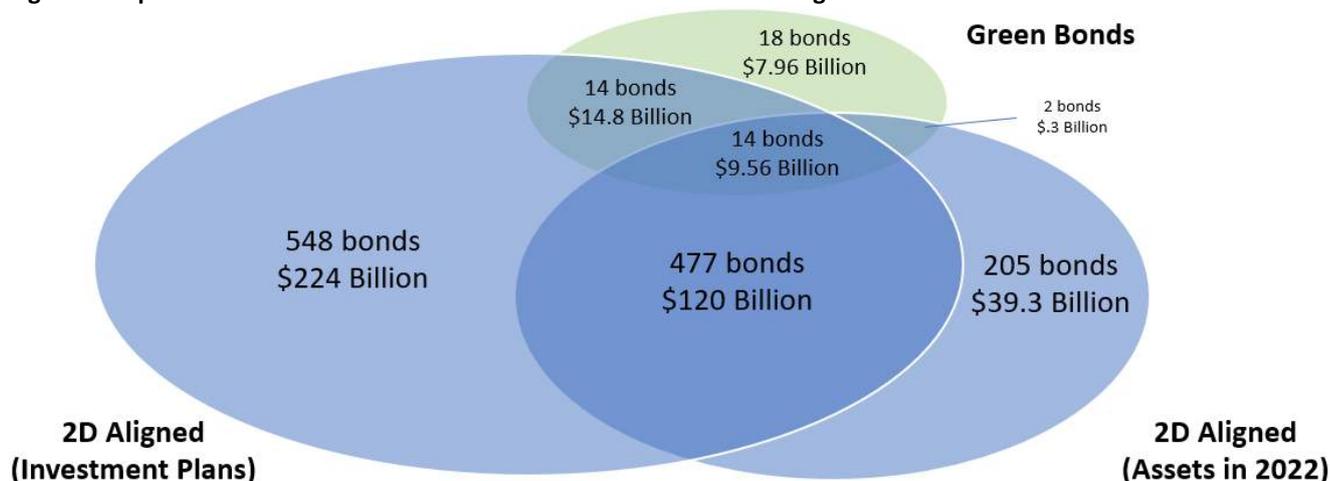
5.4. Consequences on the cost associated with labelling and the size of the market

What would be the consequence of the emergence of climate scenario analysis in the bond space? While a more sophisticated analysis would be necessary to answer this question, we provide a first ‘back of the envelop calculation’ below:

Cost of 2D scenario analysis. Based on our estimates, scenario analysis covering the alignment of both green and brown technology deployment is also 15 to 30 times cheaper than the current ‘use-of-proceed verification’ system. For example, the cost of climate scenario analysis (based on business intelligence data) for the power market on an annual basis is in the vicinity of \$300,000. This is compared to an estimated \$3M to \$7M if every bond issuer in the power sector has to pay for bond certification each year⁵⁶. Based on existing business intelligence databases, scenario analysis can also be applied to car manufacturing for an insignificant additional cost. *Green Bond+* and 2D labelling schemes can therefore be developed for a fraction of the cost of green bond certification today for key sectors (power, transportation). Like green bond labelling it could be applied to all types of issuers (corporate, municipalities, sovereign, banks) with existing methodological frameworks⁵⁷.

For other major sectors, buildings⁵⁸ and other clean transportation⁵⁹ for which methodological frameworks exist or could be easily developed, performing scenario analysis will require an individual assessment for each issuer, leading to a cost structure similar to green bond certification. For other technologies/sectors, where climate scenarios and assessment frameworks do not exist yet, the assessment can be more costly. However, this third category currently represents a very limited share of use-of-proceeds (see fig 14) and overall we identify potential for gains in cost efficiency.

Fig 16. Comparison of the Power Sector Green Bonds Market with 2D Aligned Bonds⁶⁰.



Size of the climate-related bond market.

It is difficult to estimate the global size of the market for *Green Bonds+* and *2D Bonds* given the lack of data on 2D alignment for many sectors. We can, however, estimate the implication for the power sector. As discussed in section

⁵⁶ The estimates are based on a certification cost of \$18,000 to \$41,000 per verification, assuming that the 179 power sector issuers of our sample (see Appendix) perform the assessment of their exposure (past investments and pipeline) to green projects each year to fuel their reporting to investors. The estimates for scenario analysis are based on 2Di cost assumptions.

⁵⁷ Notably see the publications of the EU [SEImetrics project](#) for corporate, sovereigns and banks.

⁵⁸ In the context of the SEImetrics project, Climate Bonds Initiative published « [Aligning Buildings with the Paris Climate Agreement – Insights and developments from the Green Bond Market](#) » (2018), which provides a scenario analysis methodological framework for buildings.

⁵⁹ A methodological framework is yet to be developed for this sector, but can be adapted from existing work including IEA scenarios, SEImetrics, Science Based Target Initiative, etc.

⁶⁰ Based on green bonds outstanding on December 31st, 2017 (Bloomberg) and on the sample used in the Appendix (179 issuers), used as a proxy for power bonds outstanding and issuers.

5.1, 2D alignment in the power sector can be estimated using an issuer's renewable assets as a proxy. By comparing this with the growth of renewable power capacity in the IEA's 2 Degree scenario⁶¹, we can define misalignment as lagging behind what should be the investment in renewables of the average power producer in the scenario.⁶²

For the remainder of this paper, we will define 2D alignment in two ways:

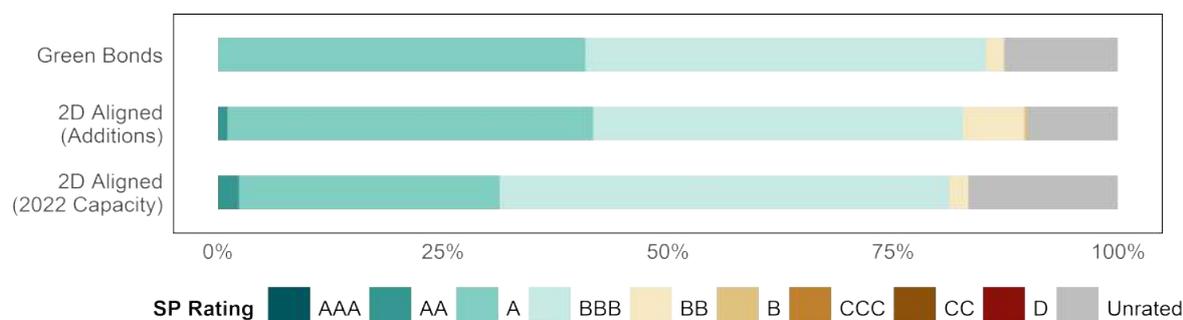
Investment Plan Alignment: the alignment of the renewable capacity additions in the next 5 years (2017 to 2022). An issuer is aligned if they grow their renewables at the same rate as the market in the 2 Degree scenario.

Asset Alignment: the alignment of the renewable capacity at the end of the 5 year period (2022). An issuer is aligned if their percent share of renewables in 2022 is greater than or equal to that of the market in the 2 Degree scenario.⁶³

Based on the 2017 Q4 state of assets and investment plans in this sector (see Appendix), the size of the 2D aligned market (shown figure 16) would be quite large:

- Between 9.9B\$ and 24.4B\$ outstanding for *Green Bond+*. It means that 30% to 50% of current green bond issuers would be eligible to a *Green Bond+* certification, depending on how the alignment criteria are defined.
- Between 169B\$ and 368B\$ outstanding for *2D Bonds*, assuming that all bond issuers aligned with the IEA 2D pathway are labelled (externally or via certification). This represents up to 34% of the bonds outstanding in December 2017, to be compared with 3.0% for labelled green bonds. Up to 22% of the power sector issuers would be 2D labelled, to be compared to 11% of power companies that are labelled GB issuers today.

Fig 17. S&P Ratings for Green Bonds and 2°C Aligned Bonds in the Power Sector



	Green Bonds	2D Aligned (Investment Plans)	2D Aligned (2022 Assets)
Count of Outstanding Bonds	48 Bonds	1053 Bonds	698 Bonds
Total Value of Outstanding Bonds	\$32.6 Billion	\$368 Billion	\$169 Billion
Total Value of Investment Grade Bonds	\$27.8 Billion	\$304 Billion	\$137 Billion

Winners and losers. If such an evolution takes place, investors would therefore benefit from a larger universe of investment grade climate-related bonds (see figure 17). Furthermore, these bonds could actually be used as a proxy for increasing an investor's exposure to green activities. If *Green bond+* and *2D Bond* labelling/tagging could eventually replace the current *Green Bond* labels the, all things being equal, it might lead to a reduction of the total assessment-related fees charged by verifiers and underwriters.

⁶¹ The IEA's "2 Degree" scenario (2DS) defines what is the required fuel mix, by year, needed to have a 50% probability of limiting the average global temperature change by 2 degrees within the next century. Methodological framework used for the analysis on www.transitionmonitor.org

⁶² In this paper 'renewable power' includes solar, offshore and onshore wind, and geothermal. Hydro is excluded.

⁶³ This is a simplistic approach, whereas a true alignment policy should consider other technologies, such as fossil fuels, as well. It can also focus on the alignment of renewable power deployment (as for green bonds today) or consider the broader picture and assess the consistency of the overall fuel mix with the scenario (probably more relevant).

APPENDIX - POWER SECTOR - DO GREEN BONDS ISSUERS INVEST GREENER?

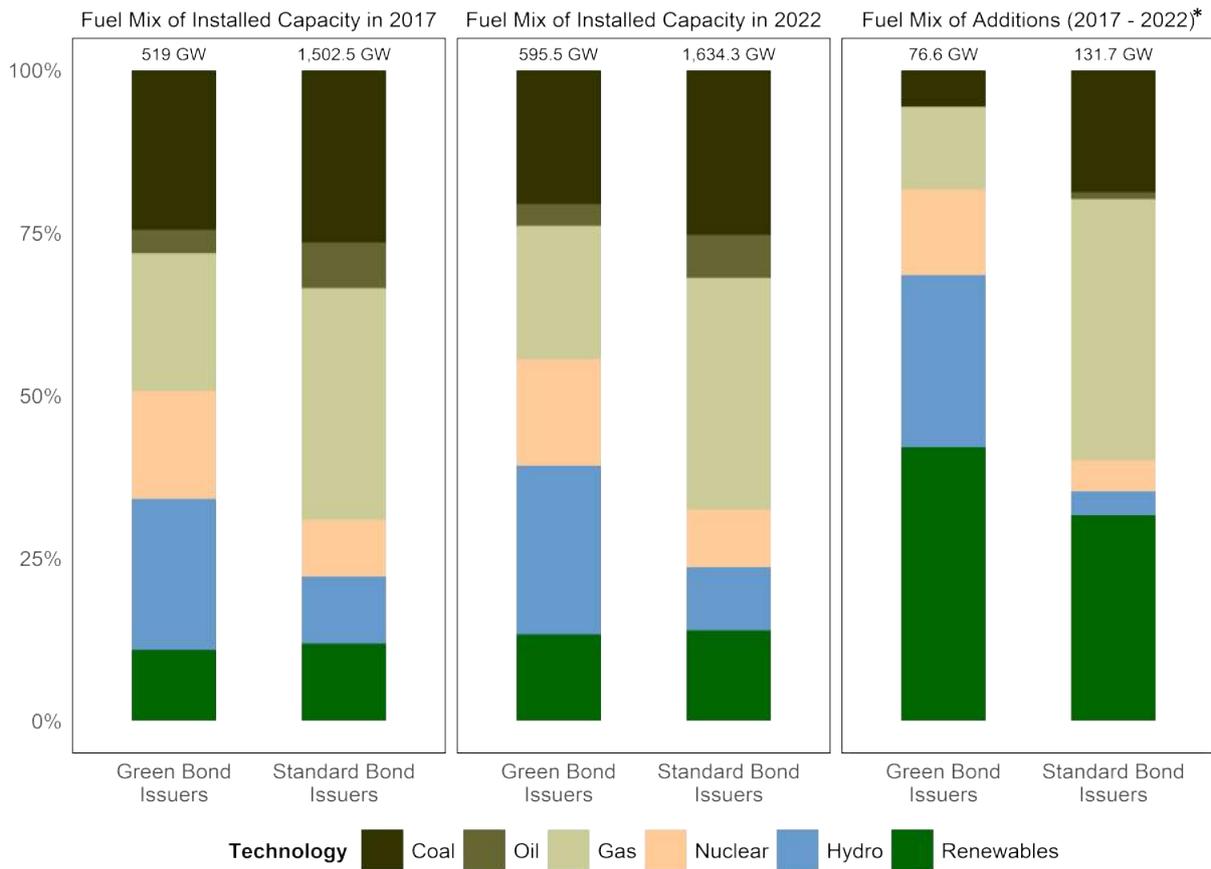
To understand the empirical relationship between the issuance of green bonds and the decision to scale up investments in renewable power, we analysed the existing capacity and investment plans of power sector bond issuers (2Dii data based on Bloomberg, Global Data). For our analysis, we defined a green bond issuer as an issuer of a corporate bond prior to 12/31/2017 labelled with “Green” Use of Proceeds with a maturity date after 12/31/2017. Standard bond issuers are all issuers who did not issue a green bond according to our definition. We compared investment and capacity plans of green bond issuers (n=20) and standard bond issuers (n=159) within the power sector⁶⁴.

The fuel mix of green bond issuers

In general, the difference between the fuel mix of green bond and standard bond issuers is mainly due to differences in hydro and nuclear capacity. The share of renewables and coal in total power capacity is nearly identical across the two groups, in both 2017 (Fig. 18 left panel) and 2022 (Fig. 18 middle panel). Beyond these two fuels, green bond issuers tend to have more hydro and nuclear, and less gas and oil, than do standard issuers.

Given that the funds from green bonds outstanding as of the end of 2017 are intended to be used to finance green activities, one would expect a higher share of low carbon capacity and renewable capacity in the additions planned by green bond issuers during 2017-2022, relative to standard issuers. While additions planned by green bond issuers are distinctly more low carbon (renewable/hydro/nuclear) than that of standard issuers, the difference again mostly comes from hydro and nuclear capacity, as opposed to renewable capacity.

Fig 18. Fuel Mix of Power Sector Issuers (Weighted by Outstanding Bonds)



*73 issuers had no additions

⁶⁴ All issuers in the sample have been classified as Utilities by Bloomberg. This sample was created by joining Bloomberg bond and industry classification data with asset level power capacity data from Global Data. This was then filtered to include only issuers with greater than 10 MW of power capacity who generate at least 37% of their revenue in the Utility sector (see methodology section for greater detail).

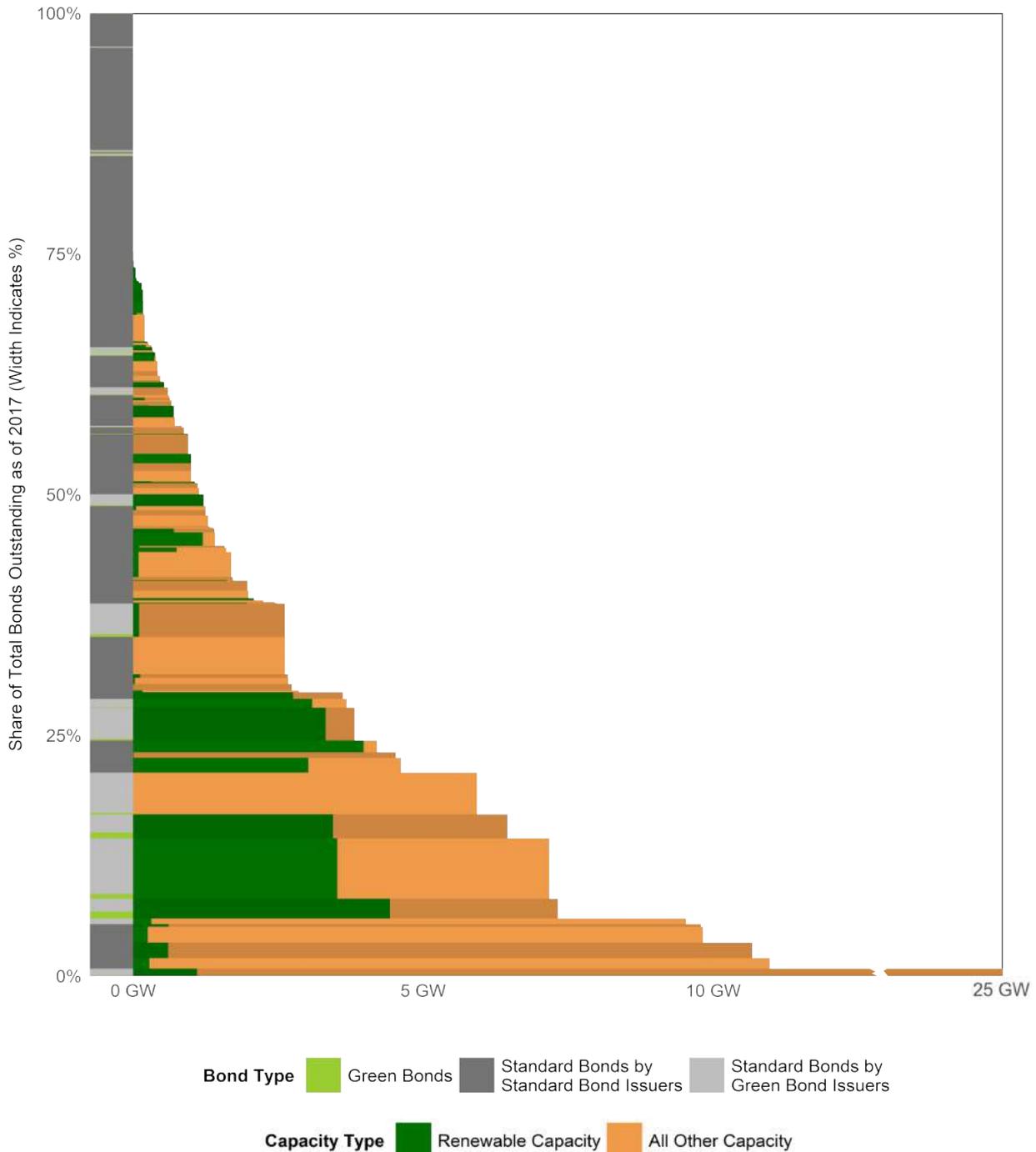
Issuers: the relationship between green bond issuance and capacity additions

The graph below shows the renewable capacity additions (dark green) and all other capacity additions (orange) for power sector bond issuers. The bond issuers are ordered on the y-axis by the total amount of planned capacity additions from 2017-2022. The width of each bar along the y-axis is determined by their share of the total bonds outstanding in our data set – i.e., the largest bond issuers have the widest bars.

The band along the y-axis shows the type of bonds issued by each issuer – whether Green bonds (as defined previously), Standard (i.e., non-Green bonds) issued by a Green Bond issuer, or a Standard Bond issued by a Standard bond issuer.

Green bond issuers are adding a higher share of renewable capacity than other issuers (Fig. 18), but Fig. 19 shows that this varies considerably between issuers. One green bond issuer in particular has investment plans adding 24 GW of coal by 2022. Although this is quite an unusual case, it emphasizes the fact that a green bond is not a guarantee of a green issuer.

Fig 19. Capacity Additions between 2017 and 2022 of Power Sector Issuers

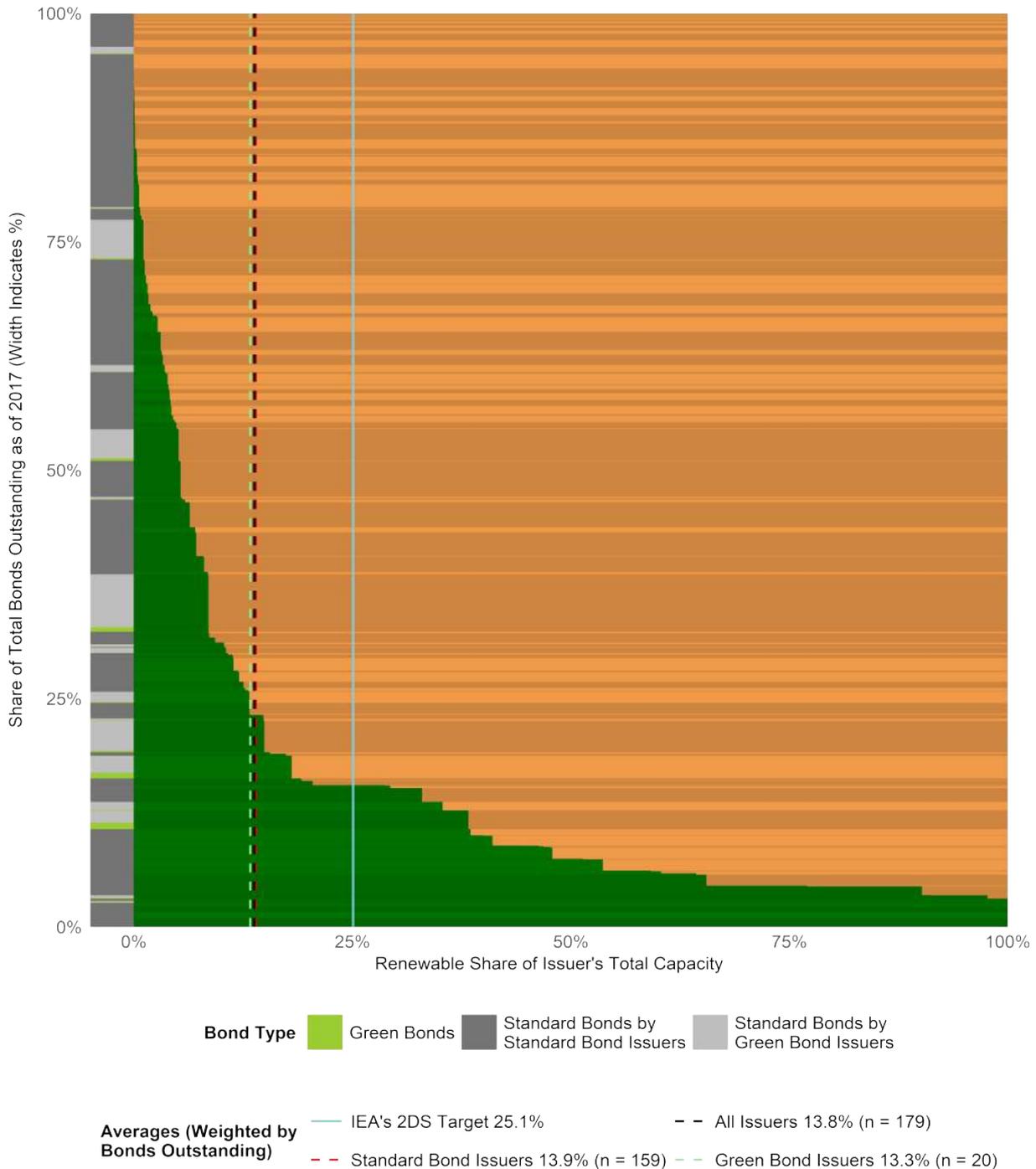


Issuers: Green bonds are poorly correlated with green capacity

In the figure below can see the makeup of the outstanding bonds and renewables capacity in 2022. When weighted by outstanding bonds, the overall average of renewable share for green bond issuers (13.3%) is nearly the same as that for the standard bond issuers (13.8%). Large green bond issuers with low renewable capacity pull down the average significantly. Combining these results with Fig. 18 and Fig. 19, it becomes clear that although green bond issuers may be growing their renewables slightly faster than other issuers, they are still far behind.

Furthermore, the spread of green bond issuers reveals very little correlation between renewable capacity and green bond issuance. Green bond issuers range from 0% renewable (1 issuer) to 100% renewable (3 issuers, most of which have very little outstanding debt). A green bond issuer can fall anywhere on the spectrum, and investors have no insight to this when choosing to invest in a bond.

Fig 20. Renewable Capacity in 2022 of Power Sector Issuers

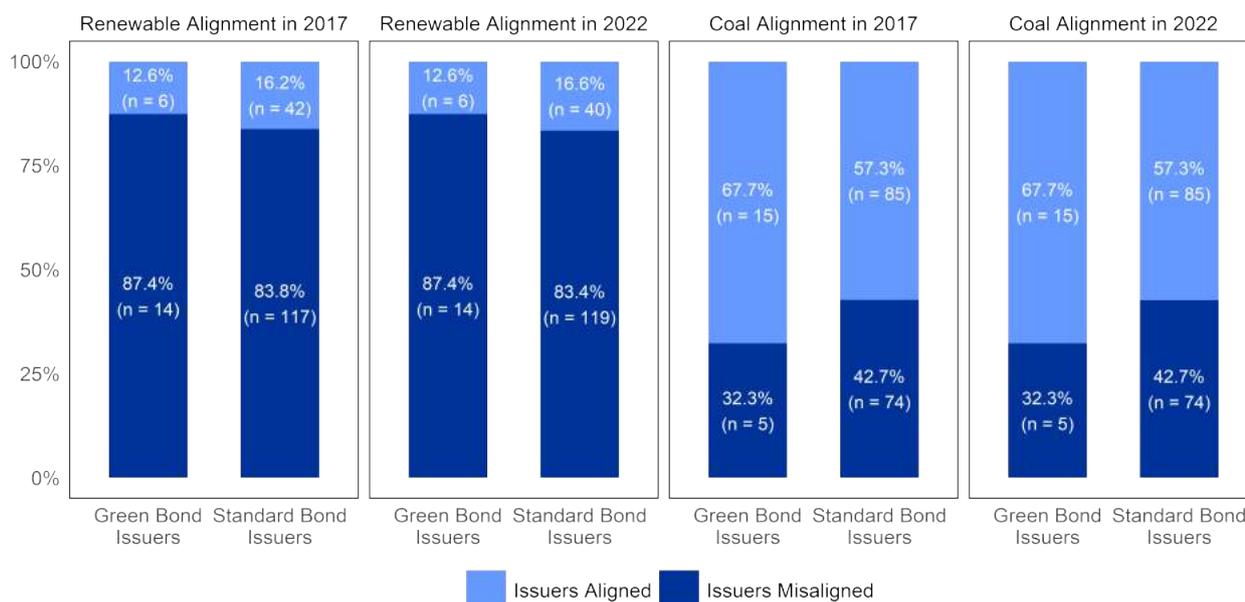


Green bond issuers power capacity is misaligned with the 2°C target

The figure below expands on the asset alignment definition given in section 5.5. The IEA’s 2° scenario for the power sector requires that total installed capacity consists of 17.4% renewables in 2017 and 25.1% in 2022. Given these alignment targets, 30% of green bond issuers are aligned with the IEA’s 2° scenario for renewable capacity in both 2017 and 2022. However, these issuers account for only 13% of total debt outstanding (see Fig 21, panels 1 and 2, first column). When weighted by the total bonds outstanding as of 2017 Q4, the debt of green bond issuers is slightly less aligned with the renewable targets than is the debt of standard issuers. This is due to several large green bond issuers who fall well below the renewable alignment target (see Fig. 20).

In terms of coal-fired electricity capacity, the debt of green bond issuers is more aligned with IEA 2° scenario targets than is the debt from standard bond issuers, in both 2017 and 2022 (see Fig 21, panels 3 and 4). However, none of the green bond issuers that were misaligned in 2017 are projected to be aligned by 2022.⁶⁵

Fig 21. IEA 2D Scenario Alignment of Power Sector Issuers (Weighted by Outstanding Bonds)



The weights, which can be seen visually as the widths of the bars in Fig. 19 and Fig. 20, make a significant difference. It stresses that, per dollar, the power sector is far less invested in renewables than it would appear. Furthermore, if investors are likely to invest in these larger bond issuers then they may not be making as green of an investment as they think. If, as discussed in section 5, *2D Bond* labelling (or some variant) was put into practice then this issue would be avoided. Investors would have a clear indicator that their investments were funding assets which improved the alignment of the global market with a 2° trajectory (such as the IEA’s).

⁶⁵ For coal-fired power alignment is defined as being less than 26.6% and less than 22.9% in 2022.

Methodology: Data Sources

Our goal with this analysis was to investigate if the issuers of green bonds were associated with more aligned capital expenditure plans when compared to issuers of other types. By focusing on the power sector, we were able to use an issuer's present and future power generating assets as a proxy for capital expenditure.

To create this sample set, we pulled outstanding bonds with issue dates before and including 12/31/2017 from Bloomberg. We filtered issuers to only those classified as Utilities. This was then combined with asset level data from Global Data for the years 2017 through 2022⁶⁶. Not all issuers are tracked by Global Data, and issuers who had no asset level data available were dropped. Despite these drops, however, our dataset still covered 82.2% of the outstanding bonds of the power sector⁶⁷.

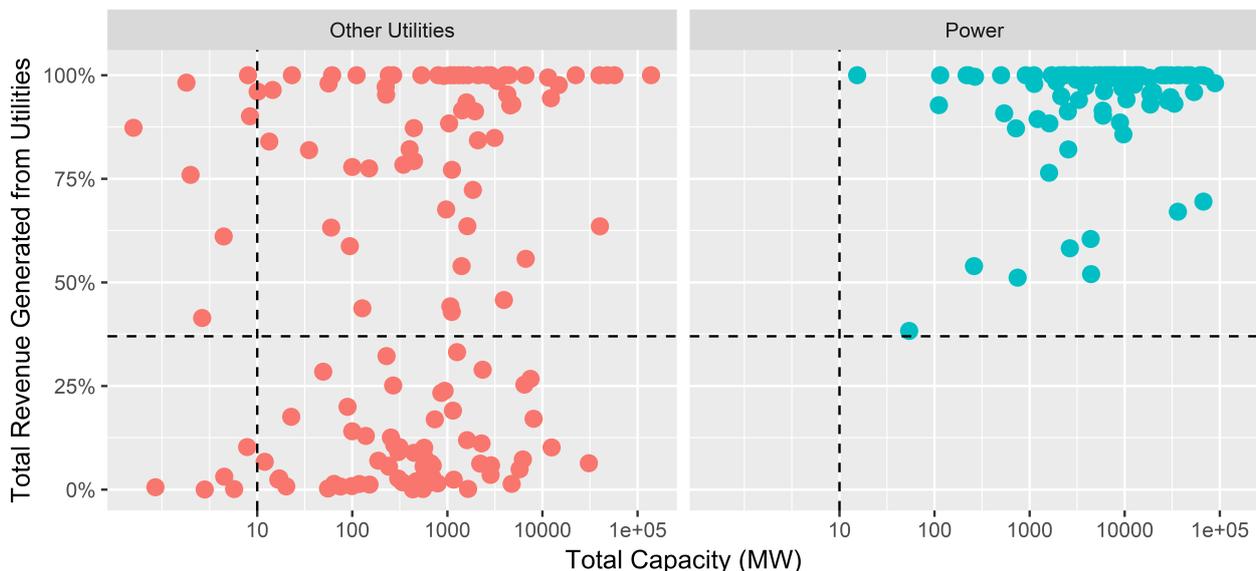
Further detail regarding the Global Data dataset:

- Power asset ownership as of April 2017
- All power capacity allocated by the respective share of equity for each direct owner, as declared by Global Data. For assets without equity share information and with multiple participants, each participant was allocated an equal portion of the physical asset.
- Physical assets owners linked to financial securities based on name matching between the Global Data's declaration of owner, and Bloomberg's declaration of issuer.
- The physical assets are then consolidated based on Bloomberg's internal consolidation of debt obligations. Explicitly ownership/obligation of each dollar of debt and each unit of physical capacity are treated as fungible between issuers who share the same corporate debt ticker and operate within the same sector, as specified by BICS Level 2 Subgroup classification.

Methodology: Sample Selection

Originally, we had intended to only focus on those issuers who were clearly a part of the power sector. This would ensure we were looking at electricity producing utilities, rather than water utilities or other non-electric utilities. The subset generated by this was small, however, and appeared to miss many issuers with large power capacities. In the graph below, the issuers on the right are those who are classified as one of the three subgroups mentioned above (we refer to these as the power sector). On the left we have all of the other issuers who are classified as Utilities by Bloomberg, but do not fall into one of those three subgroups.

Fig 22. Comparison of the Power Sector to Other Utilities (based on Bloomberg Industry Classifications)



To enhance our dataset we chose to add issuers who appeared to be similar to those already in the dataset. Since all issuers in the power sector had greater than 10 MW of capacity in 2017 and generated at least 37% of their revenue in the Utilities sector, we used these values as our filters when choosing other issuers in the Utility sector.

⁶⁶ View our publication surveying the current state of asset level climate data for more detail. [Asset-Level Data and Climate Related Financial Analysis: A Market Survey](#)

⁶⁷ The power sector was decided to be issuers in Bloomberg who were primarily classified as one of three subgroups: Power Generation, Integrated Utilities, and Electricity Networks.



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