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Are green bonds funding the transition? Investigating the link between companies' climate targets and green debt financing

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ABSTRACT

Green bonds are considered one of the most important innovations in sustainable finance. However, there is a lack of conceptual and empirical understanding of the role of green bonds in corporate transition to carbon neutrality. This study develops and tests a conceptual framework that links green bonds to climate targets in the context of corporate transition risk management and polycentric climate governance. It is based on an analysis of the twenty largest European green bond issuers in 2018. We find that in most cases there is a disconnect between issuers' climate targets and their green bond frameworks; and several shortcomings in issuers' post-issuance reporting. Our results suggest that there is little pressure for green bond issuers to use their proceeds to achieve ambitious science-based targets. Our findings highlight the need for policy action to reduce the risk of greenwashing and to situate the green bond market within planetary boundaries.

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Green bonds; impact reporting; sustainable finance; climate targets; CSR

1. Introduction

Green bonds have been called one of the most prominent financial innovations in the area of sustainable finance (Maltais and Nykvist 2020). Since the issuance of the first green bond by the World Bank in 2008, the global market for green bonds has grown from just under 20 billion USD issued in 2013 to more 250 billion issued in 2019 (Environmental Finance 2020).

The rapid growth of green bonds has made some to suggest that they act as a catalyst of a shift towards a low-carbon economy by diverting debt finance to sustainable economic activities while at the same time supporting economic growth (Flaherty et al. 2017; Glomsrød and Wei 2018). There is evidence suggesting that green bonds can make a considerable contribution to achieving the Paris Agreement and the Sustainable Development Goals (Tolliver, Keeley, and Managi 2019).

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Despite their growth in popularity, however, there is a lack of theoretical and empirical understanding of the role of green bonds in corporate transition to carbon neutrality (Linnenluecke, Smith, and McKnight 2016; Maltais and Nykvist 2020). Indeed, the way in which transition finance mechanisms such as green bonds connect with corporate climate action is under researched (Sartzetakis 2020). Specifically, little is known about the link between green bonds and corporate climate targets to reduce emissions.

Climate targets – particularly those that are science-based – have been presented as a viable tool for companies and investors to reduce their exposure to reputational and financial risk brought by the transition to a carbon-free economy (SBTi 2019b). While some have called them a ‘distraction’ that delay concerted political action (Trexler and Schendler 2015), others have argued that corporate climate targets are part of the polycentric architecture of the Paris Agreement (Faria and Labutong 2019). In this polycentric approach to climate governance, non-party stakeholders such as corporations complement and stimulate the legal and policy frameworks set by the UNFCCC (Chan, Brandi, and Bauer 2016). However, if and how corporations use climate targets to define their climate actions and facilitate the necessary investments needed for their economic transition is not well understood (Walenta 2020).

Importantly, issuers’ reporting on the use of proceeds and impact is critical to understanding the link between green bonds and issuers’ climate targets. Post-issuance reporting, however, has so far been largely overlooked in the scientific literature (Kapraun and Scheins 2019; Sartzetakis 2020; Shishlov, Morel, and Cochran 2016). A recent review also found that less than half of issuers report on the allocation of proceeds and the climate impact of their green bonds (CBI 2019). This lack of transparent and comparable post-issuance reporting fails to reduce the risk of greenwashing and hinders the scaling the green bond market (Forsbacka and Vulturius 2019). Thus, there is a need to better understand the shortcomings of reporting practices when trying to assess the contribution of green bonds to issuers’ climate targets and the role of green bonds in the polycentric approach to climate governance.

This study focuses on the European green bond market which is the largest and one of the most mature labelled bond markets (Environmental Finance 2020). It aims to build a better conceptual and empirical understanding of the role of green bonds in funding corporate transition to carbon neutrality by assessing the link between issuers climate targets, their green bond programmes, and post-issuance reporting. Specifically, this study will investigate three empirical questions.

- (1) What kind of climate targets have been adopted by green bond issuers?
- (2) To what extent are green bond frameworks connected with issuers climate targets?
- (3) To what extent does green bond reporting enable transparent and comparative assessment of issuers’ progress on climate targets?

To answer this question, this study analyses a variety of issuer documents and climate targets by the twenty largest European corporate issuers of green bonds in 2018. In the next section, we will develop a conceptual framework connecting climate targets to green bonds. The following two section will present the methods and results. In the final two sections we will discuss our findings and draw conclusions.

2. The case for green bonds to finance corporate transition and climate targets

2.1. Climate targets as a new tool for companies to manage transition risk

There is increasing awareness that corporations face two different types of climate-related financial risk (TCFD 2017). Physical risk arises from the interaction of climate-related hazards with vulnerability and exposure of companies' assets, revenue streams and their trade and supply chains (Batten 2018). Transition risk arises from changes in policy, technology, societal pressure or investor expectations which exposes companies to financial and reputational risks and forces them to adjust their business model to a low-carbon economy (TCFD 2017). A more rapid transition would mean that companies that strongly rely on fossil-fuels are at risk of ending up with 'stranded assets', which have potentially systemic consequences for the financial system (Bolton et al. 2020).

Companies set targets to quantify what want to achieve and by when so that they can track their progress in moving from the current baseline to meet their goal in a certain area. Targets can also be communicated externally, e.g. to convince their investors and society that they are reducing their transition risk and taking climate action, companies are increasingly adopting climate targets (SBTi 2019a). Setting emission reduction targets is a corporate climate risk management response to reduce regulatory and market risks (Sakhel 2017). Due to a strong association found between carbon management practices and emission reduction targets, Dietz et al. (2018) suggest that 'investors and other stakeholders should focus on getting companies to set long-term corporate targets as part of a larger set of carbon management practices'. Doda et al. (2016) suggest that carbon management practices require a specific focus on impacts in order to result in emissions reductions. Specifically, there is increasing interest in the use and effectiveness of corporate emission reduction targets to mobilize private climate action, transform business models and secure continued economic growth (Bumpus et al. 2016).

Climate targets are used to identify where a company wants its greenhouse gas emissions to be at a certain time in the future. These targets are expressed in terms of absolute targets, e.g. a reduction by a certain year compared to a baseline year or a final emissions level, or in terms of intensity targets, e.g. an emissions amount relative to a production or other output (Dietz et al. 2018). Corporate climate targets, which are voluntary, can support national efforts to fulfil national and international climate goals governed by international climate agreements. However, in order to actually ensure that they do, these targets need to be 'science-based' meaning anchored into an overall budget limiting 'unsustainable performance' using a systems perspective recognizing planetary boundaries (Haffar and Searcy 2018).

Concretely, science-based targets (SBTs) have been proposed as a tool for corporates to set emission reduction targets that are in line with a scientifically determined emission budget allowable under a 2°C or 1.5°C warming scenario (Walenta 2020). How SBTs are set depends on the methods and principles used to allocate the overall emissions budget to companies (Bjørn et al. 2017; Haffar and Searcy 2018; Krabbe et al. 2015). The linear emission reduction – where all companies reduce their absolute emissions at the same rate approach, and the sector-based allocation approach – where all companies in a given sector set emission targets that consider sectoral differences and sector-specific and abatement potentials are the two most established science-based approaches used

by corporations to set climate targets (Faria and Labutong 2019). Both are accepted by the Science Based Targets initiative (SBTi) which is behind the mainstreaming of SBTs in corporate transition risk management (Walenta 2020).

Although target setting and its effect on performance is understudied (Ioannou, Li, and Serafeim 2016), there is evidence that the ambition level of emission reduction targets positively influences a company's carbon performance (Ioannou, Li, and Serafeim 2016). Dahlmann, Branicki, and Brammer (2019) further note the positive impacts of a longer target time frame on emissions reductions. Haffar and Searcy (2018) found that disclosure resulted in performance improvement only when combined with science-based targets.

2.2. Green bonds

Climate targets, once set, usually require externally financing. Investments in climate actions by corporations stood at 172 billion USD in 2018 – with 92 USD billion coming from debt finance (CPI 2019). This compares to 2,54 trillion USD in corporate bonds that have been issued in 2019 alone (Dealogic DCM Research 2020). The size of the corporate bond market – and the estimated 6,9 trillion USD needed up till 2030 to achieve the Sustainable Development Goals and keep with the Paris Climate Agreement – has contributed to the strong focus on the potential of green bonds to fund corporate transition to carbon-neutral economy (OECD 2017).

Green bonds can be issued by private or public issuers to fund investments that deliver environmental benefits. Like regular bonds, green bonds are fixed income instrument that represent a loan made by an investor to a borrower. Issuers repay the capital (principle) and accrued interest (coupon) to the investors over an agreed period. Unlike regular bonds, however, most green bonds do not finance the general working capital of the issuer. Instead, issuers of green bonds commit to using the proceeds of the green bond to exclusively finance or re-finance, in part or in full, green projects, assets, or other business activities (OECD 2016).

Outside of China and India, the rapid growth of green bonds has been driven by non-state actors and voluntary guidelines and is an example of a market-based approach to sustainable finance (Maltais and Nykvist 2020). In 2014, the International Capital Market Association (ICMA), a global association of private and public finance institutions, issued its Green Bond Principles (GBP) that consist of four core components: the use of proceeds, the process of project evaluation and selection, the management of proceeds and reporting. These components can also be found in the guidelines of the Climate Bonds Initiative (CBI) and Green Bond Standard (GBS) proposed by the Technical Expert Group on Sustainable Finance (TEG) of the European Commission (TEG 2019). Before issuing a green bond, a company develops a so-called green bond framework (GBF) that defines eligibility criteria, how eligible projects are selected, how outstanding proceeds are managed and how it will report on the use of proceeds and the impact of green investments.

In addition to the restrictions on the use of funds, green bonds also differ from conventional bonds in terms of their costs for issuers and investors. For issuers, certifying that their bonds adhere to a given set of guidelines, keeping proceeds in separate accounts, establishing the required internal processes for selecting eligible projects,

and regular reporting on the use and impact of proceeds makes issuing a green bond more expensive than conventional bonds (Sartzetakis 2020). Additional cost ranges between 0.3 and 0.6 basis points for a USD 500 million issuance (Hachenberg and Schierneck 2018) and are particularly challenging for smaller issuers (Forsbacka and Vulturius 2019).

There is evidence that investors pay a negative price premium for green bonds meaning that investors are willing to accept a lower yield for a green bond relative to a conventional bond. This premium is to the benefit of issuers and mitigates financial costs associated with issuing. Research has estimated the average premium to range between two (Zerbib 2019) and eighteen basis points (Gianfrate and Peri 2019). It should be noted that estimating this premium is difficult because it requires comparing green bonds with conventional bonds of the same issuer, with the same rating, seniority, currency and bond type and with similar issue sizes and maturities (Kapraun and Scheins 2019). Investors willingness to accept weaker returns from green bonds can be explained by financial motives, including expected lower risk and better financial performance due, for example, to increased transparency (Sartzetakis 2020) and non-financial motives, specifically pro-environmental preferences (Maltais and Nykvist 2020; Zerbib 2019), or restrictions of investment portfolios (Shishlov, Morel, and Cochran 2016).

Importantly, the literature suggests that investors reward corporate issuers that actively reduce information asymmetries and the risk of greenwashing (Sartzetakis 2020). The GBP recommends and the CBI requires issuers to have their GBFs – or similar policies – externally reviewed to ensure that issuers meet their guidelines about the use, selection, management, and reporting of green bonds. Supporting earlier findings by Baker et al. (2018), Fatica, Panzica, and Rancan (2019) looked at the primary bond market worldwide and found that certified green bonds benefit from larger premia compared to self-labelled green bonds. Similarly, Bachelet, Becchetti, and Manfredonia (2019) find that green bonds of private issuers have a higher borrowing costs compared to non-green bonds unless they have third-party verification.

2.3. Linking corporate climate targets and green bonds reporting

As stated before, green bonds are a voluntary market. Typically in voluntary markets, increased transparency through regular disclosure of environmental performance reduces information asymmetry, reduces the cost of capital and thus influences capital markets (de Villiers and van Staden 2011). Investors also perceive transparency to be linked with risk management (Matisoff 2013). And although theoretically, this should apply to green bonds (Shishlov, Morel, and Cochran 2016), Maltais and Nykvist (2020) findings suggests that green bonds are not used by investors to actively manage their transition risk or diversify at the portfolio level, but instead to achieve their sustainability commitments without increasing their risk. Perhaps for this reason, along with the fact that the green bond market is largely made up of corporations at the forefront of environmental activities, green bond impact reporting has so far been given little attention by investors (Maltais and Nykvist 2020) or the academic literature (Sartzetakis 2020).

However, reporting is necessary to assess how green bonds are linked to issuers' climate targets as one of the main functions of the green bond market is to finance

corporates who are transitioning out of fossil fuels (Glomsrød and Wei 2018). Indeed, the literature even suggests that corporate environmental disclosure is associated with carbon performance (Velte, Stawinoga, and Lueg 2020). Although the internal processes connecting the two and the causal links have been largely unexplored (Qian and Schaltegger 2017; Velte, Stawinoga, and Lueg 2020) previous research suggests that reporting alongside increased scrutiny is a crucial part of translating corporate climate targets into environmental performance Weil et al. (2006).

How issuers report the use and impact of green bonds also matters for reducing information asymmetries and the risk of greenwashing. Reporting allows investors, regulators, and other stakeholders of the financial sector to assess whether proceeds have been allocated to eligible green projects and whether these projects have a positive environmental impact (Maltais and Nykvist 2020). Use of proceeds and impact reporting is recommended by the GBP and required by the CBI and the proposed EU GBS. However, only two-thirds of issuers included in the CBI database prior to November 2019 provide post-issuance use-of-proceeds reporting and only half provide impact reporting (CBI 2019).

The same report also found that there are large variations in the granularity of reporting in terms of project – versus portfolio-level reporting and bond – versus programme-level reporting, and large differences in the reliability and robustness of reporting in terms of impact indicators and third-party verification (ibid). In their review of Nordic green bond issuers, Forsbacka and Vulturius (2019) also found large variation in post-issuance financial and impact reporting. They conclude that harmonized reporting standards would help build trust and legitimacy of the market, demonstrate accountability of issuers and investors, and enable benchmarking of market stakeholders. To address these issues, reporting guidelines have been issued by the GBP and the CBI and are included in the GBS. A detailed comparison of reporting guidelines of the GBP, the CBI and the GBS can be found in Appendix 1.

Widespread and consistent green bond reporting is also a necessary condition for collective climate action. According to the polycentric approach for coping with climate change proposed by Ostrom (2009), communication enables collective learning and cooperation. Specifically, communication builds trust between stakeholders, supports the emergency of social norms, and is used strategically to form agreements, make promises, and commit to cooperate (Shankar and Pavitt 2002). Applied to the context of corporate action on climate change, reporting as a form of formalized communication fulfils two functions. First, it enhances trust because it signals to the public, investors and other stakeholders that companies live up to their sustainability demands (Crane and Glozer 2016). Second, it is part of a process that establishes new norms and procedures, and thus helps the private sector in crafting coherent and robust strategies to deal with sustainability and climate change (Okereke, Wittneben, and Bowen 2012). In fact, Shishlov, Morel, and Cochran (2016) claim that green bonds issuance process develops new capacities in issuers due to the development of internal connections between the sustainability department and other departments, such as the financial department, which traditionally are not involved in environmental, social, and governance issues.

Similarly, Maltais and Nykvist (2020) argue that green bond investors and issuers will adopt similar policies and procedures because they are faced with similar demands for climate action. Their argument is based on a theoretical framework developed by Fernando and Lawrence (2014) that combines institutional, legitimacy and stakeholder

theory to explain corporate engagement with sustainability. This framework suggests that green bond issuers and investors will adopt similar green bond policies and reporting procedures because they want to ensure the legitimacy of their business in the face of societal pressure for climate action, to demonstrate accountability to regulators, other relevant stakeholders, and each other, and to conform to the professional expectations and norms that have been adopted by their competitors that face the same level of pressure to engage with sustainability.

In summary, this section has presented a conceptual framework connecting green bonds to corporate climate targets in the context of the polycentric architecture of climate governance and climate risk management. The framework suggests that if green bonds play an important role for companies to demonstrate their commitment to global emission reduction efforts and their ability to manage transition risk then green bond frameworks and impact reporting should be linked to organizational level climate targets. Drawing from institutional, legitimacy and stakeholder theory, the framework also suggests that issuers report on the impact of their green bonds in a transparent and comparable way.

3. Methods

The study looks at the twenty largest European corporate green bonds issuers in terms of issuance through 2018. The issuance amounts per issuer ranges from 750 to 7694 EUR million and cover 1–38 issuances per issuer. The issuer countries include Great Britain, Germany, Spain, Denmark, Italy, Sweden, France, and the Netherlands. The breakdown per sector is as follows: energy (11), industrial services (1), transport (1), waste (1), water and wastewater (2), manufacturing (wind turbines) (2) and real estate (2) (see [Table 3](#)). The energy category includes both pure-play renewable companies (2) as well as mixed source energy companies (9). As leaders in green bond issuance, it seems likely that they would be leaders in disclosure and thus any issues identified in this small set of companies might indicate an even larger issue with companies not on the front lines of green debt finance. The issuance dates and amounts were determined using the Environmental Finance Bond Database.¹

The study was carried out via desk review of publicly available corporate documents, including websites published through 2020. Corporate websites, policy documents (strategy, environmental policy, sustainable policy, CSR policy), annual reporting documents (sustainability, CSR, integrated reporting) were reviewed for references to green bonds. Companies' climate targets, scenarios and historic emissions were extracted from using the corporate CDP Climate Change 2019 reporting (CDP 2020), and the SBTi's database (SBTi 2020) (as of April 31, 2020). Green bond related documents (green bond frameworks, investor letters or presentations) were reviewed for references to climate targets and information on use of proceeds and impact, third-party verification of reporting, and methodologies for impact reporting.

4. Results

4.1. Green bond issuers' climate targets

As a topic, climate change was featured in the documents of most companies. Eighteen of the twenty companies mentioned climate issues, such as climate change or carbon

emissions reduction in their strategic documents or websites. However, fewer companies identified climate targets related to emissions reduction in their strategic documents, CDP reporting or the SBTi database.

Table 1 lists all issuers assessed in this study and whether they have publicly stated climate targets. The table shows that five companies had no climate targets whatsoever, however four of them consider themselves pure-play companies in the renewable energy (Wind MW), wind power manufacturing (Senvion), infrastructure (Tideway), or waste sectors (Paprec). Of the fourteen companies with targets, seven companies had short-term targets (through 2025), eleven companies had long-term targets (2025+), and five companies had both. Three companies (Iren, Nordex and TenneT) had no targets past 2025 and Enel and Naturgy were the only companies to have a 2050 target. Nine companies had intensity targets (short-term, long-term or both) and fourteen companies had absolute targets (short-term, long-term or both).

Six companies (Enel, Engie, Iberdrola, Orsted, SNCF Réseau, and Vasakronan) have verified science-based targets. One additional company (Naturgy) stated that its absolute reduction target is SBTi approved but is not found in the SBTi database. Another two companies (EDF and SSE) considered their targets to be science-based but had not gotten SBTi approval.

4.2. Green bond frameworks and issuers' climate targets

4.2.1. Verification of green bond frameworks

Of the fifteen issuers with publicly available GBFs, all of them had their GBF reviewed by an established second opinion provider to verify that their frameworks are in alignment with the GBP. In addition, Iren's GBF is aligned with the Climate Bonds Standard, while the SNCF's GBF is aligned with the CBI Low Carbon Transportation standard.

4.2.2. Reference to climate targets in green bond frameworks

Table 1 also shows if issuers restated their climate targets in their GBF. As not all companies had publicly available GBFs nor targets, we examined the eleven issuers who had either of them. Only Orsted had set both an intensity and absolute target both of which were restated in its GBF. Four additional companies with GBFs had set both types of targets, but only restated one of these in their GBF. All but two of the companies which had restated at least one of their climate targets in their GBFs were energy companies. Three companies had GBFs which did not restate any of their emissions reduction targets.

4.3. Green bond reporting practices

4.3.1. Use of proceeds and impact reporting by green bond issuers

Figure 1 shows that all but three issuers comply with the GBP, CBI and GBS by reporting on the allocation of green bond proceeds. Half of the issuers have received external verification of their use of proceeds reporting which is required by the CBI and the GBS. Most issuers report the use of proceeds on an aggregated level – e.g. by project category or portfolio – which is permitted under GBP and the GBS if confidentiality agreements, competitive considerations, or many underlying projects limit the amount of detail that can be

Table 1. Issuers' emissions reductions targets and green bond frameworks.

Issuer	Sector	Intensity target through 2025	Intensity target 2025+	GBF restates intensity targets	Absolute target through 2025	Absolute target through 2025	Absolute target through 2030	Absolute target for 2050	GBF restates absolute targets
ACS	Industrial services	None	None	n/a	None	None	None	None	n/a
EDF	Energy	None	60% by 2030 (Scope 1)	None	None	None	50% by 2030 (Scope 1 + 2)	None	None
Enel	Energy	None	70% by 2030** (Scope 1)	None	None	None	16% by 2030 (Scope 3)**	100% (Scope 1)	2050 target
Engie	Energy	20% by 2020 (Scope unknown)	52% by 2030** (Scope 1 + 2 + 3)	2020 target	None	None	34% by 2030 (Scope 3)**	None	None
Naturgy	Energy	33% by 2025 (Scope 1)	None	None	25% by 2025 (Scope 1 + 2)	None	32% by 2030 (Scope 1 + 2)	Carbon neutral (Scope 1 + 2 + 3)	2025 target 2050 target
Iberdrola	Energy	None	50% by 2030 (Scope 1 + 2)	2030 target	None	None	20% by 2030 (Scope 1 + 2 + 3)**	None	None, but mentions 100% by 2050
InNonegy SE	Energy	None	None	n/a	None	None	None	None	n/a
Iren	Energy	23% by 2023 (Scope 1 + 2)	None	None	3.5% by 2023 (Scope 1 + 2)	None	None	None	None
Nonerdex*	Manufacturing	None	None	n/a	100% by 2021 (Scope 1)	None	None	None	None
Orsted	Energy	98% by 2025 (Scope 1 + 2)**	50% by 2032 (Scope 3)	2025 target	None	None	50% by 2030 (Scope 1 + 2)**	None	2030 target
Paprec*	Waste	None	None	n/a	None	None	None	None	n/a
Senvion*	Manufacturing	None	None	n/a	None	None	None	None	n/a
SNCF Reseau	Transport	None	None	n/a	25% by 2025	None	26% by 2030 (Scope 1 + 2 + 3)**	None	2030 target
SSE	Energy	None	50% by 2030 (Scope 1)	2030 target	None	None	20% by 2030 (Scope 1 + 2)	None	None
TenneT	Energy	None	None	n/a	100% by 2025 (Scope unknown)	None	Yes	None	2025 target
Thames Water	Water & wastewater	None	None	n/a	34% by 2020 (Scope unknown)	None	100% by 2030 (Scope unknown)	None	2020 target
Tideway		None	None	n/a	None	None	n/a	None	n/a

(Continued)

Table 1. Continued.

Issuer	Sector	Intensity target through 2025	Intensity target 2025+	GBF restates intensity targets	Absolute target through 2025	Absolute target through 2030	Absolute target for 2050	GBF restates absolute targets
	Water & wastewater							
Unibail Rodamco Westfield*	Real estate	30% by 2020 (Scope 1+2+3)	70% by 2030 (Scope 1+2+3)	None	None	50% by 2030 (Scope 1+2+3)	None	None
Vasakronan	Real estate	None	None	n/a	None	50% by 2030 (Scope 1+2+3)	None	2030 target
Wind MW*	Energy	None	None	n/a	None	None	None	n/a

*None GBF publicly available.

**Science-based target according to SBTi.

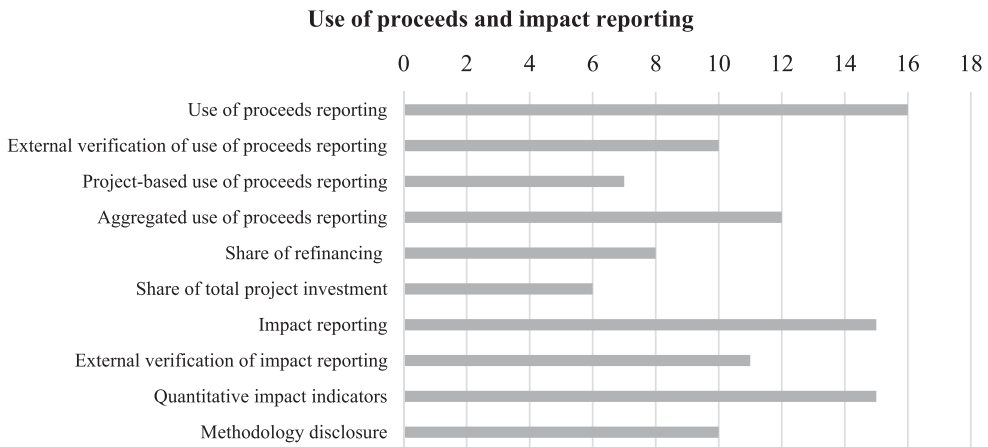


Figure 1. Green bond post-issuance reporting for 2018.

made available. Only seven of twenty issuers report on how they allocate green bond proceeds on a project-level and only six report the share of green bonds financing for individual projects. The data also shows that less than half of the issuers report on the share of green bond proceeds used for financing versus refinancing of green projects.

Impact reporting – which is required by the CBI and GBS but only recommended by the GBP – is done by fifteen of the twenty issuers. Quantitative impact indicators like installed renewable energy generation capacity, energy production or avoided CO₂ emissions per year are used by all impact reporting bond issuers. Eleven issuers follow the CBI's mandatory requirements and the GBP's and GBS's recommendations and have their impact report externally verified and ten issuers disclose the methodology how impact is measured – either directly in their impact report or their sustainability reports. Three issues have not made their impact methodology publicly available but provide independent assurance of it.

4.3.2. Allocation of green bonds proceeds

Table 2 presents a summary of the use of proceeds reporting of selected green bond issuers until 2018.² It shows the total amount each company has issued in green bonds, the amount of outstanding proceeds and how much of the total issuance has been reported as allocated. It also shows allocation of proceeds according to the GBPs eligible project categories. In total, issuers of green bonds included in our sample have reportedly allocated more than 35,27 billion EUR out of a total of 46,51 billion EUR in proceeds to climate and sustainable projects.

The table shows that except four issuers (Nordex, Paprec, Senvion and Wind MW), all companies have provided some form of use of proceeds reporting. It also shows that utility companies like Enel, Engie or SSE have allocated the majority or all of their green bond proceeds on renewable energy or energy efficiency. This seems to align with their climate targets to lower emissions from power generation. Also not surprisingly is that the two real estate companies in the sample report to have allocated all their green bond financing to green building projects and that SNCF has invested its green bonds in clean transportation.

Table 2. Reported allocation of green bond proceeds through 2018.

Issuer	Total issuance in million EUR	Outstanding proceeds	Allocated proceeds	Renewable energy	Energy efficiency	Pollution and prevention	Clean transport	Water management	Green buildings
ACS	750	115	635	594	18			22	
EDF	4496	208	4288	4288					
Enel	3500	781	2719	1812	665				
Engie	6250	2976	3274	2730	459		85		
Naturgy	864	418	446	446					
Iberdrola	7694	0	7694	7694					
Innogy SE	850	850	0						
Iren	1000	19	981	292	478	49	5	157	
Nordex	825	n/a	n/a						
Orsted	1250	146	1104	1104					
Paprec	1985	n/a	n/a						
Senwion	800	n/a	n/a						
SNCF	2650	466	2184				2184		
SSE	1250	0	1250	1250					
TenneT	6400	0	6400	6400					
Thames Water	803	0	804					804	
Tideway	942	433	509					509	
Unibail Rodamco Westfield	1415	0	1415						1415
Vasakronan	1816	0	1816						1816
Wind MW	975	n/a	n/a						
Total	46,515	6654	35,276	26,610	1620	49	2274	1491	3231

It is also notable that almost all reported investments are related to climate change mitigation. Only four companies reported that they had used green bonds to fund sustainable water and waste water management and only one issuer used proceeds to invest in pollution prevention and control. Investments into projects that support climate change adaptation, circular economy, biodiversity conservation or sustainable resource management and land use are missing for the list of green bond investments.

4.4. Green bond reporting and issuers' progress on climate targets

4.4.1. Alignment of reporting with issuers' climate targets

We also assessed if issuers' green bond impact reporting aligned with their climate targets. This assessment was carried out for the companies whose impact reporting documents were from the same year as the documentation of the targets or afterwards (strategic documents, CDP reporting, or SBTi database) or where the base year within the target is the same year or prior to the impact report year. This is because it only makes sense to see whether targets are reflected in the years after they are set.

For the twelve companies which had set at least one target and had made green bond impact reporting publicly available, the reporting documents were examined to identify whether there was evidence of links to the targets. This was done in two ways: documents were assessed (a) to see whether the targets were explicitly restated in the impact reporting (quantitative statement of what the target is) and (b) whether the indicators used to report impacts reflected the targets.

Of the twelve companies with targets, two companies restated their climate targets in their green bond reporting. Orsted restated both an intensity and absolute target in its green bond reporting, while SNFC Réseau restated its absolute target. The target which SNFC included in its green bond reporting was not a target reported in the CDP reporting (2030 target), but rather a shorter-term target it had published online. Additionally, there were three companies (EDF, Iren and Unibail Rodamco Westfield), which included both the targets and the green bond reporting within a larger integrated report but without references between them. Vasakronen does not refer to or state its SBTi targets in the green finance section of its integrated report, though it does refer to the SBTi targets numerous times elsewhere in the report.

Of these twelve companies, eight companies had an intensity target and an impact report. From these eight, only one company (Unibail Rodamco Westfield) reported indicators which were related to its emissions intensity target. All the twelve companies which had at least one target and impact reporting had an absolute emissions target. Of these, eleven reported on indicators which were related to its absolute emissions target. The most common absolute indicators were CO₂ avoided, potential CO₂ avoided, estimated avoided emissions, or avoided emissions or some variation.

4.4.2. Shortcomings in reporting practices

Our analysis of issuers' post-issuance reporting revealed several shortcomings in reporting practices which make it difficult or even impossible to accurately attribute emission reductions to green bond financing.

First, only eight companies disclose if proceeds have been used to refinance already existing projects with previously reported emission reductions. Second, there is a lack

of information about the share of green bond financing at the project level. Vasakronan for example reports only the total amount of green bond proceeds and a list of eligible projects, but not the costs of these projects or the amount of proceeds that have been allocated to finance these projects. Real-estate developer Unibail Rodamco Westfield reports the allocation of proceeds to individual projects and the climate impact of individual projects, but not how much of the total costs of individual projects was financed by green bonds.

Third, there is mismatching information about the use of proceeds and impact. TenneT and Thames Water for example report avoided emissions per bond and financed projects but do not report on the share of green bonds financing for individual projects. Even if issuers report the use of proceeds and impact at project level, imprecise reporting can still make it hard to quantify emission reductions to green bonds. Naturgy for example reports the percentage of green bond funding allocated to a specific project and the climate benefits of those projects but does not clarify if reported avoided emissions of the project have been calculated based on the share of green bond financing.

Fourth, lack of reporting of project or portfolio co-ownership can be another issue to attribute emission reduction to green bond financing. Issuers like Orsted use green bond proceeds to finance renewable energy projects that are partly owned by other investors. To address the issue, SSE reports the allocation of green bond proceeds to individual projects and the amount of carbon saved per project weighted by SSE's ownership of the project.

Fifth, there is variation in the methodologies that companies use to measure avoided greenhouse gas emissions. All issuers calculate avoided emissions from renewable energy based on the average national or regional emission factor, but only EDF considers life-cycle emissions. Also, only three issuers mention that they use the Greenhouse Gas (GHG) Protocol and the UNFCCC's methodology for measuring emission reduction from investments in renewable energy or energy efficiency. Furthermore, difficulties arise in sectors or types of projects where no established principles or methodologies for assessing and comparing green bond impact exist yet. SNFC for example has developed its own method to calculate the impact of investments in the renewal and development of rail lines.

Sixth, – and related to the issue of lack of harmonized methodology to measure the impact of green bond financing – is the absence of third-party verification of allocation and impact reporting of half of all issuers.

4.4.3. Green bond contribution to companies' climate targets

Despite the shortcomings listed above, it is possible to quantify the contribution of green bonds to climate targets of issuers who have set absolute emission reduction targets, that have sufficiently detailed use of proceeds reporting and that have comparable impact methodologies. We found this to be the case for issuers in the energy sector EDF, Enel, Naturgy, Iberdrola, Orsted and SSE. Other energy companies were not considered because they don't provide any impact reporting (Engie), don't disclose their impact methodology (Iren), had not set targets (Innogy SE and Wind MW) or had set a target without specifying the scope of emission reductions (TenneT).

For those six energy companies that had absolute targets and comparable impact methodologies, we calculated the total amount of targeted emission reductions based

Table 3. Reported contributions of green bonds to issuers' climate targets through 2018.

Issuer	2030 target	Baseline year	Emission* baseline year	Emissions avoided through 2018**	Share of 2030 target	2050 target	Percentage of 2050 target
EDF	50% by 2030 (Scope 1 + 2)	2015	60,520,487 (Scope 1 + 2)	4,470,000 (Scope 1 + 2)	15%	None	n/a
Enel	16% by 2030 (Scope 3)**	2017	71,000,000 (Scope 3)	3,781,468 (Scope 1)	n/a	100% (Scope 1)	4%
Naturgy	32% by 2030 (Scope 1 + 2)	2012	27,018,947 (Scope 1 + 2)	1,264,715 (Scope 1 + 2)	15%	Carbon neutral (Scope 1 + 2 + 3)	5%
Iberdrola	20% by 2030 (Scope 1 + 2 + 3)	2017	31,898,599 (Scope 1 + 2 + 3)	1,990,838 (Scope 1 + 2)	31%	None	n/a
Orsted	50% by 2030 (Scope 1 + 2)	2018	4,050,000 (Scope 1 + 2)	868,000 (Scope 1)	43%	None	n/a
SSE	20% by 2030 (Scope 1 + 2)	2017	9,514,386 (Scope 1 + 2)	251,202 (Scope 1 + 2)	13%	None	n/a
Total							

*In tonnes of CO₂ or CO_{2e} depending on issuer from CDP.

**Through projects in operation or development.

on the emission of the baseline year of issuers' 2030 targets. In the case of Enel and Naturgy, we also considered their targets of becoming carbon-neutral by 2050 and used the baseline year as their 2030 target. Data about issuers' emissions of their targets' baseline year was retrieved from CDP. Data about reported avoided emissions was collected from issuers' green bond impact reports.

Table 3 shows the reported contributions of green bonds to issuers' climate targets through 2018. It shows that that EDF has used green bonds to finance projects that avoid emissions equivalent to close to fifteen percent of its target to reduce its scope 1 and 2 emissions by 50 percent in 2030. In comparison, Orsted has funded projects that helped it achieve forty-three percent emission reduction target by 2030. In the case of Enel, lack of reporting on scope 3 emission reductions make it impossible to estimate the contribution of green bonds to its 2030 target. The table also shows that green bonds have made only a small contribution to issuers' 2050 targets.

5. Discussion

5.1. Issuing green bonds does not go hand in hand with setting ambitious climate targets

This study proceeded from the assumption that green bond issuers will also have adopted climate targets as part of their efforts to reduce their exposure to transition risk. The setting of publicly disclosed climate targets was mixed, with issuers ranging between having set intensity targets (9), absolute targets (14) and verified science-based targets (6). Four of the six issuers lacking climate emissions targets consider themselves green pure-play companies in various sectors who might consider their own operations as part of the carbon-neutral economy.

The timespan of the climate targets that green bond issuers have adopted also suggests that most issuers have not taken a long-term view on climate yet. Only half of the issuers (11) had set targets beyond 2025. These results are in line with Dietz et al. (2019) findings of 274 companies they consider to be the ‘world’s largest and highest-emitting public companies’ transitioning towards a low-carbon economy (Dietz et al. 2019, 4). Overall, climate targets of most green bond issuers are not indicative of an ambitious approach to lowering emissions and managing transition risks.

5.2. Disconnect between issuers’ climate targets, their green bond frameworks, and impact reporting

According to the conceptual framework developed in the first part this study, companies adopt climate targets to manage transition risk (SBTi 2019a) and utilize green bonds to achieve them (Glomsrød and Wei 2018; Shishlov, Morel, and Cochran 2016). If green bonds are indeed wielded as a strategic tool to meeting emission reduction goals, then the targets, along with relevant documents such as climate mitigation strategies, would be referred to in their GBFs and their post-issuance reporting.

Results show that only eight of the twenty issuers referenced a climate target in their GBFs. The others either had no targets, had no GBFs, or did not reference a target. Even some of the issuers who have gone through the process of setting science-based targets do not refer to them in their GBFs. Even fewer issuers draw a connection between their climate targets and impact reporting – only four issuers explicitly restate their targets in their impact reporting.

This suggests that there is a disconnect between issuers’ climate targets and green bond financing. Issuers do not use GBFs or their post-issuance reporting to externally demonstrate connections between their green debt funding and their management of transition risk, even though most of their green bond proceeds are allocated to projects that reduce emissions.

5.3. Green bond reporting lacks in transparency and comparability

Even though very few issuers explicitly link their climate targets to their green bond funding, impact reporting of most companies (12) contains information that reflect their emission reduction goals. The literature suggests that issuers disclose the climate benefits of their green bonds because investors reward them for reducing information asymmetry and greenwashing risk (Sartzetakis 2020).

Compared to the green bond market overall (CBI 2019), the issuers in our study reported more frequently on the use of proceeds – 85 percent compared to 68 percent and on the impact – 75 percent to 53 percent – of their investments. However, our results also show that there was less concern for ‘going that extra mile’ for fuller transparency. Only about half of the issuers in this study show a higher commitment to disclosure either through external verification of their impact reporting or disclosing methodologies.

Theoretical work on corporate sustainability (Fernando and Lawrence 2014) also suggests that green bond issuers report in a similar way because they face similar institutional, social and competitive pressures. However, our results are similar to those of earlier research (Forsbacka and Vulturius 2019) and show that there is great variation

in green bond reporting. While there is high compliance with the less stringent reporting guidelines of the GBP, none of the issuers report on the use and impact of green bonds in full accordance with more stringent guidelines of the CBI or the GBS. Less than half of issuers reported on a project-basis as recommended or required by major reporting guidelines or disclosed details such as the share of the refinancing, or the share of investments funded by green bonds.

Nevertheless, our analysis also showed that for the limited number of issuers that used transparent and comparable reporting, it was possible to calculate the contribution of their green bonds to their climate targets. Results suggest that six utilities used green bond proceeds to fund projects in operation or under development that helped them avoid emissions equivalent to fourteen to forty-two percent of their 2030 climate targets. Thus, there is limited evidence in support of the assumption that issuers use green bonds to achieve their emission reduction goals and manage their exposure to transition risk (Flaherty et al. 2017; Glomsrød and Wei 2018).

5.4. Reporting shortcomings increase risk of double counting and call into question green bonds additionalities

We find six key shortcomings in issuers' reporting practices that make it difficult to attribute reported avoided emissions to green bond financing: lack of reporting on refinancing; lack of project-level reporting on the share of green bonds of total investment, mismatching or imprecise use of proceeds and impact reporting, lack of consideration of project co-ownership, lack of a common impact methodology and external verification.

These limitations in reporting practices carry a high risk of double counting of avoided emissions. Specifically, lack of information about methodology, third-party verification and project co-ownership could mean that avoided emissions from a shared project are claimed by multiple owners. To avoid that two or more companies take ownership of the same emission reductions, the GHG Protocol requires that they consistently apply the same control or equity share approach when consolidating avoided emissions (WBCSD and WRI 2015). However, only three issuers state that they are reporting emissions reduced through green bond funded projects according to the protocol.

Reporting drawbacks also make it difficult to answer the question if green bonds offer any additionality compared to conventional debt finance. To what extent our results can answer this question depends on one's understanding of additionality. If additionality is understood in terms of financing of climate-related projects that would not happen otherwise, than the reporting of issuers assessed in this study suffer from the same shortcomings that have been found in earlier research (e.g. Tolliver, Keeley, and Managi 2019) which is that they don't provide explicit information regarding additional versus non-additional climate impacts.

However, many actors in the green bond market – including the EU's sustainable finance expert group – have made the case for a broader framing of the additionalities of green bonds (TEG 2019). For example, the CBI has argued that one of green bonds' key additionality is offering project developers refinancing possibilities which incentivize them to make an initial investment (Sonerud, Kidney, and Tripathy 2015). However, our study has shown that current reporting practices make it difficult to support this claim because most issuers surveyed in this study did not report on the share of refinancing and reporting doesn't reveal the issuers' original intentions when they made their initial investment.

5.5. The need for harmonized reporting policies to situate green bonds within planetary boundaries

Our findings also call into question the claim that green bonds represent a considerable innovation through their focus on green use of proceeds, tracking, impact reporting and external verification (TEG 2019). Instead, our results highlight that there is a great need for the green bond market to learn to speak in ‘a new common language’ (Michaelsen 2018, online) and adopt a harmonized reporting standard (Forsbacka and Vulturius 2019) if it wants to be a catalyst of systemic change in the financial system towards increased transparency and integration of environmental, social and governance research in investment processes.

The proposed EU GBS is arguably an important step in that direction. According to the proposal, issuers must report on the environmental impacts using metrics and thresholds that are developed in the EU Taxonomy of sustainable economic activities. Our results suggests that harmonized impact methodologies are key in ensuring that post-issuance reports of green bonds become more credible and comparable (TEG 2019). A common set of impact indicators, together with third-party verification of impact reporting, will also build trust in the market and reduce the risk of greenwashing.

Based on this study, we recommend that future political action on green bonds should force issuers to be explicit about how they want to use green bonds in their transition towards carbon neutrality. The literature points to the increasing need for public policy to drive corporate recognition and action on ecological limits (Bjørn et al. 2017). Specifically, this includes a policy framework for the accurate measurement and reporting of GHGs set-up at the European intergovernmental level to clearly signal to the private sector that stringent mandatory GHG emission controls and a global market-based instrument will to be adopted in the future (Hickmann 2017).

Thus, we suggest that policy should compel issuers of green bonds to set science-based emission reduction targets, clearly define in their GBFs how green bond will help them in achieving these targets and report on progress by using transparent and harmonized impact methodologies and metrics. This would reduce greenwashing risk, set a common benchmark for impact reporting, and help aligning the green bond market with the Paris Agreement. However, we acknowledge that science-based target setting, and high demands for impact reporting will likely increase the costs to issue green bonds. One way to tackle this problem is to simplify the requirements for smaller companies, like how it already done for environmental management system certifications.

6. Conclusions

This paper developed and tested a conceptual framework that links green bonds and climate targets in the context of polycentric climate governance and corporate climate risk management. The framework suggests that if green bonds are to play the role of demonstrating for the market that the issuer is committing to global climate change mitigation targets and managing transition risk then green bond frameworks and reporting should be linked to organizational level climate targets. The framework also suggests that issuers report on the impact of their green bonds in a transparent and comparable way.

In conclusion, our findings show that most issuers do not connect green bonds with their climate targets and fail to make both part of a comprehensive approach to managing

their transition to carbon neutrality. The lack of connection between climate targets, green bond frameworks, and the observed shortcomings in post-issuance reporting suggest that issuers' have so far faced little pressure from investors, regulators or society to reduce information asymmetry and the risk of greenwashing. Unless this changes, it is unlikely that green bonds will become a catalyst for sustainable finance and play a more important role in the polycentric climate governance system.

More research is needed to understand the internal corporate processes that take place in transition investment planning as well as how investors' behaviour might change as the green bond market becomes more diverse.

Notes

1. <https://www.bonddata.org/>.
2. In the case of SNCF use of proceeds reporting was only available through 2017.

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Appendix 1. Reporting requirements of green bond guidelines.

Table 1. Issuers' emissions reductions targets and green bond frameworks.

Reporting guidelines	Green Bond Principles (GBP)	Climate Bonds Initiative (CBI)	EU Green Bond Standard (EU GBS)
Use of proceeds reporting			
- Optionality	Recommended	Mandatory Like GBP	Mandatory Like GBP
- Frequency	Annually, until full allocation and updated in case of material developments.	Required	Required
- External verification	Unspecified		
- Scope	Project-based reporting List of the projects to which proceeds have been allocated and the amounts allocated	Project-based reporting Like the GBP + - The geographical distribution of projects & assets	Project-based reporting Like the GBP + - The geographical distribution of projects & assets
			- Whether projects are already near zero carbon or contribute to a transition
	<u>Aggregated reporting</u> Where confidentiality agreements, competitive considerations, or many underlying projects limit the amount of detail that can be made available	<u>Aggregated reporting</u> Not permitted	<u>Aggregated reporting</u> Like the GBP
	<u>Financing versus refinancing</u> Share of financing and re-financing, projects or portfolios that have been refinanced, and their look-back period	<u>Financing versus refinancing</u> Like the GBP	<u>Financing versus refinancing</u> Like the GBP
Impact reporting			
- Optionality	Recommended	Mandatory	Mandatory
- Frequency	Included in regular reporting	Include in the annual reporting	At least once during the lifetime of the bond after full allocation of the bond proceeds and thereafter, in case of material changes
			Recommended
- External verification	Recommended	Mandatory	Like the GBP +
- Scope	Disclosure of methodologies and assumptions Report based qualitative performance indicators and, where feasible, quantitative performance measures	Like the GBP + - Reporting with respect to the climate-related objectives of the bond	- Reporting with respect to the environmental objectives of the bond - Report based metrics and thresholds described in the GBF - If available, based on metrics and thresholds of the EU Taxonomy.