Transition Bond Frameworks: Goals, Issues, and Guiding Principles

Working Paper

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1 INTRODUCTION

While developed country signatories of the Paris Agreement plan to mobilize $100 billion per year (UNFCCC, 2015), the International Energy Agency (2014) estimates that $53 trillion in energy-related investments alone will be required by 2035 to achieve the 2C temperature target. Additionally, the annual abatement costs of achieving the current Nationally Determined Contributions (NDC) reduction targets submitted by member countries could require $97 to $191 billion by 2030 (Hof et al., 2017). A variety of finance mechanisms that leverage both public and private resources are thus crucial to channel global capital into the Paris Agreement and NDC initiatives.

In the context of reaching our climate targets – e.g., the 2C target set at the Paris COP – the role of transition finance is going to be key. Simply defined, transition finance is the flow of finance towards transitioning the business activities to stated climate targets (Caldecott, 2020). Transition bonds, then, are the listed (and liquid) instruments enabling flow of debt capital enabling climate transition. For example, they could allow not only funding of solar energy-based power plants but also funding of coal power plant retirements, that is they would enable not only more of so-called green assets (e.g., solar power plants) but also less of so-called brown assets (e.g., coal power plants).

Transition bonds are like other knowns bonds, such as green bonds or sustainability linked bonds. Green bonds, in their broadest definitions, are essentially transition bonds given that they are enabling climate transitions; however, green bonds are sometimes more narrowly focused on zero-carbon activities only, such as solar energy (CBI, 2020). Sustainability linked bonds, on the other hand, connect the returns on the bonds to certain sustainability related outcomes, which can again be related to climate transitions (ICMA, 2020c); however, not all investors or issuers may want to link the cost of capital to these outcomes (SFI, 2021). It can also be argued that both green and sustainability linked bonds are ultimately transition bonds in a broad sense, and the thinking from these past efforts can be included in a transition bonds framework.

Given the similarities with other existing bonds, a natural question is: Do we need a separate transition bond framework (Barclays, 2021; ICMA, 2020)? According to Credit Suisse and Climate Bonds Initiative, who partnered to publish such a framework (CBI, 2020), there is indeed a clear need for a broader transition bond framework, beyond (and potentially encompassing) the currently existing green bond frameworks, due to multiple reasons, as follows.1 One, investors are asking for more diversity in the uses of proceeds and participation from more issuers. Two, many high carbon emitters are looking for opportunities to invest in transitions and are frustrated by the lack of opportunities. Three, regulators are asking for capital markets to play an active role in financing corporate transitions.

This is not to say that there have not been any efforts on defining transition bonds. In fact, there have already been many proposed frameworks on transition bonds, including from academia and think tanks (Caldecott, 2020; CBI, 2020). This is not to say that there is not opposition to yet another (i.e., transition) bond framework, summarized as follows. One, transition is already baked into the green bond market, as formulated in Cicero (2018), where not Dark Green represents transitioning. Two, green bonds should be for everyone. Three, in the absence of clear and well-agreed upon definitions for what constitutes a relevant transition, the risk of Greenwashing goes up. A rebuttal to this opposition can then be summarized as follows. To begin with, green bonds, typically taken as zero-carbon, are not suitable for everyone. Further, Cicero Shades of Green does not connect to transition pathways. Therefore, our framework (Section 4) enables further movement on climate transition.

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1 See https://www.environmental-finance.com/content/analysis/head-to-head-debate-transition-bonds.html. This is not to say that there is not opposition to yet another (i.e., transition) bond framework, summarized as follows. One, transition is already baked into the green bond market, as formulated in Cicero (2018), where not Dark Green represents transitioning. Two, green bonds should be for everyone. Three, in the absence of clear and well-agreed upon definitions for what constitutes a relevant transition, the risk of Greenwashing goes up. A rebuttal to this opposition can then be summarized as follows. To begin with, green bonds, typically taken as zero-carbon, are not suitable for everyone. Further, Cicero Shades of Green does not connect to transition pathways. Therefore, our framework (Section 4) enables further movement on climate transition.
2020; Donovan et al, 2020) as well as the industry (AXA, 2020; Cadent, 2019; SNAM, 2020; SA, 2020). While these are all trying to define what transition finance means, and what activities should be allowed under the transition bonds framework, they suffer from various issues – from being too broad to being too narrow, or potentially allowing for the frameworks to be gamed. We provide some more details on these frameworks in Section 3.2, before we provide the contours of our own thinking in Section 4.

In this discussion paper on transition bonds, the focus is not on developing a comprehensive framework. A lot of well-funded organizations and consortia are already working on such frameworks. The idea here is to highlight some of the key issues facing such frameworks and suggest potential solutions, with the hope that our work is complementary to other ongoing activities, including on green bonds and sustainability linked bonds. This discussion paper also includes the feedback received in a workshop (SFI, 2021).

In summary, the goal of this discussion paper is to take a step back, to (a) first explore what should the goals of a transition bond framework be (Section 2), while (b) learning from similar experiences (e.g., green bonds) so far (Section 3), and then to (c) propose certain elements of a framework that is rooted in analytical rigor while being practical enough to be used widely in the industry (Section 4). In this process, it attempts to answer the following key questions in Section 4:

- How can issuers signal *ex-ante* alignment with climate targets and pathways (Sections 4.2 and 4.3)?
- How can stakeholders verify *ex-post* alignment with climate targets and pathways (Sections 4.4 and 4.6)?

The rest of the paper is organized as follows. Section 2 provides a high-level discussion of what the principles for a transition bond framework be. Section 3 provides a summary of experiences with related activities, such as green bonds, transition bond frameworks, and transition pathway protocols. Section 4 then discussed contours of transition bond frameworks, including the framework itself, the need for offsets and regulation, and some case studies. Section 5 then concludes.

## 2 PRINCIPLES FOR CLASSIFICATION

In this section, we explore the following questions on what the principles for transition bond classification should be: What should be the goals? What are potential choices to be made? What could be potential issues to be addressed? Etc.

A transition bond framework needs to align with appropriate transitions. It should, therefore, start with climate goals. Currently, the outcome is clear – a well-defined climate goal, such as the 2°C Paris COP target (IPCC, 2015). Second, any framework needs to be able to align with transition pathways (e.g., a linear path to net-zero by 2050); and third, it needs to specify business level activities (e.g., solar power plants) that enable getting to this climate target. The first and second – i.e., climate goals and transition pathways – would need to be specified at the firm level (Ehlers et al, 2020). This outcome can further be tracked via intermediate variables, such as the capital flow towards approved activities and pathways.
However, a transition bond framework also needs to allow for flexibility in getting to climate goals, by recognizing
the need for various choices. For example, the IPCC identifies multiple pathways to get to the 1.5C target (IPCC,
2019), and different pathways may have different roles for natural gas (RMI, 2020a). These include a necessary
tension between stringency and flexibility of choosing pathways and associated activities. Stricter choices would
enable reaching climate targets in a more certain manner, however they may ignore industry constraints on making
the required transition (CBI, 2020). On the other hand, less stringent choices may allow flexibility in getting to
climate goals; however, they also open possibility of greenwashing (CBI, 2020).

Further, given the confusion around definitions, this also brings up the issue of whether this framework should be
regulation driven or an organically developed protocol within the industry (Brest, 2020). Finally, a transition bond
framework would need to watch for so-called gaming and greenwashing, which essentially means that the stated
climate goals are not met, or the stated transition pathways are not adhered to (EF, 2020).

This greenwashing can occur in many ways, including the following: one, transition bonds issuances for non-
approved activities; two, use of proceeds for non-approved activities; and three, use of proceeds being non-
additional towards approved activities. It turns out that all these potential ways of greenwashing may create
confusion around the credibility of transition bonds and would need to be addressed appropriately. Examples of
each are listed below:

- Transition bonds issuances for non-approved activities: Bond issuances for improving the
efficiency of coal power plants, or of gas refineries. An example of the latter is the Repsol green
bond in 2017, which came under a lot of criticism given that neither the use of proceeds,
nor the corporate strategy were at the time aligned with the Paris Agreement (CBI, 2020).
- Use of proceeds for non-approved activities: Bond issuance towards retrofitting gas pipelines for
hydrogen but use of proceeds towards reducing methane leakage from higher natural
gas extraction. A potential example of this could be the SNAM Climate Action Bond in 2019, given
its inclusion of methane leakage target, which increased from 25% to 40% over time (CBI, 2020).
- Use of proceeds being non-additional towards approved activities: Bond issuances not resulting
in improvement in carbon intensity at the firm level, indicating lack of additionality
(Ehlers et al, 2020).

3 Learnings from Experience

In this section, we explore the following questions with the aim to be learning from the past: Is there enough data
and is it reliable? Were goals met, issues faced; why, why not? What are implications for recognition, standards,
regulation, and implementation? Etc. We end up looking at three specific aspects, as follows: green bonds (Section
3.1), transition bond frameworks (Section 3.2), and transition pathway frameworks (Section 3.3).

2 For example, for the 1.5C target, one pathway estimates an increase of natural gas consumption by 85% by 2050, whereas another estimates
an 88% reduction by the same time. This has led to many controversial transition bonds, including from the Bank of China (EF, 2020), where the
key issue appears to be lack of clear definition of transition pathways to well-defined climate targets.
3 Additionality of an intervention (e.g., transition bond) essentially means that the resulting activities are driving change beyond the business-
as-usual operation. In the context of our work, the environmental additionality (i.e., the carbon emission reduction) is the key outcome to
watch for; however, intermediate variables may also be of value, such as financial additionality (i.e., increase in flow of capital or reduction in
cost of capital).
3.1 Green bonds

In recent years, green bonds (GBs) are gaining salience among the climate finance schemes at the core of this international mobilization of capital. The volume of GBs outstanding began at $230 million in 2010 and rose sharply from around $4.8 billion in 2013 to roughly $142 billion by 2017 (CBI, 2018), with the latter growth representing nearly 30-fold increase over four years. Annual GB issuances showed similar patterns, experiencing a nearly 120-fold increase from just over $1.2 billion in 2011 to just under $143 billion by 2017.

Given that they have been around for about a decade, most of the empirical work has been performed on green bonds (WB, 2019). However, even for green bonds, data availability remains an issue, especially on post-issuance allocation of proceeds (Tolliver et al, 2019), despite availability of Green Bond Principles for quite some time (ICMA, 2018; NPSI, 2020). For example, in 2017, less than 10% of the green bonds reported post-issuance allocation, and less than 7% reported impact metrics (Tolliver et al, 2019).

This is not to say that measurement and reporting guidelines do not exist. The voluntary Green Bond Principles (ICMA, 2018), around since 2013, have been reasonably comprehensive in specifying what is needed to capture quality data and to demonstrate additionality for green bonds, from the perspective of availability of capital. These have four components: project evaluation and selection, use of proceeds, management of proceeds, and reporting. These principles are then suitably supported in terms of impact reporting by the Harmonized Framework for Impact Reporting for green bonds (ICMA, 2020b). However, this is not to say that they cover all the needed aspects: for example, there appears to be no provision for establishing an impact on the cost of capital.

Furthermore, both frameworks (ICMA, 2018; ICMA, 2020b) are not only voluntary but also quite flexible (e.g., using terms such as “recommend” and “encourage”, without being prescriptive), which likely leads to divergence in impact reporting. This results in majority of green bond fund investors (i.e., 60%) still finding current green bond impact reporting to be inadequate, citing key areas for improvement as transparency and standardization (EF, 2020). In fact, based on a recent survey of green bonds funds (EF, 2020), these issues encompass data collection, data aggregation, and data presentation; with most of these activities remaining as manual, time consuming tasks. This indicates the need for standardization on not only major aspects such as metrics, benchmarks, and methodologies but also minor aspects such as timing and format (EF, 2020).

While the limited available data may still allow some focused and specialized investigations soon – e.g., in foreign direct investments in renewable energy, or even corporate investments in renewable energy – this prohibits any comprehensive and meaningful empirical analysis on the financial additionality of green bonds at the firm and in particular project level, whether in increased capital allocation or in reduced cost of capital (CPI, 2020). Thus, it is key that reliable data is collected not only at issuance but also for verification over time, with verification by trusted third parties.

4 Foreign direct investment (FDI) is the largest source of financing across all public and private sources (Buchner et al, 2011); and has the potential to deliver the greening effects of technology transfer (Gallagher and Zarsky, 2007). There is, therefore, a call for green FDI to enable these effects (Golub et al, 2011). Cross-national flow of GBs has been increasing so has green FDI. This highlights the need to investigate the following: 1) the relationships between GBs and green FDI, and especially 2) the role of GBs in stimulating FDI in renewable energy (RE), the sector receiving the largest share of GBs and the second largest share of the total FDI (Tolliver et al, 2019; Tolliver et al 2020a; Tolliver et al 2020b).
5 According to IRENA (2020), 50% of green bonds studied were for renewable energy, and 67% of these were by corporations.
Despite this lack of granular data, there have been multiple empirical investigations into the additionality of green bonds at the firm level, albeit with contradicting findings. For example, Flammer (2020) and Sebastiani (2019) show that green bond issuances improve performance on financial metrics (e.g., stock prices) and environmental indicators (e.g., carbon emissions). On the other hand, Ehlers et al (2020) shows that green bond issuances are not correlated with statistically significant improved environmental (i.e., Scope 1-3 emission intensity) at the firm level, and Economist (2020) finds that green bonds do not result in a reduced cost of capital. While it is not straightforward to reconcile these results, given differences in dataset and methodologies, this indicates a need for a deeper investigation in the future. In any case, the issues here may be two-fold: one, lack of reliable data, as discussed earlier; and two, lack of trustworthy M&V.

The second issue is related to the well-known issue of greenwashing. For example, Kendall (2019) finds that at least one-third of green bond issuances in the last three year did not meet three well known criteria, such as credible issuer ESG performance, alignment with the green bond framework, and measurable quantitative impact. In this context, Flammer (2020) and Bachelet (2019) show that issuer reputation and verifier credibility – i.e., lack of greenwashing – matters for improved firm performance, in particular financial ones, suggesting that perception of greenwashing may eventually hurt a firm’s performance.

### 3.2 Transition bond frameworks

We now examine existing transition bond frameworks. Currently, there are multiple transition bond frameworks, including from the industry as well as researchers. We briefly discuss them below, including their strengths and weaknesses from the perspective of the principles outlined in Section 2, which leads to identification of gaps in these frameworks, and indicates that further work is required.

In the former category, the following frameworks are well known – AXA (2020), Cadent (2019), SNAM (2020), and SA (2020). While these are praiseworthy, given that these companies took initiative in absence of existing industry standards, the danger of these initiatives is that these are likely to be company and industry specific, and be too flexible from the perspective of reaching climate targets. For example, the transition bonds issued by Repsol and Marfrig have already come under intense criticism (CBI, 2020), primarily because either the corporate strategy or the use of proceeds were not aligned with the Paris Accord in 2015.

In the latter category, three frameworks are well known – Caldecott (2020), CBI (2020), and Donovan et al (2020). Caldecott (2020), the first such framework, is quite broad and, therefore, likely to function more loose guidance.

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6 Flammer (2020) is based on performance of public companies’ green bond issuances between 2007 and 2018, whereas Bachelet (2019) is based on similar issuances between 2013-2017, and Ehlers (2020) is based on similar issuances between 2015-2018. Sebastiani (2019), on the other hand, is based on energy and utility companies’ green bond issuances between 2013-2018. All use the Bloomberg fixed-income database as well Climate Bonds Initiative green bond database.

7 A comparison between Flammer (2020) and Ehlers (2020) is instructive. Flammer (2020) uses the total carbon emissions from Thomson Reuters’ ASSET4 database, creates carbon intensities using total assets in the denominator, and utilizes a sophisticated (matched, difference-in-difference, event study based) statistical model, to show impact on an average firm’s carbon performance 1-2 years out. Ehlers (2020) uses the carbon emissions (Scopes 1-3) from S&P’s TruCost database, creates carbon intensities using revenues in the denominator (they argue that revenues are better suited given their high correlation with carbon emissions), and utilizes a simple (first order) statistical model, to show average (and median) impact on a firm’s carbon performance 1-3 years out.

8 AXA (2020) lists specific activities to be allowed under transition bonds, including in energy (cogeneration, carbon capture and storage, gas transport infrastructure, coal-to-gas switch, waste-to-energy), transportation (gas powered ships, alternate aviation fuels), and industry (energy efficiency improvements in cement, metal, glass). However, it is not clear if these are output of a well-defined framework, such as ours (Section 4).
Donovan et al (2020) is again quite broad, except that it discusses minimum rate of transitions on selected transition pathways, however without defining what these minimum rates should be. CBI (2020) is the most comprehensive so far, given coverage of principles, the framework itself, and representative issuances; however, even here the transition bond framework is derived as a derivative of the existing green bond framework, as opposed to being the overarching transition bond framework we are after.

Further, all these papers suffer from multiple issues, including the following: one, while the targets are defined, pathways and activities are not appropriately defined to signal ambitions; two, the discussion of tricky questions (e.g., stranded coal plants) is at a superficial level; and three, there are no clear linkages to sustainability linked bonds, to provide appropriate financial incentives for transition ambitions.

Finally, in the context of policymakers and regulators, EU (2020) provides first such guidance in terms of the EU Green Taxonomy. This guidance sets performance thresholds for economic activities which meet the following criteria: make a substantive contribution to one of the six environmental objectives (e.g., climate change mitigation, climate change adaptation, protection of water and marine resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems), do no significant harm to the other five, and meet minimum safeguards that are already established as standards (e.g. OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights). While EU (2020) is quite detailed in identifying approved economic activities, it may still be too prescriptive and not be flexible enough for industry (Harris, 2019).

### 3.3 Transition pathway frameworks

As we have discussed in Section 2, a transition bond framework would need to not only align with specific transition pathway to a climate target but also be specific about approved activities on these pathways. Currently there are multiple pathways-setting and measurement frameworks, including ETC (2020), SBTi (2020), TPI (2020), etc. We cover these three in this sub-section, given that they provide a reasonable overview of existing efforts. In Section 4.3, we then discuss what needs to be done in addition to these efforts, to develop a comprehensive transition bond framework.

TPI (2020) is the oldest of these and engages in both pathways-setting as well as measurement, in alignment with the IEA’s 2C scenarios, also known as 2DS (IEA, 2017). It uses the top-down sectoral decarbonization approach (SDA) to assign transition pathways to sectors and companies (Krabbe et al, 2015), and measures their performance against these transition pathways over time. However, it does not specify actual business level activities to get to these transition pathways. Further, given that focus on the IEA 2DS, it is not flexible enough in terms of pathways. Finally, from a carbon performance perspective, it appears to focus only on Scope 1 and 2 emissions; and,

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9 Donovan et al (2020) lists specific activities that should be allowed under transition bonds, including energy efficiency, gas pipelines for synthetic methane and blended hydrogen, land use changes including agricultural practices and biotic conservation, low-carbon food supply such as plant-based proteins, some information and communications technologies, and fossil fuel infrastructure decommissioning costs. However, it is not clear if these are output of a well-defined framework, such as ours (Section 4).

10 The top-down Sectoral Decarbonization Approach (SDA) allocates the worldwide 2°C carbon budget to different sectors and geographies. This method considers inherent differences among sectors, such as mitigation potential and how fast each sector can grow relative to economic and population growth.
therefore, likely to miss the deeper emission cuts driven by the more comprehensive Scope 3 emissions (Shrimali, 2021).

SBTi (2020) is the first pathways-setting framework that not only recognizes the role of flexibility in setting transition pathways but also the need for minimum rates of transition. It, therefore, prescribes minimum rates for transition for the 2C and 1.5C climate targets, at 4.2% and 2.5% per year, respectively. SBTi (2020) is likely to work together with measurement frameworks specifically designed for specific industry groups (e.g., CDP, 2020; PCAF, 2020; PRI, 2020), which includes all scopes of emissions. However, SBTi (2020) remains top-down, with little direction on actual business level activities to get to these transition pathways. Furthermore, SBTi (2020) still may not provide enough flexibility to industry.

ETC (2020), on the other hand, is a bottom-up approach, so it starts with approved activities to get to net-zero pathways consistent with the 1.5C target. It identifies the key role of business level activities such as renewable power, electrification of buildings and transportation, green hydrogen, and bioenergy with carbon capture and storage. However, ETC (2020) does not appear to be flexible enough to assign activities to different transition pathways even within 1.5C target, notwithstanding other climate targets. At the end of the day, we may need a combination of the approaches used by SBTi (2020) and ETC (2020), for pathways and business level activities, respectively. This is what we propose in Section 4, as follows.

4 Framework for Classification

In this section, we move towards a framework for transition bond classification, via exploring the following questions: What should goals be set? What should potential choices be made? What should be potential issues be addressed? Etc. We end up exploring sector-based approaches (Section 4.1), proposing a transition rating framework (Sections 4.2 and 4.3), discussing how to address the issue of additionality (Section 4.5), and exploring the role of regulation (Section 4.6). Many of these are in line with recommendations issued in ICMA (2020).

4.1 A sector-based approach may be necessary

The literature on transition bonds is expanding over time. While these frameworks are of different ambition (i.e., climate targets) and specificity (i.e., transition pathways and business activities), there seems to be consensus on sector-based approaches (TPI, 2020; RMI, 2020a). Given that each sector is unique and would require specialized approaches that rely on sector level experts, the focus on sector-based approaches makes sense (RMI, 2020a).

Thus, a sector level approach is our starting point where, given a global carbon budget, country and sector level targets can be derived using suitable approaches such as SDA (Krabbe et al, 2015) and GEVA (Randers, 2012). In this context, the power sector, given its early start, is likely to set the tone for the rest of the sectors (SFI, 2021).

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11 The rate of transition can be derived once the climate targets are set and the carbon budget is derived. This carbon budget (i.e., area of the carbon emissions over time) can then drive the transition pathway (i.e., the decreasing function enveloping the area defining the carbon budget). For example, for a net-zero (i.e., zero carbon emissions) target to 2050, a potential pathway could be a linear pathway starting from current emissions, and the slope of the pathway is the rate of transition.

12 GEVA stands for GHG Emissions per unit of Value Add.
4.2 A transition rating framework

Beyond agreeing on a sector-based approach, the biggest gap is the specificity of recommendations on grades of transition finance. While it is possible to be highly prescriptive while being focused on the 1.5/2C climate targets (e.g., TPI, 2020; ETC, 2020), this approach is likely to be inflexible to industry needs and constraints. On the other hand, providing too much flexibility may result in lack of tangible progress towards meeting climate targets.

In this context, a suitable approach may be to allow issuers to issue transition bonds with different transition ratings to indicate the underlying ambition. These ratings would then provide suitable information to stakeholders, such as investors, to make informed decisions, and help them drive the required progress towards our climate goals. These transition ratings, which would be separate from the credit ratings, would also appropriately bypass the debate around the need to incorporate the climate risk aspects into credit ratings (SP, 2020).

There may be multiple advantages of issuing a higher rated transition bond. One, a highly rated transition bond may attract more capital compared a lower rated bond, due to higher demand by investors with ambitious climate commitments, e.g., via the task force for financial disclosure or TCFD (TCFD, 2017). Two, a higher rated bond may also attract capital at a lower cost of capital, due to not only higher demand vs supply but also potential incorporation of these transition (i.e., climate) ratings into credit risk determination. In fact, even if the market is not explicitly incorporating the transition risk, the transition bond rating can be directly linked to lower cost of capital in a way like sustainability linked bonds (ICMA, 2020c), where the cost of capital would lower contingent on meeting stated targets.13

Thus, one way to address this issue may be to simply assign transition ratings, like existing credit ratings, such as the green rating framework suggested by Ehlers et al (2020). The basic idea in Ehlers et al (2020) is as follows. Business entities are assigned green ratings on a scale of 1-10 based on their firm-level carbon intensity. This green rating goes from very green (GGGGG or 10), to green (G or 6), to polluting (P or 5), to very polluting (PPPPP or 1). A business entity can then improve its green rating by improving its carbon intensity in a tangible manner over time.

However, while the rating system suggested by Ehlers et al (2020) allows firms to signal transitioning to lower carbon pathways over time and is necessary for incentivizing high carbon intensity firms (SFI, 2021), it does not allow for tracking progress towards the required climate targets, indicating the need for a more suitable rating system for our task. For example, in Ehlers et al (2020) framework, a high carbon intensity firm may not be able to raise a transition bond with a high rating, even if the underlying activity (e.g., solar energy) aligns with most ambitious climate goals.

This indicates the need for transition bond ratings to reflect the ambition of the climate goal as well as the commitment to a transition pathway (Flammer, 2020), in a way like the key performance indicators and sustainability performance targets proposed for sustainability linked bonds (ICMA, 2020c). For example, like credit ratings (Figure 1), we may use the letter rating (i.e., A/B/C) to denote the stringency of the climate target (i.e., 1.5-2/3/4 C), and the sub-letter rating (i.e., AAA/AA/A) to denote the ambition of the transition pathway (i.e., the climate

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13 While there is a lot of literature around incorporation of climate risk into financial risk, including on physical and transition risks (CFTC, 2020), this discussion gets muddied given the shorter timeframes for financial decision making (i.e., 1-3 years), as compared to timeframes where the transition (i.e., 10-30 years) and physical risks (i.e., 30-50 years) would materially (and significantly) play out (Nicholson and Smyth, 2020).

14 For example, see the sustainability linked bond from UltraTech, the largest cement manufacturer in India (IFR, 2021). The cost of these bonds would be 75bps lower if they meet the 2017-2030 target of 22% reduction in emissions.
ambition reached by 2030/2040/2050). This would signal appropriate ambition to investors, while avoiding the confusion around how the climate ambition impacts actual credit ratings. We discuss this further in Section 4.3, in the context of IPCC defined pathways.

**Figure 1:** Example transition pathways, starting from current emission levels and going to zero, for A-rated transition bonds. All pathways below the black line would qualify for a AAA rating, whereas all pathways between the green and black lines would qualify for an AA rating, and so on.

Further, this transition pathway would ideally need to be defined in terms of the Scope 3 emissions of the firm, to ensure that supply chain emissions are accounted for, and potential for leakage to other parts of the supply chain is minimized (Song et al, 2020); however, recognizing the current difficulties around measuring Scope 3 emissions reliably, at the minimum this pathway would need to be defined in terms of the Scope 1 emissions, and include Scope 2 emissions.

In this context, another way to assign the letter rating could be based on the technical feasibility of the pathways. For example, for some sectors (e.g., long-haul passenger aviation), pathways to the most ambitious (i.e., 1.5-2°C) targets may not exist today (CBI, 2020). In this case, a suitable assignment of letter grades may be best on how well the sector is doing in terms of getting to technically feasible climate targets, and these letter grades (i.e., A/B/C) could be assigned to first best (FB), second-best (SB), and third best (TB) pathways, respectively. Another potential way may involve using the implied temperature rating (ITR), currently explored as a suitable alternative to emissions (TCFD, 2020b). In any case, a lot more work is needed to define not only these pathways but also corresponding business activities on these pathways.

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15 Leakage is essentially moving the Scope 1 carbon emissions of a firm to another actor in the supply chain, whether upstream or downstream (Kondo et al, 2019).

16 It is not clear, however, whether ITR provide a better forward-looking metric compared to emissions, because they themselves rely on emission forecasts. A comprehensive critique to ITR is in TPI (2020c).
This is not to say that this proposed framework is inconsistent with what Ehlers et al (2020) suggests. In fact, Ehlers et al (2020) framework is highly suitable for tracking a business entity’s carbon performance over time, and it can be complementary to our proposed framework. For example, it is possible for a high carbon intensity firm in Ehlers et al (2020) framework to raise the highest rated transition bond according to our framework; however, this firm would then also need to show a transition to a lower carbon intensity firm as coded in Ehlers et al (2020).

In fact, one desirable element of Ehlers et al (2020) framework is the focus on the firm. In absence of a focus on the firm level commitments and progress, given capital is fungible, the potential for greenwashing (especially lack of additionality) goes up. So, our proposed framework would include a transition rating for the firm as well, given commitment to a specific climate target and a transition pathway, like what we have proposed above. Now, independent of how a transition bond is raised, whether at firm level or at project level, the rating of the transition bond would need to be consistent with the firm-level commitment. Of course, this rating would change if the firm-level commitment changes over time, including potential upgrades or even downgrades, sending appropriate market signals to stakeholders.17

4.3 Pathways and activities need to be appropriately defined

In Section 3.3, we started discussing existing initiatives on defining transition pathways and corresponding activities that could be funded by transition bonds. As we mentioned, these initiatives are a welcome start; however, these initiatives need to be further expanded to cover the range of transition pathways and activities covered by a broad transition bond framework that includes various climate targets.

In terms of pathways and activities, a good place to start is the IPCC reports, such as ones focused on the 1.5C target (IPCC, 2019). Chapter 2 (and corresponding supplementary material) of this report provides detailed guidance on transition pathways as well as mitigation activities (IPCC, 2019b), where the pathways are outputs of integrated assessment models (IAMs), and the sector-specific mitigation options (i.e., activities) range from renewable energy to carbon dioxide removal (i.e., CDR).18

It is also instructive to connect IPCC (2019b) to the proposed transition bond rating system discussed in Section 4.2, and connect the speed of transition to the degrees of overshoot. For the 1.5C target, IPCC (2019b) specifies 90 pathways with various degrees of overshoot, resulting in three classes of pathways; and, for the 2C target, it specifies 132 pathways with two classes. Here, the “Below-1.5C” pathway class could map to a AAA transition bond rating; whereas the “1.5C-low-OS” and “1.5-high-OS” classes would map to AA and A ratings, respectively.19

In this context, an open question is around how flexible we would like this transition bond framework to be. For example, IPCC (2019) covers only the 1.5/2C target, which reflects the A letter rating. If we would like broader

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17 E.g., see the recent threat by Amundi on dumping State Bank of India’s green bonds, given the latter’s recent decision to invest in a coal mine. In presence of our framework, given a commitment by the State Bank of India, this could result in a potential downgrade in the transition rating.

18 Among mitigation options, within the range specified by renewable energy and carbon dioxide removal, we see electrification, energy efficiency, afforestation, bioenergy with carbon capture and storage (BECCS), and green hydrogen (IPCC, 2019b). IPCC (2019b) also specifies these activities by sector, e.g., electricity, buildings, industry, transportation, and agriculture.

19 Below-1.5C are pathways limiting peak warming to below 1.5C during the entire 21st century with 50-66% likelihood; 1.5C-low-OS are pathways limiting median warming to below 1.5C in 2100 and with a 50-67% probability of temporarily overshooting that level earlier; 1.5C-high-OS are pathways limiting median warming to below 1.5C in 2100 and with greater than 67% probability of temporarily overshooting that level earlier (IPCC, 2019b). Overshoots, while allowing for more flexibility, would require carbon dioxide removal technologies.
coverage, encompassing the 3C or 4C targets, which reflect the B and C letter ratings, we would need to dig into corresponding literature like IPCC (2019), in a manner like above, to derive sub-letter ratings.

4.4 Offsets: What to do with them and how?

We now examine the controversial topic of offsets and their role in getting to stated climate targets and transition pathways (CBI, 2020). Offsets have been around since the early days of climate negotiations, including the Clean Development Mechanism (CDM) and various voluntary markets (McKinsey, 2020). The basic idea, and the promise, is straightforward: Since we would like emission reductions at the least cost, it makes sense to allow for emission reductions in various locations around the world, in particular ones that are not in the jurisdictions focused on emission reductions (Millock, 2013). While these offset opportunities can be anywhere in the world, they typically tend to be in developing countries.

However, there have been various issues with offsets, from the perspectives of effectiveness as well as efficiency (Wara and Victor, 2008). Some of the examples involve Green Trees (Bloomberg, 2020), which provides questionable forest carbon offsets – e.g., from existing forests – to corporations; as well as the World Bank (Feldman, 2010), which got slammed for using questionable HFC offsets, and paying more than $1 billion when the actual costs were less than $100 million. This is because not only these ex-ante claims are factually unobservable but also the focus on low-cost emission reduction renders such endeavors intrinsically low quality (Cullenward, 2020). Furthermore, these contracts suffer from multiple issues, including asymmetric information, perverse incentives, and inadequate institutions, making this a hard principal-agent problem (van Kooten, 2017). This also raises questions around real additionality and, subsequently, greenwashing. Due to this, CBI (2020) posits that offsets should not be allowed in transition bonds.

On the other hand, there is an increasing recognition that offsets may eventually be needed to get to our ambitious climate targets (Argitis, 2020), leading to the establishment of a UN task force under Mark Carney, former Governor of the Bank of England. In fact, according to Mr. Carney, this market is likely to be $100 billion a year (FT, 2020). This taskforce has recently released a report (TSVCM, 2021), outlining recommendations for creating a functioning and deep offset market. However, while comprehensive in many aspects, it leaves out key important questions, such as the following: How would the quality of offsets be determined? What would be the connection of the offset markets to credible carbon markets, e.g., via using multipliers of quality or price? How could these markets be regulated? Etc.

Given this potentially crucial role for offsets, the focus may need to be on what are the real issues for using offsets, and can these issues be resolved in a credible manner? According to recent research (Cullenward, 2020), offsets would work only if they were (a) real, (b) verifiable, and (c) verified, i.e., if they are essentially of high quality. This has proven extremely hard so far, with dearth of success stories. Thus, at the end of the day, the solution on offsets may lie in ensuring quality, which is going to be hard; and using independent and trusted verifiers to do so. At the very least, it would require a trusted international registry that certifies high-quality offsets (Hermwille and Kreibich, 2016). Finally, there appears to be consensus that offsets, even if used, should not justify inaction, and follow only after all feasible activities for appropriate transitions have been utilized (SFI, 2021).

20 See https://www.iif.com/tsvcm
4.5 Data and additionality: Ensuring ex-post effectiveness

On data, the trick is to ensure that appropriate data is collected, and with high degree of transparency as well as accuracy (EF, 2020), so that the ex-ante claims on transition pathways can be verified. This would require three steps, the first two being ex-ante and the third being ex-post, as follows. First, setting climate targets, pathways corresponding to these targets, and activities along these pathways; with focus on demonstrating additionality compared to business-as-usual pathways. Second, assigning transition bond issuances to the stated targets, pathways, and activities; and creating special purpose vehicles that would contain the proceeds of these bonds. Third, demonstrating that the proceeds in these special purpose vehicles are indeed allocated to promised activities, pathways, and targets.

These three steps would allow for verification of additionality with respect to business-as-usual pathways, using both simple and sophisticated statistical techniques (Ehlers et al, 2020; Flammer, 2020). Like offsets, the third step would also require working with independent and trusted verifiers (UNFCCC, 2020). It turns out that most of these principles have already been highlighted earlier for green bonds (ICMA, 2018), and have also been recently reiterated not only for green bonds (NPSI, 2020) but also for sustainability linked bonds (ICMA, 2020c); and, the real issue may be in lack of implementation, primarily due to the voluntary nature of these frameworks; which we believe is likely to be addressed with mandatory (esp. regulatory) approaches, as discussed in Section 4.6 below.

4.6 Need for regulation?

An issue with transition bond frameworks is the existence of the plethora of coalitions, each driving their own definition. This has led to inconsistency of definitions and frameworks (TCFD, 2020), and has the potential to cause confusion to investors, like the aggregate confusion issue in ESG frameworks (Berg et al, 2019). The major underlying cause in ESG is that it is the well-known general equilibrium problem in economics, where different stakeholders have different units for their utility functions, and it is well known that such problems do not have a solution that is acceptable to all stakeholders involved (Mankiw, 2006).

The only hope for a transition finance framework is that it is narrow enough in scope (i.e., with focus on carbon emissions only), to allow for a partial equilibrium solution, which is known to exist (Mankiw, 2006). However, even here, there is a need to ensure that there is standardization of frameworks, whether driven organically by the industry, or by regulation. Convergence towards commonly accepted definitions will be essential to maximize the effectiveness, efficiency, and integrity of the market (Piemonte et al, 2019). Since we are running out of time on meeting our climate targets, given that it may take time to converge to standards, if it happens at all (FT, 2020b); the industry led approach may not be optimal, even if driven by actors (e.g., bond funds) with significant clout (EF, 2020).

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21 In fact, as Tuhkanen and Vulturius (2020) admits, these principles have also been established in other guidelines, such as by the Climate Bonds Initiative and the Green Bonds Standards proposed by Technical Expert Group on Sustainable Finance (TEG) of the European Commission (TEG, 2019).
22 ESG stands for Environmental, Social, and Governance.
23 A partial equilibrium solution is possible when agents’ utility functions have common (e.g., monetary) units.
24 Another recent effort for harmonization is by the IFRS foundation – see IFRS Foundation plans autumn decision on int'l sustainability standards board | Accounting Today
In this context, the insights from Brest (2020) are particularly relevant. According to Brest (2020), we need not only robust internal mechanisms (i.e., processes and procedures) to accurately measure progress towards stated targets but also strong external mechanisms (i.e., auditing, and regulatory enforcement). The effectiveness of mandatory reporting in achieving required outcomes has been well documented, including in climate finance – e.g., BF (2021) shows that the TECV\textsuperscript{26} law in France curtailed fossil fuel financing by institutional investors by 39%.

Brest (2020) argues that, even in financial reporting, which is the backbone of well-functioning financial markets, strong regulatory interventions were needed even in developed countries, such as in the US as well as in Europe (Habib et al, 2014; Leuz and Wysocki, 2016), by the Securities Exchange Commission (SEC) and the International Financial Reporting Standards (IFRS), respectively. Brest (2020) further recognizes that financial regulators (e.g., the SEC in the US) may need to work together with the environmental regulators (e.g., the Environmental Protection Agency, or the EPA) to create such regulations, including for transition bonds.

One way to address this issue may be to drive a top-down standard process, run by the UN or a similar entity such as the G20. They can even run a competitive bidding process to select one of the existing coalitions – e.g., the Green Bond Principles or the Climate Bonds Initiative – as the de-facto standards coalition. This would allow for a single standard, while avoiding the confusion created by different countries and coalitions setting their own standards. This chosen coalition would then work with industry experts in each sector to define targets, pathways, and activities; this coalition would also need to develop appropriate mechanisms for measurement and verification.

4.7 India case studies

We now examine the prospect of transition bond in the context of a particular country, India in this case. As a starting point, we examine suitable applications from Shrimali (2020) and Koberle et al (2020). The former (i.e., Shrimali, 2020) is suitable given it establishes a business case for retiring a significant fraction of existing coal power plant capacity, making way for a higher renewable power plant capacity given anticipated demand, and helping India reach increasingly ambitious renewable energy targets. The latter (i.e., Koberle et al, 2020) is suitable given it establishes a strategic business case for key public sector entities in India’s coal power sector – the National Thermal Power Corporation, Coal India Limited, and the Indian Railways – to transition to lower carbon pathways, given India’s ambitious renewable energy targets.

Starting from Shrimali (2020), which establishes a business case (given that variable cost of existing coal power is more expensive than the average cost of new solar power) for retiring nearly half – approximately 100GW out of 200GW – of existing coal power plant capacity, transition bonds can allow for a further improved business case. This is because most of the coal power is under capacity contracts, which means that eventually the consumers are on the hook for paying for the initial capital expenditure as well as corresponding financing costs. By paying this liability early, by refinancing via a securitized transition bond (based on pre-determined consumer surcharges into a special purpose vehicle), raised at a lower cost of capital, the eventual cost to consumers can be further reduced. The lower cost of capital may be a result of securitization itself, combined with issuer balance sheet strength (especially if the issuer is a state government) as well as concessional finance (e.g., from development finance institutions).

\textsuperscript{25} Similar thoughts are echoed in Steele (2020), which argues for micro-prudential climate regulation.

\textsuperscript{26} The Transition ENergetique et Croissance Verte (TECV) law compelled institutional investors registered in France to provide detailed reporting on their exposure to climate-related risk and efforts to mitigate climate change.
Starting from Koberle et al (2020), which establishes a business case (given lower value at risk) for more climate friendly activities, transition bonds can allow for corresponding capital raise. For example, given India’s aspirational renewable energy target of 450GW of installed capacity by 2030, compared to a business-as-usual pathway with 91GW and 39GW installed capacity for coal and solar energy respectively, NTPC would halve its value at risk by moving to a pathway with 81GW and 49GW of installed capacity for coal and solar energy, respectively. This additional 10GW of solar capacity can again be raised via transition bonds that correctly reflect NTPC’s transition pathway.

While the eventual transition ratings of corresponding bonds will depend on the framework in Section 4.2, we hope that the discussion above provides the appropriate background and impetus for further development of transition bond mechanisms on the ground, either at public sector level or in the private sector as appropriate.

5 Path Forward

In this discussion paper, we have explored the timely topic of transition bonds. We have outlined the goals of a transition bond framework, including potential issues (Section 2). We have then provided a rationale for the need for a comprehensive framework, investigated the experience from experience (Section 3), and introduced a basic framework (Section 4). The main contribution is to suggest that we create a transition bond rating system that allows for appropriate flexibility in issuance but also avoids greenwashing ex-post.

However, many open questions remain. In this section, we set the agenda for future research by asking the following questions: How should transition pathways and activities be chosen? How should additionality be approached? How should data quality be improved? Etc.

One, based on the transition bond rating framework identified in Section 4.2, there needs to be a lot more work by think tanks (and potentially academia) on identifying potential pathways under the first-best (e.g., 1.5-2C), second-best (e.g., 3C), and third-best (e.g., 4C) climate targets for every sector (Section 4.3). This work needs to be further nuanced based on the speed at which these pathways approach the implied targets, again identified as first-best (e.g., by 2030), second-best (e.g., by 2040), and third best (e.g., by 2050). Finally, under each of the climate targets and pathways, there needs to be identification of suitable business level activities, like the one started by ETC (2020) for the 1.5-2C target.

Two, building on existing academic research (Section 3.1), there needs to be further development of clear methodologies by academia for tracking whether the proposed interventions are additional to the business-as-usual scenario i.e., up to 5C global warming (Section 4.4). This would mean ensuring that the so-called greenwashing is identified (and, therefore, avoided) at all levels, starting at bond issuance, moving to allocation of proceeds, and finally to financial and climate additionality. There may need to be additional focused research on establishing additionality of offsets.

In this context, it may help to borrow elements from other frameworks, such as the sustainability linked bonds (ICMA, 2020c); and connect the eventual impact of a transition bond to improved carbon performance. Of course, the traditional way of sustainability linked bonds to connect the cost of capital to improved carbon performance...
could work as a significant incentive. Furthermore, in case of default, whether on financial obligations or climate ones, there may be provisions that allow accelerated retirement of carbon-heavy assets, such as coal power plants or coal mines.

Three, to support the methodologies to ensure additionality and no greenwashing, it is key that data is collected at all levels, starting at issuance, moving to allocation, and finally to financial and climate additionality (Section 4.4). Any standard for transition bonds would need to ensure that issuers abide by the requirements for data collection and allow for the methodologies to be applied to this data to ensure additionality. Given the failure of well-defined voluntary approaches so far, and given the urgency of the climate crisis, this would ultimately require top-down approaches, such as regulation and would need involvement of advocacy groups as well as regulators (Section 4.6).

In this context, from an academic perspective, we see two specific potential statistical inquiries in the near term (Section 3.1). First, given availability of green bonds data on corporate as well as foreign direct investments in renewable energy, an empirical study to assess effectiveness (i.e., financial additionality) would be timely. Two, given the disparate findings of Flammer (2020) and Ehlers et al (2020), it would be desirable to assess reasons behind the divergence, and get to ultimate convergence on the findings, whether positive (Flammer, 2020) or negative (Ehlers et al, 2020).

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27 In this context, a caution is to ensure that the eventual framework is appealing to all kinds of investors, including central banks. For example, linking the cost of capital to transition bond rating may need to be sorted out.


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