



Should Green Bonds Be Centrally Controlled?

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Abstract

The world's environmental crisis is assuming alarming proportions at an unprecedented scale. Even though 193 members of the General Assembly formally adopted the framework "Transforming our world: the 2030 Agenda for Sustainable Development" with 17 goals & 169 targets, the progress in achieving them is painfully slow. All data on the topic shows that the COVID 19 pandemic also dealt a severe blow and, in many instances, reversed all the efforts made in the years preceding it. Closer examination establishes that lack of adequate financial means and prioritisation of a nation's current economic issues have been the principal cause of this predicament. In such a scenario, it becomes even more important for financial institutions and multilateral development banks (MDBs) to support governments to secure the world's future. Banks at their end have tried to innovate to increase their contribution to the SDG goals and Green Bonds have emerged as a popular green finance tool. This paper analyses their advantages and whether centralisation of the issuance of such bonds could make a larger impact.

Keywords: green bonds, sustainable development, ESG goals, carbon emissions, renewable energy, climate change

1. Introduction:

The environmental threat faced by our planet and the negative impact of the rapid climate change on the economy is beginning to be felt across the world. Even though the countries have come together in principle to address these challenges by agreeing to help resolve the problem by focusing on the "comprehensive, far-reaching and people-centred set of universal and transformative Sustainable Development Goals and targets by 2030" [1], most of them have failed to make any major headway. The underlying theme of the UN Sustainable Development Goals (SDGs) and the Paris Agreement was that nations must "aim to balance economic growth with environmental stewardship by regulating carbon emissions and promoting renewable energy, eradicating poverty, promoting peace and justice, and fostering sustainable growth (United Nations UN, 2015). The Paris Agreement had earlier stressed limiting the increase in global temperature and focus on funding a low-carbon development based growth.

Given the scale of the challenge, Governments across the world need the support of financial institutions to mobilize significant capital towards this environmental agenda. It is estimated that an annual investment of USD 5–7 trillion is needed to achieve the 2030 Agenda for Sustainable Development. The financing gap to achieve the SDGs in developing countries is estimated to be US\$ 2.5 – 3 trillion per year (UNCTAD World Investment Report, 2014) [2]. This figure has substantially increased according to the latest (UNCTAD World

Investment Report, 2023) which declared that “developing countries actually face a staggering \$4 trillion gap in sustainable development investments”. This was further reiterated by the UNCTAD Secretary-General Rebeca Grynspan who stated that a “significant increase” in material support for renewable energy in developing countries is “crucial” for the world to reach its climate goals by 2030. This is disheartening as it is evident that the warning of the UNCTAD World Investment Report, 2014 went unheeded and that we are nowhere close to achieving the given targets. The most disappointing has been the lack of will to invest in infrastructure that can trigger the change for the better. It is widely acknowledged that “Infrastructure sits at the very center of development pathways and underpins economic growth, productivity, and well-being. Yet infrastructure has suffered from chronic underinvestment for decades, in both developed and developing economies” [3]. It is important to note that current energy, transport, building and water infrastructure together emit more than 60% of global greenhouse gas emissions. Thus, if we are to meet the SDG goals, investment in sustainable transformation of infrastructure in all the above said areas must be given priority. Given the scale of investment needed Governments across the world may be ill equipped to handle it themselves. This makes mobilization of private investment crucial. In fact, the increasingly pressing challenges, and risks of climate change, may turn out to be the crucial turning point for the global economy with unprecedented investment opportunities. The positive outcome of this growing awareness is the notable increase in research focused on sustainable and socially responsible finance without which Sustainable development cannot happen [4,5]. This Innovation in finance drew the world to what is now aptly described as “Green finance”, a term for finance that funds investment that promotes/supports environmentally positive activities/projects to facilitate the transition to a more sustainable economy [6]. Green finance has begun to play a vital role in the global financial system and is the much-needed support for governments in keeping up with their SDG commitments. Its principal aim is to address environmental challenges while creating new lucrative economic opportunities [7,8].

It was within the green finance ecosystem that Green bonds emerged as a popular measure to mobilize capital towards environmentally sustainable projects. Their unique feature that separates them from all other bonds issued in the past are that the proceeds from these bonds are used exclusively to financing renewable energy and climate projects, scaling up climate-friendly investments, promoting transparency and accountability (use of proceeds and output of projects), and aligning financial markets with climate goals. The first step in this direction was taken in Europe when the European Investment Bank issued the first Climate Awareness Bond in 2007 [9]. The world bank was quick to respond and issued its first ever Green Bond in 2008. Regulations on the issuance of such bonds were strengthened to inspire investor confidence first in 2010 when the Climate Bonds Initiative launched the Climate Bond Standard and thereafter in 2014 when the ICMA published the Green Bond Principles [10]. The true impact of the green bond was felt when the first USD 1bn green bond issued by the IFC in March 2013 was sold out within an hour of its issuance. In November of the same year Vasakronan, a Swedish property company issued its first ever corporate green bond. There has been no looking back ever since. In March 2014, Unilever issued a £250 M green bond to “cut in half the amount of waste, water usage and greenhouse gas emissions of existing factories’ [11]. Apple became the first to breach the billion mark when it issued a \$1B green bond to finance “renewable energy and energy efficiency at its facilities and in its supply chain” in June 2017 [12]. In 2021, the \$2 billion green bond mark was breached by Walmart which became the largest corporate green bond at the time. According to a Bloomberg report the move was made by the retail giant “to reduce carbon emissions, boost recycling and clean up its supply chain” [13].

There has been no looking back. Green Bonds have entered the investing mainstream and the market for them as shown year on year growth with average growth of about 90% per year from 2016 to 2021 [14]. According to data compiled by Bloomberg “Sustainable bond issuance topped more than half a trillion dollars in the first six months of 2023, buoyed by record levels of green bond issuance. Sustainable bond issuance from corporates and governments rose 18.6% compared to the same period in 2022”. This is heartening as the sudden decline in the green bond issuance in 2022 caused by geopolitical uncertainty, volatile markets, inflation, rising oil prices and interest rates had reduced the investor interest across the broader bond market threatening to derail the progress made in green finance. The EU’s first green bond, issued in 2021, is a good example of issuers and investors uniting for a larger global cause. The Bond raised a record €12 billion for green and sustainable investments across the bloc, and was more than 11 times oversubscribed, with orders

from a wide range of investors topping €135 billion [15]. Moreover, the fact that the Chinese market, the biggest this far in Asia also showed a decisive upturn and a quick rebound in absolute volumes was a welcome start for this year [16]. The significant contribution made by these bonds in resource mobilisation for building a secure future for our planet can no longer be undermined. Thus, it is important to evaluate its advantages and shortcomings and analyse if these shortcomings can be mitigated through a more centralised regulatory mechanism.

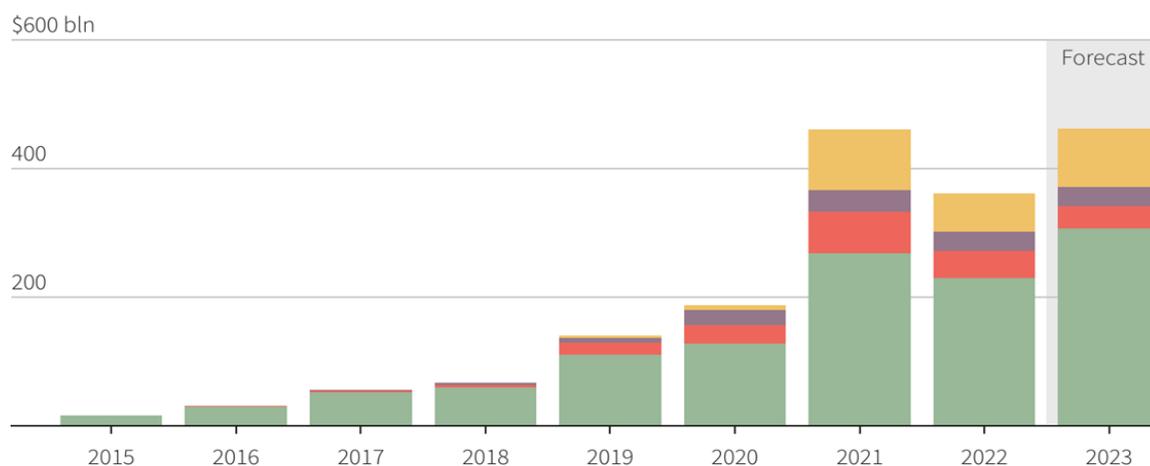
2. The growth of the Green Bond market

The momentum in the green bond market is a reassuring silver lining for the world as it is reflective of the commitment of the Governments, financial institutions, and the corporations to building a sustainable economy. According to the “Climate Bonds Initiative” and its Green Bond Database, the green bond market has witnessed substantial growth, averaging a remarkable rate of 54% in the period 2015 onwards. The decline in 2020 caused primarily by the COVID 19 pandemic, soon gave way to an unprecedented resurgence with volumes increasing by 75% in 2021 compared to the previous year. Unfortunately, the market volatility and the geopolitical uncertainty cause by the Russian – Ukraine war had an adverse impact on the Green Bond market in 2022 with a 25.6% decline in green bond supply. All indicators show another resurgence in the anvil according to analysts. a lot is expected from China which has been the largest contributor to Green Bonds in the world. “Efforts to standardize the market will spur growth in 2023, said Jianheng Chen, head of fixed income research at Beijing-based CICC Research. China's Green Bond Principles, published in July 2022, clearly spell out the unified criteria and uniform regulatory standards that are more in line with international practices, are expected to help win greater investor and issuer confidence. In the United States, President Joe Biden's Inflation Reduction Act is also likely to have a positive impact on the green bond issuance and investment according to Bram Bos, lead portfolio manager for green, social and impact bonds at Goldman Sachs Asset Management. The good news also came from Bloomberg who reported that even in 2022 when there was a downslide in green bond investment, “the Bloomberg MSCI USD Green Bond Index suffered less than the Bloomberg Global Aggregate Total Return index, despite the former being 90% composed of corporate bonds. This could reflect the more ‘buy and hold’ nature of investors in the green space”.

Corporate ESG bond sales set to recover in 2023

ESG bond issuances in hard currency

● Green ● Sustainability ● Social ● Sustainability-linked



Source: Barclays | Reuters, Jan. 4, 2023 | By Prinz Magtulis

2. Advantages of Green Bonds

2.1 Environmental Impact:

It is widely acknowledged that the progress being made towards achieving the SDG goals by 2030 is worrisome. Given the scale of financing need to achieve the SDG goals, relying on Governments alone for mobilisation of capital is more likely lead to failure, Green bonds have the potential to widen the mobilisation of funds. Since the Green bonds are specifically designed to finance projects with positive environmental impact, they can play a significant role in generating finance for helping to mitigate the climate risk that the world faces. Green bonds are fast becoming a key tool to integrate environmental issues into the financial sector [17] and a crucial tools of Green Financing which is solely focussed on maintaining the natural environment, eliminating pollution, and supporting sustainable development [18,19].

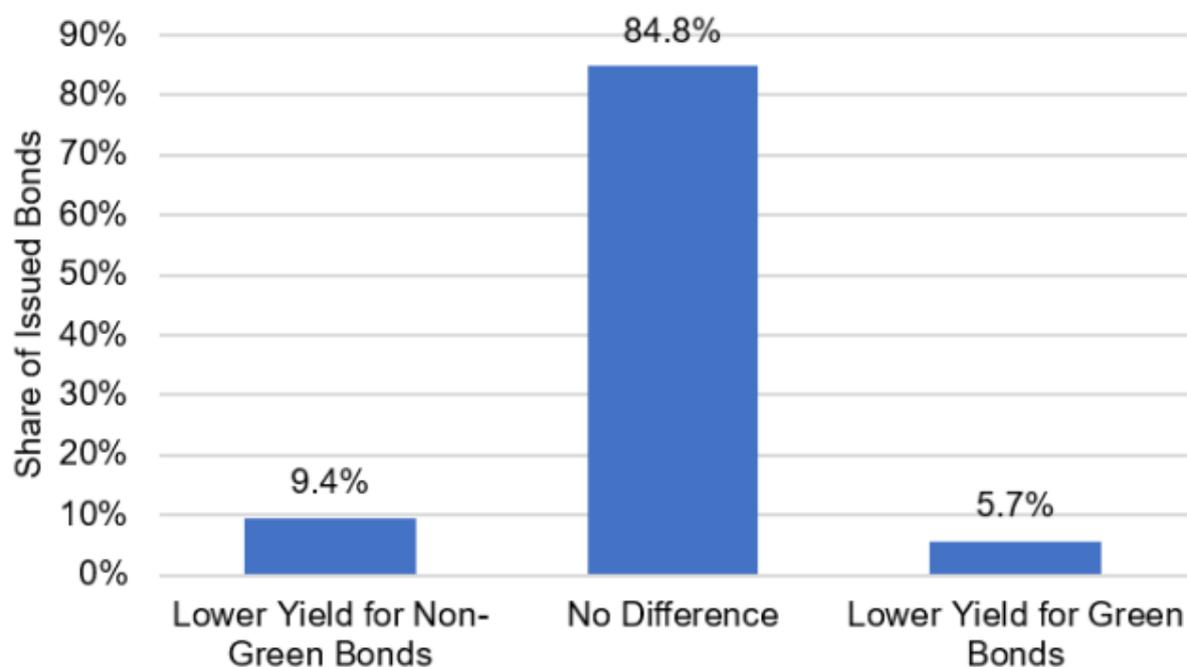
2.2 Brand Building:

Companies are increasingly realising that supporting green finance indirectly helps build their reputation and brand value as most people are becoming aware that achievement of SDG goals is crucial to secure their own future and that of their children. If we were to study this from the lens of the Signalling theory, by issuing green bonds, companies send the signal of their commitment toward the environment and concern for a secure future to their investors. Since investors have limited access to information about companies, the Green Bonds on account of their inbuilt accountability help in building investor confidence and helps them distinguish between companies that are clearly invested in the wellbeing of the world and those that are not. Studies have also shown the positive co relation between stock market and ESG compliance of companies making companies profit from eco-friendly behaviour [20,21] Vasakronan, a Swedish real estate company became the first to launch their corporate Green bonds. The company admitted using the tool to “diversify Vasakronan’s borrowings, which, over time, will result in lower borrowing costs” [22]. Its CFO Christer Nerlich, CFO went on record to say that “We have already obtained business benefits from our sustainability efforts in the rental and transaction market and we’re pleased that this can now positively affect our financing options.” Once Vasakronan showed the way, many banks and companies across the world have used this mechanism for funding their own carbon neutrality footprint while gaining from it in the long run. Subsequently, companies used the same for image building, course correction in their own business operations and to demonstrate leadership in making the world more secure. Apple exemplified its intent to provide leadership to demonstrate “how businesses can lead in driving the reduction of global carbon emissions” through its issuance of Green Bonds. Since February 2016, Apple has issued a total of \$4.7 billion in green bonds, with over \$3.2 billion allocated to date. These Green Bonds serve to fund the company’s efforts to reach carbon neutrality across Apple’s entire carbon footprint, including the full product life cycle, by 2030 [23]. Toyota introduced the auto industry’s first-ever asset-backed Green Bond in 2014. TMCC has issued five Green Bonds totalling \$7.6 billion as of December 31, 2021. The bond funds “vehicles that meet specific clean air criteria, including powertrain, fuel efficiency and emissions” [24] paving the way for others in this sector which responsible for approximately one quarter of greenhouse gas emissions [25]. Studies have revealed that companies that issued Green Bonds saw a significant improvement in their stocks on the day of the announcement itself. Green bond offerings are also associated with a 2.4% increase in long-term value, measured by the ratio of the firm’s market value to the book value of its assets [26], showing a positive co-relation between Green bonds and company evaluations. Investments in green bonds are also driven by the need to impress credit ratings which increasingly account for environmental, social and governance (ESG) risks [27].

2.3 Access to new Markets:

One potential benefit of green bonds that market participants have suggested is that it helps to broaden the issuer's investor base [28]. Green bonds open new avenues for issuers to access capital. By broadening their investor base, issuers can access greater liquidity and at a lower cost since these green bonds tend to garner greater attention. Apple's landmark \$1.5 billion bond was the first green bond issued by a technology company and the publicity that followed may have also helped it win the corporate green bond of the year award. The green bond issued by Starbucks, was very well received, and received positive reviews raising the credibility of the brand while giving them access to newer share of investors. Since green bonds attract investors who are committed to the environment, they are ready to wait and even compromise on the return on investment as they too add these to their portfolio to be able to make a positive contribution to the wellbeing of our planet and in some cases to fulfil their ESG compliance. On the other hand, studies of US corporate and municipal bonds show green bonds trade at a yield premium relative to non-green bonds [29].

Yield Differences: Green vs. Non-Green Muni Bonds with Identical Risk



Source: [David F. Larcker and Edward M. Watts, "Where's the Greenium."](#)

2.3 Diversification of Investor's portfolio and tax incentivisation:

Green bonds provide an opportunity for investors to diversify their portfolios and fulfil their moral obligation of contributing to the planet's welfare indirectly. This diversification also helps them save on taxes if the green bonds offer tax incentives (depending on the issuer and jurisdiction), such as tax exemption and tax credits. This portfolio diversification also helps investors reduce the risk that may be associated with their investments in the more traditional and non-green industries.

2.4 Increase in ownership by long-term and green investors crucial for LCR investments:

Corporate green bonds attract investors who are not looking for a short-term windfall and genuinely care about the long term and the environment. there is growing Evidence of more "buy and hold" investors for green bonds which can lead to lower bond volatility in secondary market. This makes the green bond extremely valuable for investing in the fight for climate change globally as these projects are capital intensive to begin with and it takes times for them to start showing results. This also makes it crucial for funding R&D which also requires long term fund support. The world will have to increase investments in building LCR infrastructure if we are to achieve the climate goals

set for 2030. This is because approximately 70 percent of greenhouse gas GHG emissions come from infrastructure such as electricity generation, transportation, industry, and buildings. “Given the enormity of these funding requirements and public budget constraints, private finance will need to play a key role in meeting these additional needs. McKinsey estimates that the private sector could close up to half of the LCR infrastructure spending gap” [30]. Bonds have the potential to provide the long term and cost-effective sources of debt capital needed by LCR infrastructure projects. It may be possible to achieve a reduction in the weighted average cost of capital (WACC) for LCR infrastructure financed or re-financed with bonds. Bonds can raise capital directly for LCR projects, or they can re-finance existing shorter- term loans potentially at a lower cost [31]. “Lowering the cost of capital for renewable energy is important because an estimated 50-70% of the costs of electricity generation are in the financial cost of capital, with only the balance being the physical or operational costs of the installation” [32]. Thus, even small changes in the WACC can have substantial impact on the long-term feasibility of the investments. Traditionally, bonds have been the asset class favoured by OECD pension funds and insurance companies, which in 2013 invested on average 53% and 64% respectively of their portfolio in bonds [33]. It would be interesting to see them go green.

2.5 Increased accountability of company operations:

Since the regulatory provisions of Green Bonds require issuers to disclose detailed periodic information about the use of proceeds and the environmental impact of financed projects, issuers are accountable to the investors at all times. This Added transparency of use of proceeds, and reporting requirements gives the investors informational advantage otherwise unavailable, giving green bond investors a significant information benefit [34]. This transparency may be operationally good for the issuer too as it will help them have a much better internal MIS and a better grasp over their operations which could enhance efficiency “Tracking of proceeds use and reporting leads to improved internal governance structures and a positive feedback loop which improves the overall credit quality of the issuer” [34,35].

2.6 Government and institutional support:

Governments across the world understand that a lot more needs to be done to mobilise private capital and to solicit the participation of the individual investor in the fight against climate change. thus, they are extremely supportive of such moves by companies and are even known to incentivize the issuance of green bonds through various measures such as tax incentives, subsidies, and favourable regulations. This support encourages issuers and reassures them to take the plunge with confidence. on the investor side, the governmental support and regulatory measures adopted to ensure that the funds are not misused also inspires the investor [36].

2.6 Funding innovation:

Moving the world from its current environmental status to an environment which fullfills all SDG goals is not possible without innovation. Given that research for innovative technologies and mechanisms on Renewable Energy Projects, achieving energy efficiency across polluting sectors, waste management, Clean Transportation Infrastructure etc requires cost effective long term funding, Green bonds have emerged as an important tool for companies to raise funds that can be utilised for this issue without added pressure on their revenue. Green technological innovation is defined as innovative products and processes that reduce negative environmental impacts [37]. Oltra and Saint-Jean (2009) define green technologies as “innovations consisting of new or improved processes, practices, systems, and products that contribute to environmental sustainability” [38].

Speaking at the United Nations General Assembly in September 2020, President Xi Jinping of China declared “China would achieve carbon peaking by 2030 and carbon neutrality by 2060”,

emphasizing that the research and application of green technologies should be vigorously developed to achieve carbon neutrality as soon as possible. The very fact that he set a 2060 target showed that he was not satisfied with the current pace. Studies reveal that while Governments want to push the SDG agenda forward in principle, these plans are hindered by limited resources for implementation [39,40] and for effectively encouraging green technological innovation (GTI). Empirical research has shown that green finance policy may stimulate green innovation in enterprises through incentive or constraint mechanisms [41,42,43] as they channelise investment and secure additional access to funding that may otherwise be difficult to secure. This financial support is imperative to accelerate the development and implementation of environmentally friendly technologies and practices if we are to make a more deliberate headway towards achieving the SDG goals.

2.7 Encourages people's participation.

Green Bonds give an opportunity to individual investors to contribute towards the betterment of the planet. Majority people across the world express helplessness as they are aware of the environmental crisis but don't understand how they can contribute to a more effective sustained effort. Green bonds offer them this opportunity. It also lets people choose brands in line with their personal priorities as Green Bonds require greater transparency in how the money raised is invested.

3. Shortcoming and challenges of green bonds

3.1 Lack of Standardization:

In the absence of a uniform global standardisation of regulations that govern Green bonds, there is a lot of ambiguity that surrounds them and may over a period of time even begin to discourage larger investor participation. The surge seen in Green bonds over the last few years cannot push nations and companies into complacency in terms of their standardisation as the lack of it can cause an unwanted reversal and the world could stand to lose a crucial tool for sustainable development. Investor confidence in the long term will need solutions that foster standardisation.

Critics cite the notable lack of common disclosure frameworks for each asset class of green bonds, compounded by the technical nature of 'green' disclosure data points. Then there is this ambiguity around what clear elements qualifies as a 'green bond'. This ambiguity is evident even in the leading Green Bond markets, EU, China, and the USA.

The rapidly growing European green bond market saw its first centralised regulation when it has recently become one of the focal points of discussion across the world [44]. The announcement by EU Commissioner Johannes Hahn, hinting that the EU planned to issue green bonds worth €250 billion to fund the post-COVID-19 recovery initiatives of the Member States in an environmentally friendly manner [45], came close on the heels of the announcement of setting up the EU Green Bond Standard to establish a comprehensive framework for the issuance of green bonds within the EU. Instead of assuaging the doubts of standardisation, the move further raises doubts. Though it clearly states that the Green Bond standard serves the primary objective of the CMU to integrate European national capital markets into a genuine European single market [46] and overcoming fragmentation of the European financial market [47], it does not lay out a specific mechanism to stop the existing fragmented approach of the national regimes and that of private regulators who have been around for some time. This does not change the basic self-made nature of the EU green bond market self-made which has been largely self-regulating [48]. The proposal also does not shed light on the future role International Capital Market Association (ICMA) and the Climate Bonds Initiative (CBI), which emerged as the market response to the absence of public regulation [49]. Lack of clarity is likely to cause confusion for investors who till now relied on the private validation (certification) frameworks based on their own standards like the Green Bond Principles (GBP) and Climate Bonds Standard (CBS) [50,51].

The absence of a centralised regulating agency for Green Bonds in the USA has further complicated the standardization issue. There is a very thin line between the municipal bonds and the green bonds and there is still a lot of ambiguity around the disclosure guidelines for the issuers which might make the individual middle income investors wary to invest. Currently global green bond indices are compiled by Bank of America Merrill Lynch, Barclays MSCI, Standard & Poor's and Solactive [52]. In the absence of a centralised framework, each of these agencies use their own methodology for assessment. Since the agency can be flexible, there is a lot of grey that might be exploited for greenwashing.

Companies do use independent verifying agencies to showcase compliance integrity. One such example is of *CICERO* is a climate research institute and a leading provider of second opinions. Its “Shades of Green” business now merged S&P Global rated companies based on “how well a green bond aligns with a low-carbon resilient future” and graded the companies in different shades of green, Light Green, Medium Green and Dark Green. The dark green reflecting the bond's adherence to a long-term vision for a low carbon, “environmentally resilient” society. The weakness is that *CICERO* reviews the green bond framework at the time of issuance and the post issue review happens only if the issuer specifically requests it [53].

The People’s Republic of China (PRC) issued its first green bond in 2015 and has over the years become one of the key players in the world’s green bond market. However there has been some ambiguity around what is classified as Green and the regulation on the eligible uses of proceeds in the Chinese context. The PRC’s green bond market is supervised by four government agencies, namely the PBoC, the NDRC, the CSRC, and the NAFMII. Even though all four have information disclosure regulatory requirements, they vary a great deal in the terms and conditions. The PBoC’s mandates disclosure on the use of proceeds every quarter, while the NAFMII guidelines contain provisions that mandate two disclosures, the first one being on the use of proceeds and progress of green projects in the previous year before 30 April each year; and the second one being prior to 30 August each year, disclosing the use of proceeds and progress of green projects in the first half of the current year (NAFMII 2017a) while also asking for compulsory third party certification of claims. The CSRC mandates disclosure in the annual management report (CSRC 2017), while the NDRC does not lay down any specific disclosure requirements (NDRC 2015a). The same ambiguity is seen in the use of proceeds with PBoC’s allowing investment in clean coal as an eligible “green” investment, something that is red flagged under international standards. (PBoC 2015b). Similarly, under the NDRC’s project catalogue, the key areas of support for green bond investment include the retrofitting of coal-fired generation units toward ultra-low emission and better energy efficiency (NDRC 2015a). In addition to variation in the evaluation of proceeds, there is great variance on the eligible use of proceeds as well. The NDRC Under (NDRC 2015a) allows corporates to use up to 50% of the Green Bond revenue for debt repayment and their own operative costs whereas, most international standards limit it to 5% (Hong Kong Stock Exchange 2018). These variations may work for the domestic market but is a challenge for international investors [54]. It comes as no surprise that the Climate Bonds Initiative’s analysis, put USD 3.7 billion of Green Bonds as suspect in terms of international standards in 2019 [55].

China is taking significant steps to improve the quality of its green bonds. A new draft of guidelines for the catalogue of eligible China green bond projects, released in May 2020, aims to remove “clean coal” and other fossil-fuel related projects from the eligibility list. The draft plan was jointly issued by the People’s Bank of China, China Securities Regulatory Commission, and National Development and Reform Commission, signalling greater coordination among the bond markets’ key regulatory authorities. PRC’s four Green Bond regulating agencies released the "Green Bond Endorsed Projects Catalogue (2021 Edition) to achieve parity with international standards and bringing in more uniform assessment criteria for regulating agencies and withdrew the support to Carbon-intensive projects including what they earlier categorised as cleaner use of coal and other fossil fuels [56].

3.2 Green Washing accusations

There is no doubt that Green Bonds have emerged as a popular green finance tool helping raise capital specifically for climate-aligned projects. Their popularity is a clear indicator that investors are more than ready to back initiatives to help save the planet. The worrisome aspect is that these initiatives have regulatory gaps that can be exploited for greenwashing. Greenwashing is the term used for misrepresentation and ambiguity around green investment from capital raised through green Bonds. Traditionally, 'greenwashing' refers to the practice wherein companies make false or exaggerated claims about their environmental responsibilities by selectively disclosing information or presenting misleading narratives [57,58]. In the absence of an international universally accepted global standard for green bonds issuance and regulation, each country has devised its own internal mechanisms inspired by the broader guidelines of the International Capital Market Association's (ICMA) Green Bond Principles. These principles are very clear about what can be certified as a Green Bond but lack clear cut contractual guidelines and protections for investors in terms of reporting metrics and transparency and penalties for default. Failure on the part of the issuer to use the capital raised from Green Bonds stated green projects (or deliberate use for non-green purposes) and inadequate annual reporting (or simple noncompliance) are not defined as events of default with no legal recourse or protection to "enable the noteholders to accelerate or redeem their bonds in the event of breach. Nor are they step-up events, which trigger an increase in the coupon payable by an issuer" [59]. Since regulation of these bonds is primarily left to a mixture of non-governmental organisations, credit-rating agencies, and second opinion providers that formulate and verify adherence to voluntary standards [60], there no universally accepted common international standard for determining green bond eligibility [61], causing confusion in all stake holders.

There is no clear-cut legal enforcement provision to hold issuers accountable [62]. This ambiguity around legal recourse or provisions to protect the investor could embolden the issuer to green wash and creates reputational and legal risks that undermine the integrity of green bonds [63] and make the investors suspicious and less inclined to invest.

Studies in China have revealed that increase in Green Bonds also led to a corresponding increase in the number of green patent applications by a staggering 59.48%. while the non-invention patent application only increases by 10.59%. the crucial observation is that despite such a huge surge, the ratio of granted green invention patents dropped by 37.61% [64]. This shows that although Green Bonds has seen a quantitative increase in innovative initiatives, the quality has been dismal. Which in essence doesn't serve the larger purpose of creating a sustainable planet. In April 2019, the head of the International Accounting Standards Board stated publicly that "greenwashing is rampant". In 2019, China USD 1 billion in "green" finance to coal projects. The example of the Hong Kong airport which was financed by Green Bonds was found to be a huge threat to the Chinese white dolphins. Until recently, investors have been relatively relaxed about the prospect of their money not being used as had been promised. In 2019, German energy firm Innogy raised close to €3.5bn for building five wind farms and within six months of the issuance of the bond Innogy's parent RWE announced that it would sell its stake in the company to rival energy giant E.ON. which had no green intentions. In the same year, Green Bond funding for a new airport in Mexico City left investors compromised despite top rated agency S&P and Moody's involvement in the evaluations and verification [65].

3.3 Issuer fatigue and confusion

Despite good intent, most corporates don't have the band width to go through the complex process of issuing a green bond and opening themselves for intense scrutiny. Given the multiple preconditions and criteria and the varying assessment and regulatory criteria of various agencies, some companies are not ready to risk their reputations even though they might have the right intent. So, companies are also reluctant about the disclosure reporting guidelines and standards fearing bad publicity. This makes companies lose out on an opportunity to transform and make amendments by contributing towards environmental protection to make up for any adverse effects their operations may have caused. (Stock exchanges, rating agencies, second party reviewers,

disclosure reporting guidance, certifiers, index providers, industry bodies such as ICMA and the Climate Bond Initiative and the increasing phalanx of active buy-side industry groupings focused on sustainability. Reputational risk stems primarily from the potential for greenwashing, where green bonds are implicated in superficial displays of environmental concern.

Issuers are also wary of the news created by the dubious use of Green bonds for the use of environmentally dubious or destructive projects. This includes a 725 space parking garage in the U.S. [66] (Berensmann et al., 2018), coal-fired power and petrochemical factories in China [67] (EuroMoney, 2019), and a Brazilian hydropower dam with negative social and ecological impacts [68]. (Bracking, 2015) and some blame it on the absence of strong and consistent regulation means and clarity in various clauses and are thus reluctant to fish in muddy waters. Lack of clarity also makes issuers wary of what would be construed as “green default” [69,70] or environmental non-performance and its legal and reputational consequences.

3.4 Market Evaluation:

Compared to conventional bonds, the secondary market liquidity of green bonds may be lower due to the ambiguous nature of quantifying their returns in the short term. Moreover, the financial value of the environmental benefit is rarely quantified for green bonds [71] as there are no precedents based on which they can be evaluated which is not encouraging for investors looking at minimal risk investments. The grey ambiguous nature of the bonds “would make it difficult for the court to assess damages in the event of environmental non-performance. This lack of accountability harms the market’s credibility and diminishes investor confidence in the integrity of green bonds” [71] and sullies investor incentive. Investors also find it difficult to find willing buyers in the short term since investments of green bonds rarely cover short term projects that can exhibit quick results, making a quick and lucrative exit difficult. Studies reveal that Fixed-income investors think that lack of reliable ESG data does not allow a fairer assessment of the issuer issuing green bonds and is a barrier to considering climate change in their investment strategies [72].

3.5 Challenges in soliciting global investment:

The third challenge for growing green bonds their ability to attract international investors, this is even more crucial in the case of developing and underdeveloped economies that are lagging in the SDG agenda and could drag the entire planet’s effort down. The Low-income countries who essentially need this green Finance urgently currently receive very limited proceeds from green bonds. “Only 6.5% of global green issuance flowed to Africa and Asia (excluding China) between 2007 and 2016” [73] and there has been not much progress made in this regard.

Varying domestic regulatory standards and taxation principles limit globalisation of these green bonds. The US for example has imposed limits on foreign access to the green component of their multi-trillion-dollar municipal bond market [74,75]. Since most countries offer tax exemptions to Capital gains from municipal bonds so they are over booked by domestic users who use it as a tax shield. Since these bonds normally have lower interest rates than the conventional ones, they are unattractive for international investors who do not have the benefit of U.S. tax liabilities to offset the smaller returns. The tax exemption has thus become a double-edged benefit, while it encourages domestic investors, it serves as an hindrance for the international investors in “greening the municipal bond market and using it to finance the massive climate-related infrastructure needs in the US” [74,75]. Regulations that restrict investment in AA/AAA rated bonds by US and EU pension funds also compounds the problem of them investing in other countries that need this finance [74]. Nations with inconvertible currencies are also kept out of this investment opportunity [76].

3.6 Scalability restrictions

The institutional and market barriers that define the minimum size, transaction costs, and technical capacity of the Green Bonds make it restrictive for smaller and medium cap players. “Minimum size is the minimum value a green bond should bear to support liquidity and appeal to bond underwriters. \$US 200–250 million is generally considered the minimum value needed to support liquidity, interest the underwriters, and be eligible for green bond indices” [73,75]. This restricts the capacity of low-income nations and smaller companies with standalone projects, which are the base line that can make the maximum benefit in reversing climate change. Besides this Transaction costs for verification, monitoring, and reporting also restrict smaller players from taking this initiative to raise funds [77].

3.7 Deepening economic fault lines

It is feared that if the rich corporations and governments had monopoly over the green bonds than they can begin to add surcharge to activities that are vital for the poor. The example that best exemplifies this is that of repair and upgradation of the New York subway post Super-storm Sandy in 2012. This subway is the lifeline of the low-income residents of the city. The subway is critical infrastructure for the city’s low-income workers—particularly women and people of colour in the service industry—as they have limited transportation options relative to the subway’s whiter, higher-income commuters. The green bond campaign for this work reserved 50% of the issue for retail (i.e., non-institutional) investors. This indirectly amounted to the lower income commuters giving a kind of extra rent to higher-income, bond-owning commuters and amplify the feeling of patronisation [78].

3.8 Limited supply:

Due to the tedious procedures and regulatory measures involved in the issuance of green bonds, there supply is limited as compared to the growing demand fuelled by increased awareness of the extent of the environmental risk faced by the planet. Due to limited supply, the investors have very few options to choose from and this limits their investment prospects as they cannot have a diversified portfolio to minimise risk.

4. Conclusion:

The UN Secretary-General’s annual report on SDG progress with updates on the progress made on the SDGH agenda across the world since 2015. The report makes the uncomfortable revelation that preliminary assessment of the progress on the 17 SDG goals shows that “about 12% are on track. Nearly 50% of the targets are moderately or severely off track and approximately 30% have either stagnated or “regressed below the 2015 baseline.” Recognizing that the lack of progress is universal, the report underscores that “developing countries and the world’s poorest and most vulnerable people are bearing the brunt” of it. Amongst its recommendations, the one that is most pertinent refers to the mobilisation of resources and investment needed to “ support developing countries in their efforts to achieve the SDGs, recommit to deliver on the Addis Ababa Action Agenda (AAAA) and help those experiencing acute vulnerability” [79].

It is apparent that climate change is already upon us with countries across the world grappling with unprecedented climate change related disasters and conflict, unprecedented economic damage caused by the COVID 19 pandemic, disturbance in global supply chain due to the Russia- Ukraine conflict and the growing chasm in the US-China relations among other inflationary trigger points. The report of the UN Secretary general has nothing unusual mentioned, it’s a known fact that a surge in financing alone can help us move in the right direction. The report talks about restructuring and reforming “the international financial architecture to make it resilient, equitable, and accessible for all” by doing away with the structural inequities and inefficiencies that have existed since past. The Secretary-General spoke of an immediate SDG Stimulus of USD 500 billion per year to set things back on a reasonable track. Here he made a mention a combining concessional and non-concessional finance. He implores to public development banks and multilateral development banks (MDBs) to focus on scaling up debt for sustainability swaps and gradually reducing and

“phasing fossil fuel financing and substantially increasing the quality and quantity of finance for climate change mitigation, adaptation, and resilient infrastructure in developing countries”. It also emphasises on mobilising global private finance by offering a conducive regulatory and operating environment by introducing de-risking mechanisms, guarantees, and transparency around the key risk markers to boost investor sentiment.

Time is certainly running out for our planet. Unless the environment is prioritized, the window for limiting global warming to a below 1.5° Centigrade increase may shut forever putting the planet to grave risk. The UN has gone on record to estimate that the required investment in clean energy projects for effective mitigation is about \$5 trillion a year. The amount currently available is a mere 15% of the actual requirement. The world cannot rely on Multilateral development banks (MDBs) alone to meet this huge financing gap. The attention needs to turn to the private sector and huge mobilisation of individual customer base towards Green Finance. It is here that key innovations like green bonds and allied instruments like transition bonds, sustainability bonds and sustainability linked bonds can play a significant role. During the past five years, the flow of these assets has grown annually at a phenomenal rate of 55% to a total issuance of \$3.5 trillion. There is clearly enough scope for growth, with some suggesting that we haven't even tapped a fraction of it yet.

Green bonds have emerged as a crucial Green Financing tool to raise low-cost capital to finance sustainable projects, give the individual investor an opportunity to participate in helping save the planet through green projects and to encourage companies from across the world to introspect and look for ways to make an environmentally friendly transformation and improve their own risk management and ESG performance.

Despite their shortcomings, green bonds can play a significant role in transitioning towards a more sustainable economy. The efforts of individual countries to address these inadequacies and come up with a more fool proof system to ensure the integrity of the Green bond market, have clearly left much to be desired and it's too early for the world to congratulate itself over the surge of the Green Bond capital in the last five years, as it has not generated the capital in trillions that the world needs to be able to combat the problems of climate change; but there is growing evidence that it could.

This momentum could be best achieved if there is an international consensus to bring in uniformity in issuance parameters, risk management and implementation regulation. The integrity of this tool can only be enhanced if the investors from across the world and of all sizes are reassured about the standardisation in monitoring compliance to ensure that investments are directed to the space for which the bond was issued. The report “Green Bonds for Climate Resilience” prepared by the Climate Bonds Initiative for the Global Center on Adaptation, in cooperation with the EBRD highlights the need for preparing and implementing Technical Assistance (TA) and Green Bonds for Climate Resilience support programmes for public and private stakeholders across the world so that this tool can be put to effective use [80]. It also hints at a collaboration between supranationals and international cooperation for “structuring of green bond frameworks, their governance structure responsible for selection of resilience criteria and reporting, the development of metrics and reporting platforms, as well as benchmarking processes against industry best practice and evolving standards”. In developing countries and emerging economies, help in project preparation facilities like “project feasibility studies; value-for-money analyses that comprise climate risk assessments” are needed to create a safer investment climate. The report specifically mentions the benefit of creating “dedicated investment funds to support the issuance of Green Bonds for Climate Resilience, especially for sovereigns and sub-nationals with low credit ratings by providing the anchor investment for first time issuers, incorporating de-risking mechanisms, and enabling debt conversion swaps for countries with limited fiscal space and aiding in cross currency swaps for sub-sovereign entities. Given the severity of the challenge on a global scale, only a centralised mechanism could reduce the ambiguity and confusion in the Green Bond space. Centralization can help establish transparent universal guidelines and criteria for green bond eligibility and accountability in their usage. While some might argue that decentralisation allows nations to prioritise as per their unique environmental needs and challenges, it must be understood that the environmental challenge is without borders and the so should the solutions. It would be left to the experts of the centralised agency to understand the local priorities before guiding issuers on the Green Bond in question.

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