Climate bond’s characteristics in mitigating climate change: second opinion perspective

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Abstract. The objective of this paper is to analyze the characteristics of climate bonds used to mitigate climate change. Climate bonds are superior to green bonds as they are reviewed by the certified independent reviewer, while the green bonds are not. The research employed a qualitative approach with correlation test. The samples were all registered climate bonds. The results showed that climate bonds are dominantly based on USD and EUR currency, while the size is not related to the issuance period. Sectors for climate bond standards should be prepared well, due to many climate bonds have various characteristics.

1. Introduction
Climate change is a phenomenon which should be responded to accordingly as it is a common global platform to reduce Greenhouse Gas (GHG). At the international level, there are such forums which formulate how to reduce GHG such as the Convention (21 March 1994), Kyoto Protocol (11 December 1997), and Paris agreement (2015). Paris agreement plans to set up to 1.5-2 °C above the pre-industrial level. This goal relates to adaptation of climate change mitigation, especially the GHG. Furthermore, it is known as Nationally Determined Contributions (NDCs) in which each country contributed in climate change adaptation.

However, reducing the unavoidably GHG needs financing that may include debts in the form of bonds in addition to grants. Maintaining the 1.5-2 °C increase by boosting the economic development needs green and environmentally conducive projects. Climate bond is one of the financing sources to support green projects, which can decelerate the temperature increase. Climate bond is reviewed by certified independent reviewers, and thus it is different from the green bond.

The objective of this paper is to analyze the characteristics of climate bond from the earliest until the latest issuance. Many climate bonds have specific characteristics with specific purposes set up by the issuer. Problems may arise as each independent review has a different format to report the second opinion. This research only covers information from the second opinion of climate bond and related information from Climate Bond Initiative (CBI).

2. Literature review: what is a climate bond?
While green bonds have been widely studied, only a few papers studied climate bond issues. Some researchers have assumed that climate bond is similar with green bond that supports the environment and reduces Greenhouse Gases (GHG). Flaherty et al. [1] do not define climate bond explicitly. They define climate bond as a green bond that relates to supporting better environment. The green bond itself has the definition of green terminology to Green Bond Principles (GBP) set up by the International
Capital Market Association (ICMA) (https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/). Yap [2] raised an interesting issue concerning climate bond in India. The incentive would be applied (tax exemption on gain) if Rupee appreciates against US Dollar as the bond is issued in US Dollar. Another bond may not have this assurance.

According to CBI [3], a climate bond can be defined as a bond that has been reviewed by a certified independent reviewer for supporting environmental issues. This includes sectors such as solar, water, wind, low carbon building, low carbon transport, geothermal, and marine renewable energy.

The sectors under developing programs are bioenergy, land use, hydropower, waste management, information technology, broadband, and fisheries. The only paper that defines climate bond accordingly was written by Więckowska [4], which referred the definition to Climate Bond Initiative (CBI). But the paper is still a preliminary study explaining the nature of climate bond, which might have misinterpreted between green bond and climate bond. The total issuance until December 2017 was only USD 32.4 billion instead of USD175 billion like in the study. Therefore, her paper actually may not represent climate bond issues.

Lazurko and Venema [5] highlight the criteria for water in climate bonds that is suitable to mitigate environmental issues. They promoted Distributed Water Harvesting (DWH) that is allocated water infrastructure for agriculture irrigation. This method is aligned to Canadian Prairies that needs supportive action to adopt the climate change and ecosystem. Climate adaptation has long-term benefits since the cost compensation will result after 15 years. Mathews et al. [6] have a promising prediction on the prospect of climate bond to mitigate issues in low carbon and environment.

Therefore, green and climate bonds are different. Climate bonds need to be verified based on Climate Bond Standards and specific criteria which issued by Climate Bond Initiative (CBI) (see figure 1). Only certified reviewers who can conduct this process since only some independent reviewers have this certification. Climate Bond Standard is an obligatory standard to be referred by independent review, which submits the proposal of climate bond. After issuance, in 12 months there is a report of post-issuance. This includes the usage of the fund for green activities [3].

3. Research method
This research uses the descriptive method with correlation test to measure the size of the bond and the length of the bond’s issuance. The sample of this research comprises all climate bonds at the Climate Bond Initiative (CBI). However, since not all of the bonds have complete data, some samples were eliminated.

![Climate Bond Certification process](image)

**Figure 1.** Climate bond certification process
Source: Climate Bond Initiative[3]
The final sample climate bonds data were 79 of total 85 (Table 1). Some studies were lack of information and second opinions of six climate bonds, therefore they were deleted from the analysis. All data were taken from the website of the Climate Bond Initiative (CBI) on 15 February 2018. Other currencies are converted to USD to compare total value based on the current rate [7].

**Table 1. Sample data**

| Description    | Total |
|----------------|-------|
| All climate bonds | 85    |
| No data         | 6     |
| Final sample    | 79    |

Totally, 11 independent review institutions have been certified for climate bond standards, while green bonds’ reviewers are not certified by the Climate Bond Initiative (CBI).

**Table 2. The currency of climate bond**

| Currency | The amount in USD (15 February 2018) |
|----------|-------------------------------------|
| EUR      | 14,870,864,198                      |
| USD      | 13,173,080,000                      |
| AUD      | 2,673,015,873                       |
| INR      | 689,548,066                         |
| SGD      | 458,015,267                         |
| PHP      | 204,549,799                         |
| CNY      | 157,480,315                         |
| ZAR      | 85,984,523                          |
| BRL      | 47,737,152                          |
| NGN      | 29,612,188                          |
| GBP      | 21,548,817                          |
| NZD      | 3,803,324                           |

Climate bond issuance is interesting since it is based on the approved selected criteria. Table 2 shows the biggest issuance was in EUR with the total amount of USD 14.8 billion, followed by USD and AUD. However, most issuers were from the European countries with Euro (EUR) functional currency. In fact, there was only a little information from the second opinion especially the relationship with the currency basis, for example the climate bond in Philippine Pesos (PHP). It does not state where the location of the project from this climate bond is. To find further information, we can find the description of the issuer (AP Renewables Inc.) from the website of CBI (https://www.climatebonds.net/standards/certification/ap-renewables), but the detailed location of the bond projects is still not informed. The second opinion should inform detail information including the location and other important information about the project. The climate bond issue usually is on the risk since the issuer must cover a long period due to the longer nature of the project.

The largest sector allocation of climate bond is on transport (29.13%), followed by energy (16.11%) and building (14.27%) (Table 3). The allocation is based on sector stated in the second opinion. In fact, no specific amount is stated in the second opinion, hence the allocation is based on the proportional amount of bond issuance. Some second opinions did not state the allocated sector (8.51%). However, CBI only covers six standards as stated above.
Some stated sectors in the second opinion such as efficiency, environment, and forest still do have not the standard yet, however, sectors are stated explicitly in the second opinion. This is an interesting issue on how these climate bonds are standardized by CBI. Referring to climate bonds taxonomy, other sectors that have not been developed are information, technology, and communication (ITC), waste and pollution control, nature-based assets and industry & energy-intensive commercial. However, some subsectors are being developed in the energy sector, namely hydropower, bioenergy, wave, and tidal (Figure 2). Problems may occur if the sector of the issue has not been standardized. Different interpretation may emerge as no standard to be referred.

Table 3. Sector composition

| Sector       | Amount (USD)       | %  |
|--------------|--------------------|----|
| Transport    | 8,951,693,704      | 29.13 |
| Energy       | 4,949,148,522      | 16.11 |
| Building     | 4,386,592,224      | 14.27 |
| Wind         | 2,731,007,243      | 8.89  |
| n.a          | 2,615,883,944      | 8.51  |
| Solar        | 2,464,152,180      | 8.02  |
| Water        | 2,079,370,035      | 6.77  |
| Rail         | 705,026,455        | 2.29  |
| Efficiency   | 552,006,173        | 1.80  |
| Geothermal   | 548,353,123        | 1.78  |
| Environment  | 438,675,560        | 1.43  |
| Hydropower   | 297,619,048        | 0.97  |
| Forest       | 9,772,022          | 0.03  |

Source: Data (Color reflect sector, grey= being developed)

Table 4 show that the smallest amount is USD 138,504 by Contact Energy while the biggest is USD2,172,935,000 by New York MTA. The average amount is USD 381,260,000 with skewness of 1.72 and a kurtosis of 4.81. As Z-Skewness= Skewness / sqrt (6/N) > +1.96, therefore, it has left tendency, while Z-Kurtosis = Kurtosis / sqrt (24/N) > +1.96 which is lower curve (platikurk). This means that the amount of climate bond is more likely towards the left of mean amount of tendency, but the number is spread out in the range of a low curve.

Table 4. Descriptive statistics of climate bonds

| Minimum Statistic | Maximum Statistic | Mean Statistic | Std. Deviation Statistic | Skewness | Std. Error | Kurtosis | Std. Error |
|-------------------|-------------------|----------------|--------------------------|----------|------------|----------|------------|
| Amount in USD     | 138,504.00        | 2.17E9         | 3.8136E8                 | 1.728    | .261       | 4.813    | .517       |
| Length            | 1.00              | 47.00          | 14.5529                  | 12.62415 | .921       | -.659    | .517       |
| Valid N (listwise)|                  |                |                          |          |            |          |            |
Climate bond should match with the payback of the project, and thus it has a long-term period of maturity. Pearson’s correlation shows that there is no correlation between the amounts of climate bond issuance and the length of issuance (Table 5). This means that the larger amount of climate bond issuance does not affect the length of issuance. This fact may be not good because there should be a positive correlation between the two variables. A larger amount of issuance requires a longer period to be recovered for the green project.

![Climate Bonds Taxonomy](image)

**Figure 2.** Sector composition in percentage  
Source: Climate Bond Initiative 2017[3]

| Amount in USD | Pearson’s Correlation | Sig. (2-tailed) | N | Length |
|---------------|------------------------|-----------------|---|--------|
| USD           | 1                      | .007            | 85 | 85     |

The condition is illustrated in Figure 3, whereas the larger amount of climate bond issuance does not affect the length of the bond period. Another factor may affects this condition, since the average period issuance is 14.1 years. This is similar to Lazurko and Venema [5] in which the analysis was on the period of climate bond, while the preferable climate bond period is 15 years.
5. Conclusion
Climate bond is a unique financing for green projects that may be different from the green bond. The dominant currencies of green climate are Euro and US Dollar, which are the largest second issuance. The interesting issue is sector classification since CBI has not provided a classification for all sectors. However, in fact, some sectors are specified although CBI does not state the standards. Most of the climate bond projects have a long period which are proportional to the longer payback period.

References
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