

A Work Project, presented as part of the requirements for the Award of a Masters Degree in
Management from the NOVA School of Business and Economics.

**Financing Green Development: ‘Climate Bonds’ as a Solution for Institutional Investors
Engagement**

Author’s Name: Paulo Ricardo Rua Aguiar

Student Number: 15000771

A Project carried out on the Applied Policy Analysis course, under the supervision of:

Professor Maria Antonieta da Cunha e Sá

Lisbon, January 07, 2013

Abstract

Financing Green Development: ‘Climate Bonds’ as a Solution for Institutional Investors’ Engagement

This study examines whether ‘climate bonds’ are achieving the desired investment scale to tackle climate change and whether those bonds are being issued with features that are attractive to institutional investors. Several cases of climate bond issuances, especially by companies were analyzed. While investor’s interest in climate bonds exists, this market is still small and investors are not being offered with an attractive investment scale. As the results indicate, both credit enhancements and aggregation vehicles to enable scale investments are possible solutions to boost the climate bond market.

Keywords: renewable energy, institutional investors, climate bonds, investment scale.

Table of Contents

- 1. Introduction 1
- 2. Literature Review 4
 - 2.1. *Financing through Bonds – ‘Targeted Bonds’* 4
 - 2.2. *Green Finance Solutions – ‘Climate Bonds’* 5
 - 2.3. *Green Bond Requirements and Key Success Factors*..... 6
- 3. Analysis of Climate Bond Financing Cases..... 7
 - 3.1. Resume table of the bond financing cases analyzed 9
 - 3.1.1. Bonds Issued by Renewable Energy Companies..... 10
 - 3.1.2. Bonds Issued by Multilateral Institutions and Development Banks 16
 - 3.2. Discussion and Conclusions 17
- 4. Conclusion 20
- 5. References 21

1. Introduction

It is clear nowadays that urgent action needs to be taken among governments, corporations and the public to tackle climate change. “The transition to a low-carbon and resilient economy, and more broadly, a “greening growth” over the next years will require significant amounts of capital from fossil fuels and resource-intensive and polluting technologies to newer, clean technology and infrastructure.” In order to achieve this goal, appropriate policy frameworks and financial tools need to be provided to drive the additional invested capital (sources of private capital in a much larger scale than the current ones) towards the greening and phase-out of these “long-lived black-assets” (Della Croce, Kaminker, & Stewart, 2011).

After the 16th United Nations Framework Convention on Climate Change (UNFCCC) Conference in Cancun, in 2010, the involved parties agreed that an amount of approximately US\$1 trillion¹ would be raised annually by 2020, from both public and private funds in order to support climate change mitigation projects and initiatives in developing countries. However, as a result of the global financial crisis and self-imposed austerity measures, banks and governments have been forced to cut their support and lending to renewable energy [RE] investments.

According to EU’s annual report on RE investment trends, several European governments are not able to keep up with their previous investment levels in energy efficiency and green projects, and have cut in their support to RE in order to alleviate short-term gaps. Some of these cuts have been registered in feed-in tariffs initiatives, in Germany, Italy, Spain, Czech Republic and other countries. Spain and Czech Republic have made cuts for feed-in tariffs in projects that were already set, hampering the investment in the sector, while Germany and Italy are also reducing the feed-in tariffs.

¹ International Energy Agency estimates also an investment need of US\$1 trillion by 2020.

Henceforth, the role of private sector in financing the mitigation of climate change is at stake, because it is within the strategic and institutional investors that the majority of resources and capacity are available to finance green projects' high capital expenditures and help in the transition to a green economy.

Following the Strategic Framework for the World Bank Group technical report of 2008, the UNFCCC study estimates that the private sector has a capacity to provide 80% of funding to cover the costs of adaptation and mitigation of climate change. The private sector has already contributed with over 75% of total investment in renewable energy initiatives in developing countries², especially through the participation of Multilateral and Bilateral Development Banks. However, even that exceptional level of activity is still modest to face the world's total green infrastructure financial needs.

Clean energy markets are pretty small at the moment, according to Bloomberg New Energy Finance [BNEF] an amount of \$260 million was invested during 2011, a number that lies behind the amount required in the context of what needs to be accomplished. Moreover, much of this amount was financed through the balance-sheets of power companies, which are supported by syndicated bank loans and investments from multilateral entities and agencies mentioned before.

“There is however a source of finance that there is not explored at its full potential and that needs to be tapped to fund these large scale green energy projects more actively. And that is the bond market, which is currently worth \$100 trillion, in contrast to the last few years, when it used to be smaller than equity capital market, now worth only \$55 trillion”. The bond market will allow the diversification and exploring new capital

² India's clean energy sector for example, saw an increase of 54% to \$10.2 billion in private investment during 2011, in the biggest part mostly due to its India Solar Mission Program, with the goal of 20 GW of solar power installed until 2010, which collected investments of \$4.6 billion. Information available in the link: <http://www.projectsmonitor.com/MISC/private-investment-up-in-indias-clean-energy-sector>

sources into the energy market, as Sean Kidney³ encouraged in his speech in BNEF summit in New York, 2012. Bonds are a potential financing source to attract institutional investors to finance green initiatives and projects, namely pension funds, sovereign well funds, insurance funds and foundations as they owned a total of \$70 trillion in assets in 2009 under management⁴, of which 50% to 60% are made of bonds.

So the question is how to attract these investors to support RE initiatives? Among guarantees, asset-backing and other features, one of the most important requirements is scale, and at the moment the clean energy market is made of many small investments, and very few reach the scale of the biggest clean energy projects capable of tapping their investments with bond offerings (like the Topaz project).

With that being said, ‘climate bonds’ issued so far by companies, multilateral institutions and banks like the European Investment Bank or the World Bank, are presented as possible solutions to help tackling the climate change issues and help financing green project initiatives.

In this study I attempt to assess whether a possible solution to engage the private sector in renewable energy financing can be found via bonds, which as it will be described were an important financing source to support public infrastructures in the past and are already being issued to fund green energy initiatives and projects through ‘Climate Bonds’, both by multilateral institutions and companies. Considering such high capital expenditures with long-life projects required by RE technologies, these ‘climate bonds’ seem to be considered as a more attractive solution for institutional investor’s engagement due to their preference for long term investments.

³ Sean Kidney is Chair of the London-based Climate Bonds Initiative. He has a20 years’ experience working with Government, pension funds and NGOs on social change.

⁴ Michael Mendelsohn, February 2012, Tapping the Capital Markets: Are REITs Another Tool or Toolbox? Article available at: <https://financere.nrel.gov/finance/content/capital-markets-reit-real-estate-investment-trust-renewable-energy-project-finance-prologis-KIMCO>

2. Literature Review

2.1. Financing through Bonds – ‘Targeted Bonds’

Private debt financing instruments, namely bonds or debentures played a key role in the past, contributing to the funding of major infrastructure projects. They were targeted to invest in public infrastructures, like sewage systems, energy grids and hospitals, offering a guaranteed rate of return over a determined time span of 20 years or longer.

War bonds, seen as loans to the government to help financing military operations during war, in US or UK can be seen as targeted bonds. They were made affordable to everyone and sold for reduced prices. The return offered was below market value but they were recognized as a great effort to collect funds for the war. Similarly, local and state governments in the US have raised debt by issuing **municipal bonds**, since the mid-1800s allowing governments to borrow from private institutional investors to fund their projects.

Municipal Bonds in the form of revenue bonds⁵ were also widely used in England in toll roads, bridges and waterways during the 1770s. In the US, revenue bonds were used initially (until 1957) for construction, such as utility projects or local public housing projects, but lately (early 1960s) were applied to several other purposes: water, sewer, electric and gas systems, etc.⁶

Investors find this kind of bonds attractive because the interest income associated is exempt from federal income taxes, and sometimes also from state and local taxes. They have also a much lower default rate than corporate bonds (0.04% against 9.83%, between 1970 and 2002), being considered a safe category of investment, although with lower yields than corporate bonds (Fahim, 2012).

Those instruments described above are important examples of targeted bonds which proved to be extremely effective as a mean of advancing infrastructure developments in

⁵ A municipal bond supported by the revenues from a specific. Source: Investopedia

⁶ Alan Walter Series – Local Government Finance: Capital Facilities Planning and Debt Administration Available at: <http://www-personal.umich.edu/~steiss/page63.html>

several regions relying on a close working relationship between industry, finance providers and governments (Kidney S. , Mallon, Silver, & Williams, 2009). Although they have not been targeted at clean-energy or climate-friendly investments (except for US), they might be seen as attractive industrial options to involve individuals and institutional investors in climate mitigation support and financing green infrastructures (Mathews & Kidney, 2012).

2.2. Green Finance Solutions – ‘Climate Bonds’

Taking into account bond financing options directed to green infrastructures and climate-related investment opportunities, some programs were suggested in the last few years, under the tag of ‘Climate Bonds’ (Mathews & Kidney, 2012). These bonds have been issued mainly by three entities, namely, multilateral institutions, private companies and national and local government institutions, which collected over US\$15.6 billion by August of 2011 (Della Croce, Kaminker, & Stewart, 2011).

Bonds can be issued both by government entities and private companies to fund their initiatives. However, in this case to guarantee the repayment of the bonds it is convenient to have an asset-backed structure - Covered Bond.

Damerow, Kidney, & Clenaghan (2012) explain that existing frameworks can be used for a better application of covered bonds for funding RE projects. One of the most important features to the success of the issuance of the bonds is that the assets in the cover pool must be wrapped or guaranteed by supranational or government entities in order to broaden institutional investment (like the World Bank green bonds). “Through this mechanism, public sector investment can be leveraged to more effect than through support of single selected projects alone.” (Damerow, Kidney, & Clenaghan, 2012)

Government-backed guarantees can also be added to tax incentives as a form of financing. US Clean Renewable Energy Bonds (CREBs) are examples of tax-credit bonds

in form of a Federal Loan Program, which pay their holder a federal tax credit instead of interest, being issued with a zero percent interest rate.

2.3. Green Bond Requirements and Key Success Factors

Concerns over risk-return ratio trade-offs remain one of the most important features for investors in any kind of financing, henceforth, green bonds are no exception.

As Mathews & Kidney (2012) mention, for a ‘Climate Bonds’ market to flourish, the levels of risk influencing the return of investors cannot be greater than those of conventional government and corporate bond markets. Thus, for those bonds to ensure a robust structure they need to have *assets backing* their issues and some kind of *guarantees* (from multilateral institutions, export credit agencies or governments), as well as regular payments (either coupon interests or tax credits) resulting from the energy projects they are designed to support. Moreover, the *maturity* of the bonds needs to be adequately extended so that the energy projects have the time to repay investors in a better way than fossil fuel projects.

On the other hand, companies are not rated as highly as government bodies, and may be hampered by less favorable reputation in the markets even when their bonds are covered. Green bonds face the same risk, and a company issuing the bond would benefit from a control phase which could report to investors, the green investments’ potential environmental and social benefits (Morel & Bordier, 2012).

Solutions implemented in response to the liquidity and monitoring issues:

- 1) Use of “Special Purpose Vehicles”, which are a discrete business created around a project, with a legal form, allowing the lending and equity funds to be disconnected from other obligations or activities of a company (Justice, 2009), mainly used to isolate financial risk;
- 2) Enable private company’s bonds to be issued with public guarantees: Government and public guarantees were an effective way of supporting bank funding and to avoid liquidity crises and widespread bankruptcies, as well as reducing the likelihood of credit crunches

during and after the 2008 crisis (evidence can be found in (Grande, Levy, Panetta, & Zaghini, 2011). This solution can be found in several cases of RE financing, namely, in Italy and US (these cases will be mentioned later on during the work project);

3) Award a “green” or “climate” label to the bonds that have been issued to support clean energy investments, certifying that the funds raised via the bonds’ issuances are actually used to finance green energy projects and initiatives, protecting investors against reputational risk as well as to standardize climate bonds issuances in general.

3. Analysis of Climate Bond Financing Cases

According to BNEF report ‘Global Trend in Renewable Energy Investment’ of 2012, during 2011 there was an increase of awareness concerning the importance of green bonds for future investments in the clean energy sector, although the proportion of bond financing in total renewable investment is still small. In the same report it is estimated that there is an amount of around \$243 billion in green fixed-interest securities (\$186 billion in 2009), of which, \$233 billion are corporate bonds that were issued by companies in clean energy or low-carbon industries, and another \$10 billion issued by international financial institutions or project developers which fund the projects directly.

Recently, according to Climate Bonds initiative ‘Bonds and Climate Change – the state of the market in 2012’, since the Kyoto Protocol in 2005 there has been an amount of US\$174 billion in over 1,000 climate-themed bonds outstanding from 207 issuers, of which 82% are companies, followed by development banks and financial institutions (13%), project bonds (3%) and municipal bonds (2%).

Considering the bond market as a possible and additional solution to tackle climate change and finance renewable energy projects, it registered in the end of 2010 an outstanding amount of \$95 trillion, of which only \$174 billion are represented by a stake for climate-themed bonds by the middle of 2012. Although this number has grown in the

last few years, there is still a large potential for improvement in order to achieve a larger global investment scale through the issuance of climate-bonds, while only 1% of this whole vast bond market can make the difference.

Several institutional investors such as pension funds and insurance companies “are acutely aware of the macro risks of climate change; but they generally believe they lack information to shift their portfolio investments. Given a choice between green and black investments with a similar risk/reward profile, they say they will prefer green in recognition of those macro risks” (Della Croce, Kaminker, & Stewart, 2011).

Institutional investors are looking for securities which are asset-backed, inflation-protected, have long-term maturities to match their liabilities, a steady yield and a low correction for the rest of their portfolio. However, the majority of pension funds will tend to be more interested in lower risk investments (i.e. deployable renewables), which will provide a steady, inflation adjusted, income stream (Della Croce, Kaminker, & Stewart, 2011). Hence, climate-bonds fall under that category of fixed-income investments.

In the next part of this chapter, several cases of bonds issued by companies will be summarized in a table and then presented individually. The most important features of these climate bonds will be underlined and analyzed considering the preferred investment features required by an institutional investor (named before) and the “Green Bonds Requirements and KSF” (described in literature review), to assess whether current bond issuances are attracting institutional investors and analyze which features can make this market boost in the future.

The climate bonds analyzed within the scope of my project took into special account the corporate bonds issued by renewable energy companies in developed countries like the US, UK, Germany and Italy and also in developing countries like Mexico, South Africa and China and also green bonds issued by multilateral institutions like The World Bank Group, African Development Bank and Asian Development Bank.

3.1. Resume table of the bond financing cases analyzed

| Country | Project | Type of bond | Scale | Guarantee | Rate | Maturity | Yield |
|--------------|---------------------|--------------------------------|--------------------|-----------|------------|-------------|---------------------|
| US | Nine Canyon | Municipal Bond and CREB | \$141 Million | PPA | A2 | 22 | 5,85% |
| US | Shepherd Wind | Asset-backed Structured | \$1.9 Billion* | DOE | AAA/BBB- | 19 | Floating |
| US | Topaz Solar | Not secured | \$2.4 Billion** | PPA | Baa3/BBB- | 27,5 | 5,75% |
| Mexico | Oaxaca Wind | Not secured | \$298 Million | PPA | BBB- | 19 | 7,25% |
| UK | Ecotricity Bonds | Mini Bonds Unsecured | \$16 Million each | X | X | 4 |]6% - 7,5%] |
| UK | ReBonds | Mini Bonds Unsecured | \$10 Million | X | X | 4 |]7,5% - 8%] |
| Germany | Windreich | Corporate Small Business Bonds | \$97 Million | Listed | BBB+ | 5 | 6,50% |
| Italy | SunPower Andromeda | Asset-backed Structured | \$253,2 Million | SACE | Aa2/Baa3 | 18 | 5,715%/4,839% |
| Germany | Breeze II Bonds | SPV and Asset Backed | \$609 Million | SPV | B+/CCC | 20/10 | 4,524%/6,708% |
| World Bank | Green Bonds | 1st Issued bond | \$348,7 Million | | AAA | 6 | 3,25% |
| Total | | | <u>\$3 Billion</u> | | <u>AAA</u> | <u>3-10</u> | <u>]0,5% - 10%]</u> |
| AfDB | Clean Energy Bonds | | \$220 Million | | AAA | 3-7 | |
| South Africa | Ned Bank Bonds | Green Savings bond program | \$490 Million | | | | 7,50% |
| South Africa | IDC | Balance-Sheet level | \$636 Million | | | 14 | 9% |
| ADB | Clean Energy Bonds | | \$897 Million | | AAA | 3-7 |]4,4% - 7,18%] |
| China | Goldwind | Not Secured | \$476 Million | | | | |
| China | Yingli Green Energy | Not Secured | \$238 Million | | AA | 3/5 | 6,01%/5,78% |

Note: *\$1,2 Bilion on Debt; **\$1.3 Billion on Debt

3.1.1. Bonds Issued by Renewable Energy Companies

Starting with the US market, bond financing has already been used to support clean energy projects, namely, in the wind and solar sectors.

According to Sean Kidney, Davos speech⁷ “The US is a larger market with greater pools of capital, and a longer history of doing private placements”, and bonds have already been used throughout the country’s history to finance several causes, namely, war, infrastructure projects and renewable energy projects, as it was presented in the literature review.

Municipal bond market has been one of the most active in the country due to its advantages in comparison with other bonds, namely, the lower default rates and interest exempt from federal income taxes. Also, with the American Recovery and Reinvestment Act of 2009 several types of tax exempt and tax subsidized bond programs have been created to support renewable energy projects in the country.

In 2001, (municipal) bond market financing was used for the first time in the US to finance a big wind project, the **Nine Canyon Wind Project** by Energy Northwest, and the company was a pioneer and paved the way for other public power agencies to finance wind projects using the bond market and a new federal incentive, the CREB program.

Project risks were reduced via power purchase agreements⁸ [PPA] in the different phases, and also due to a strong internal liquidity and a stable operating performance history, a strong offtaker credit profile, as well as proactive actions taken by the project to offset the impact of the anticipated expiration of the turbines warranties. Those risk mitigants enabled the project to receive an A2 rating with a stable outlook by Moody’s rating agency.

⁷ Available at: <http://climatebonds.net/2012/01/8-point-plan/>

⁸ PPA is a long-term contract between the seller of energy and the purchaser. The existence of a PPA is a critical step in the development of any wind energy project in the sense that it secures a long-term revenue stream through the sale of energy from the project.

A scale obtained for a project like the **Shepherds Wind Farm** or **Topaz Solar Farm** is really uncommon among the total issuances of climate bonds. However there are differences between these issuances, as one of them (Shepherds) benefits from a governmental guarantee by the US governmental Department of Energy (DOE) and also an asset-backed structure whereas the other does not, which differentiates their bond ratings. Nevertheless, this was not a critical factor for Topaz Solar Farm bonds to obtain financing, as it did not benefit from a government guarantee and was seriously oversubscribed by more than \$400 million.

The project was financed with a 50% equity stake by the Warren Buffet's Berkshire Hathaway holding company, and despite not being guaranteed it was the first project to be rated by three top rating agencies, according to BNEF. The notes were rated Baa3 by Moody's, its lowest investment grade, and Standard & Poor's and Fitch assigned the debt an equivalent BBB-. Topaz Solar Farm issued on February 16 of 2012, \$850 million in 27.5-year amortizing bonds with a return rate of 5.75%, unsecured debt due in September 2039 (maturity date) that priced to yield 3.797 percentage points, which is more than similar-maturity Treasuries, according to data compiled by Bloomberg (3.8% higher than US Treasury Bills).

Another differentiator factor was the fact that the bond was not floated to public purchase reflecting a strong financial capability of the company to float this kind of debt without public participation (Meehan, 2012). The bond was predominantly bought by North American insurance companies, and a key feature is that it helps educating investors like bankers about the sector and technologies involved.

“Projects of this size are the offspring of the loan guarantee era, and may be much scarcer going forward”, (Lowder, 2012). This Topaz Solar bond seems like an atypical case of financing that resulted in success, especially due to the fact that it lacked a government guarantee, which is according to the literature review one of the important features required

in green bonds. However, the huge scale of investment was a major factor of motivation for private investors, as well as the good reputation and financial capability of the company that issued the bonds.

There are as well some important and encouragingly replicable elements for future bonds issuances, like both the PPA with a strong and creditworthy company (**Oaxaca Wind Farms** are another example with this feature) and the EPC contract which sets milestone clauses that will incentivize First Solar to meet its contractual obligations and keep up the level of future performance. Furthermore, solar projects are reportedly making returns of approximately 15%⁹ (with Topaz Solar Farm projections to be even higher at 16.30%) attracting the attention of institutional investors in solar-backed financial products.

Looking at the table presented before, we can see a large difference in scale from the bonds issued in the US in comparison with Europe. Although climate-themed bonds in other parts of the world like China or South Africa start to meet the attractable threshold desired by investors (above the US\$300 million according to IEA, 2012 'Tracking Clean Energy Progress' report), in Europe this amount is still behind that level, considering the financing cases presented, except Breeze II bonds.

Concerning the bonds in Europe, there is a large difference in terms of scale between the small retail bonds issued by corporations in UK and also in Germany with the Andromeda and Breeze II bonds. Most of the differences arise from the fact that the small green bonds in UK did not have a type of guarantee and an adequately extended maturity, and consequently (also due to their size) they had superior yields than the other European bonds analyzed, reflecting the risk factors associated.

⁹ Martin, Christopher, (March 20, 2012) - "[Solar 15% Returns Lure Investments from Google to Buffett.](#)" Bloomberg Businessweek.

However, they proved to be popular and were heavily oversubscribed in the case of **Ecotricity bonds**, suggesting that a strong customer database can also be a good factor attracting bond investors. Moreover, the bonds were opened to individual investors, charities, companies and trusts, with a minimum investment of £500 (in order to attract small investors), a similar strategy to the war bonds.

In the case of **Windreich bonds** in Germany, due to the bonds being tradable and rated with B+, together with a strong financial position and reputation of the company issuing the bonds, which is listed as one of the largest offshore wind companies in Germany with three of its projects in the top ten offshore wind farms in the country, gave investors additional confidence to invest in the bonds.

Very recently (November 2012), in UK the Pension Insurance Corporation (PIC), announced its £40 million (\$64 million) investment in a **Solar Power Generation Ltd bond**, the first ever UK publically-listed solar finance bond, which matures in 2036.

The bond is certainly a good match for PIC's pension liabilities providing highly predictable, inflation-linked cash flows for 24 years with a regulated and creditworthy entity, with a 3.6% coupon rate. The cash flows are expected to arise from the production of RE with payments coming from FITs regime for 25 years which decreases the risk associated.

The co-head of Asset Liability Management at PIC, Mar Gull says: "Infrastructure investments will become increasingly important for the holders of long term capital, such as insurers and pension funds, as they seek yield over and above that available on gilts, in a low risk structure. We will certainly look at other opportunities as they arise." These are certainly encouraging words for solar developer producers and for future bonds issuances.

Like a covered-bond, “**Andromeda Bonds**” were structured to have an asset-backed issuance, being the first tranche fully guaranteed by the Italian export credit agency SACE¹⁰ controlled by Italy’s Ministry of Economy and Finance, whereas the second tranche was sold exclusively via the European Investment Bank opening the doors for the other bond tranche to be successfully sold to insurance companies, mostly from Italy.

Monoline insurance companies used to be common prior to the financial crisis, and provided credit guarantees that transformed sub-investment grade securitizations into triple-A transactions. In the absence of these insurance companies, SACE provided a wrap for one of the tranches of these bonds, allowing a more attractive credit rating from Moody’s.

This was the first “bond secured against an Italian project financing, the first renewable energy project bond since 2008 financial crisis, and probably the first transaction in the post-monoline [momentum]”¹¹. Additionally, the huge amount of experience in solar power and the straightforwardness of the underlying asset and the guarantee from SACE convinced bond-holders and mitigated risk and concerns about failure and future payments.

Breeze II bonds had a great potential to succeed, especially due to the solution adopted by using a special purpose vehicle and, consequently, by diversifying some of the risk for investors they were easily subscribed by insurance companies, banks, pension funds and asset managers. However, recently the company has failed to meet some of its debt obligations with the bondholders and revealed some weaknesses in their financial structure.

Consequently, the rating of the two tranches of the bonds have decreased to unattractive levels of B+ and triple C not inspiring so much confidence to investors. Since one of the most

¹⁰ SACE is an Italian insurance and financial group active in export credit, credit insurance, investment protection, financial guarantees, securities and factoring activities.

¹¹ Article at Environmental Finance, (26 July 2011) – ‘Environmental Bond Issue of the Year’, available at: <http://www.environmental-finance.com/features/view/599>

important features of green bonds is that they are designed to pay its investors based on the mainstream revenues from the renewable energy projects they sponsor, it is important for a company or other entity that issues the bonds to guarantee that the studies concerning the energy conditions (wind, solar, etc..) are precise in order to mitigate as much as possible future risks that may arise in order to meet their future debt payments.

In **other countries**, especially developing countries which have greater needs, like South Africa, bond issuances with maturity adequately extended and scale of investment larger than the desired threshold begin to appear.

South African's Nedbank for example, plans to raise R4 billion (\$490 million) through a green savings bond program that will enable clients to invest in a flexible way with amounts as little as \$122. The bonds are designed for all the public, and clients with 60 years old or older will receive preferential interest rates, attempting to attract people that have their savings in bank deposits and don't know where to apply them.

Some important events are also happening in **China** regarding new ways of financing renewable energy. One of them is the adoption of Green Municipal Bonds, pioneered by JUCCCE, a non-profit organization which role is to enable multi-stakeholder collaboration to catalyze systemic change in the key drivers of energy use in China.

The first four pilots for municipal bonds were introduced in November 2011, and they are the cities of Shanghai, Shenzhen, Zhejiang and Guangdong. They will be allowed to issue debt on their own rather than through the central government, like the US states. Shanghai issued its first bond directly to investors in November 2011, (same yields offered for central governments). The bonds were rapidly subscribed, but with lower than expected yields.

This is an important step for China which is now in a good position “to open up a trillion plus dollar market in green municipal bonds to finance the greening of China” (JUCCCE).

Although the amounts issued with these climate bonds are higher than the ones being issued in Europe the yields offered are also higher, which reflects in most of the cases a country and company riskiness without a respective safe guarantee of an A rated bond. Oaxaca Farms, for example, had a PPA to counter some of the risk involved with its bond issuances and in one of the Chinese bonds presented there is a strong rating of AA by a credit rating Chinese agency.

3.1.2. Bonds Issued by Multilateral Institutions and Development Banks

As mentioned before, multilateral institutions and development banks have been really active in supporting green initiatives and clean energy projects, especially in developing countries through their issuances of green bonds. Around a total of \$US6.8 billion in green bonds was issued by multilateral institutions since 2006 (Della Croce, Kaminker, & Stewart, 2011).

A common feature of green bonds issued by multilateral institutions like the World Bank Group is the creditworthiness of the issuer, which automatically guarantees an AAA rating to the bonds. In comparison to green bonds issued by companies, especially if they lack a type of guarantee or an asset-backed structure it is an enormous advantage, since the majority of the bonds analyzed previously had a triple B rating or less.

We can see in the table presented before that the World Bank Group green bond program has the greatest contribution among other multilateral entities presenting also a larger number of transactions. The World Bank Group offers many possibilities for investments in green initiatives with different scales of investment and different maturities and yields, especially in the developing world countries. All of these multilateral institutions can add some risk premium to their yields by issuing bonds in other currencies, attracting in this way more investors who prefer to invest in other currencies that offer the same rate of investment (safe with triple A) than in their local currency with lower yields.

Although these multilateral institutions that have issued climate-themed bonds benefit from a good and attractive rating, they lack so far the scale of investment that issued bonds by companies can achieve, and generally offer lower yields and less extended maturities, in comparison to those offered by companies.

According to news from February 2012 on the European¹², the World Bank is planning to increase the size of its green bonds issues to a range of \$300 million to \$500 million as it recognizes that scale is necessary to attract large bond funds. Most of the bonds issued have been under the \$100 million, which fall off the radar of many large institutional investors, as well as it is not enough to reach the scale desired to tackle climate change.

3.2. Discussion and Conclusions

One of the first conclusions is that the quantity of financial support needed can only be raised if entities like multilateral organizations, export credit agencies or governments guarantee the access of investors to more efficient financing solutions like bonds, signing purchase contracts that enable companies to issue corporate bond or by taking part in renewable energy projects, assuming the position of a shareholder or an issuer, helping in this way in the risk mitigation of the renewable energy projects, enabling the project to receive an higher rating and therefore attract more institutional investors.

Additionally, governments, although restricted in financial capacity, can also continue to play an important role in the development of the green bonds' market by creating secure policy environments for clean energy technologies by providing them with the mentioned guarantees and tax incentives, like the Clean Renewable Energy Bonds program launched in the US.

According to the literature review, this is a solution implemented in response to the liquidity and monitoring issues. Covered bonds, as described, can be identified as a solution if adapted

¹² Available at: <http://www.the-european.eu/story-170/world-bank-to-issue-larger-green-bonds.html>

to renewable energy finance needs, especially, for bonds issued by companies which do not have strong credit ratings as the bonds issued by multilateral institutions.

According to IEA, 2012 ‘Tracking Clean Energy Progress’ report, a liquid green bond market requires at least an amount of bonds outstanding between US\$200 – US\$300 Billion, made up of bonds with a rating of BBB or higher. Considering the same report, the benchmark for the issuance size of the bonds to attract institutional investors is at least an amount of US\$300 million.

Comparing those goals and features with the results obtained from the financing cases studied we can see that the majority of cases analyzed have an issuance amount higher than the threshold presented by IEA, especially in US, developing countries (South Africa and China) and the Breeze II bonds in Europe. However, many bonds don’t get “off the ground phase” due to their small size. Oaxaca Wind farm had difficulty to get their bonds issued as it barely reaches \$300 million.

A second conclusion of this study is that a greater expansion of green bonds into the market requires smaller projects to be aggregated in order to present institutional players with suitable deal flow and a desired investment threshold of at least US\$300/\$500 million. Therefore, and, quoting the Climate Bonds Initiative last report on the state of the market, aggregation vehicles are needed to “take assets off bank balance sheets, lower the cost of capital, recycle funds into new investments and issue securities at scale to achieve entry onto indices tracked by large investors”.

A possible solution for the aggregation of such smaller projects is the creation of Green Investment Units and Banks to channel funds directly to green initiatives¹³ by grouping

¹³ As an example the United Kingdom’s new Green Investment Bank will play a role in greening the economy, by issuing various types of green bonds in the future, which will enable the market to grow.

projects that have similar features and characteristics, with special focus of activity in less developed countries, which have weaker financial structures to support their renewable energy investments, according to literature.

Initiatives like the “Project Bond Initiative” developed by the European Union is a good example for the future of climate bond issuances, providing support to project companies issuing bonds to fund large-scale infrastructure projects, aiming to access new pools of capital from institutional investors and creating mechanisms for enhancing the credit rating of bonds working similarly to a guarantee.

Finally, taking into account the financing case of Breeze Bonds II, despite having asset-backed structures, through the use of a special purpose vehicle to diversify the risk, companies issuing the bonds need to guarantee the repayment of their bonds, according to the projected performance in due time of coupon and principal payments.

That did not happen in CRC Breeze Finance, which saw a decrease in their bond ratings by rating agencies. Since investors most of the times base their investments on rating agencies “opinions” on securities, a company needs to guarantee the feasibility of their studies (technical and or environment factors), and if for any reason the company cannot repay the bonds from the revenue streams generated by the products, it must use other options, namely their balance-sheets.

A strong and healthy financial structure of a company has demonstrated in several cases of bond financing (i.e. Topaz, Windreich) that despite of some bonds not possessing a guarantee by a governmental body or other institution, investors subscribe to bonds issued by creditworthy companies which demonstrate to have a capability to repay their debt obligations. Henceforth, investors would be safer if a company or other entity issuing the project bonds has this robustness.

According to the analysis performed, there were few bond financing cases that adopted a similar structure of the war bonds described in literature, which aimed at the contribution of a large part of the population, by making bond purchases available at little amounts. A similar example can be found in the ReBonds and EcoBonds in UK, which were oversubscribed despite not being guaranteed. Climate change has a similar and important need for financing as the one government had for financing their military operations.

In a similar way, municipal and infrastructure bonds, commonly used in the past to finance public infrastructure and energy systems, are not being widely used among countries to finance their renewable energy initiatives, with the exception of the US (Nine Canyon Wind Farm) and now China that is starting to make a move in this new market. Municipal bonds have been mostly used to tap basic energy infrastructure needs; however this kind of bond has several advantages compared to other bond issuances, and could potentially create new opportunities for green bond market growth in the future.

4. Conclusion

It is imperative for private sector to bear a large part of the responsibility for delivering a low-carbon economic transition, especially due to the tight financial conditions that many governments are experiencing. One of the immediate objectives of this study is to examine whether a climate bond market can bring innovative stimulation from banks, issuers and policy-makers alike to attract a broad range of institutional investors to contribute for the bridging of the financing gap that currently exists.

We can see from the financing cases studied that a climate bond market presents an opportunity to stimulate private investment in the renewable energy sector offering securities which are designed to fit in the portfolio requirements of institutional investors. The climate

bond market, despite small in comparison to what can be achieved taking into account the total of \$95 trillion estimated for the bond market, is growing strongly each year as more investors seek to engage in low-carbon economy and infrastructure investments.

Nevertheless, as this study shows, potential purchasers of these products are not being offered appropriate investments on a large enough scale, like the Topaz Solar bond. Hence, the discussed aggregation vehicles and continuous creation of Green Investment Units and Banks to channel funds directly to green initiatives are a crucial step for future bond issuances as literature also defends.

Finally, as some financing cases analyzed suggest, governments can still play a major role signaling the attractiveness and potential of this investments to institutional investors, either by supporting the market directly through the creation of attractive policy environments, enabling preferential tax treatments (not taxing the interest on the bonds (CREBs or municipal bonds, i.e.)), replicating policy environments previously enjoyed by fossil fuel industry or by switching fossil fuel subsidies to green energy solutions, and through the provision of partial guarantees (which can also be sought from multilateral institutions, banks or export credit agencies like the Andromeda Bonds example).

5. References

- Atteridge, A. (2011). "Will Private Finance Support Climate Change Adaptation in Developing Countries: Historical Investment Patterns as a Window on Future Private Climate Finance". *Stockholm Environment Institute working paper*.
- Damerow, F., Kidney, S., & Clenaghan, S. (May 2012). "How Covered Bond markets can be adapted for Renewable Energy Finance and how this could Catalyse Innovation in Low-Carbon Capital Markets". *Climate Bonds Initiative discussion paper*.

- Della Croce, R., Kaminker, C., & Stewart, F. (2011). "The Role of Pension Funds in Financing Green Growth Initiatives". *OECD Publishing, Paris*.
- Fahim, M. (2012, March 20). "Municipal bonds have been issued by US local governments since 1812". Retrieved from City Mayors: <http://www.citymayors.com/gratis/authors-mayraj-fahim.html>
- Furber, S. (February 2012). "European bond finance: a time for alternative sources of capital". *Infrastructure Journal*.
- Grande, G., Levy, A., Panetta, F., & Zaghini, A. (2011). 'Public Guarantees on Bank Bonds: Effectiveness and Distortions'. *OECD Journal: Financial Market Trends; Volume 2011 - Issue 2*.
- Justice, S. (December 2009). Private Financing of Renewable Energy – a Guide for Policy Makers. *Bloomber New Energy Finance publication*.
- Kidney, S., Mallon, K., Silver, N., & Williams, C. (December 2009). Climate Bonds Initiative: Financing a rapid, global, transition. *Climate Bonds Initiative draft or discussion*.
- Leigland, J. (1997). "Accelerating municipal bond market development in emerging economies: An assessment of strategies and progress". *Research Triangle Institute*.
- Lowder, T. (2012, March 3). *Financere, National Renewable Energy Laboratory*. Retrieved July 7, 2012, from "MidAmerican Takes Solar Out to Wall Street": <https://financere.nrel.gov/finance/content/midamerican-solar-thin-film-utility-scale-project-topaz-550-MW-megawatt-bond-financing>
- Mathews, J., & Kidney, S. (2012). "Financing climate-friendly energy development through bonds". *Development Southern Africa, Volume 29, Number 2, 337-349(13)*.
- Meehan, C. (2012, February 24). "MidAmerican Holdings' Topaz Solar Farm bonds prove widely popular". Retrieved July 8, 2012, from Clean Energy Authority: <http://www.cleanenergyauthority.com/solar-energy-news/midamerican-holdings-topaz-solar-farm-bonds-022412>
- Morel, R., & Bordier, C. (May 2012). "Financing the transition to a green economy: their word is their (green) bond?". *CDC Climat Research, n° 14*.
- Natter, R. (May 2011, May). "Covered Bonds". *Barnett Sivon & Natter P.C.*
- Reichelt, H. (2010). 'Green Bonds: a model to mobilize private capital to fund climate change mitigation and adaptation projects'. *The Euromoney Handbooks*.
- Wohlgemuth, N., & Painuly, J. (2003). 'Promoting Private Sector Financing of Commercial Investments in Renewable Energy Technologies'. *Proceedings. Testing new policy approaches. United Nations, New York, 319-334*