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**HOW “GREEN” ARE *GREEN*
BONDS?**

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Johns Hopkins Institute for Applied Economics,
Global Health, and Study of Business Enterprise



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By Jeremy Fraenkel and Jackson Adams

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About the series

The *Studies in Applied Economics* series is under the general direction of Professor Steve H. Hanke, Co-Director of the Institute for Applied Economics, Global Health, and the Study of Business Enterprise (hanke@jhu.edu).

This working paper is one in a series on currency boards and other Economic topics. The authors are Research Assistants at the Institute for Applied Economics, Global Health, and the Study of Business Enterprise at The Johns Hopkins University in Baltimore, MD.

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Summary

A green bond is a bond aimed to finance investment linked to environmental benefit. This paper discusses the current state of ambiguity surrounding the definition and application of green bonds and offers two methodologies to measure investment impact towards *green* initiatives. Data utilized in the analysis were gathered by surveying all companies that have been known to issue green use of proceeds bonds in the past.

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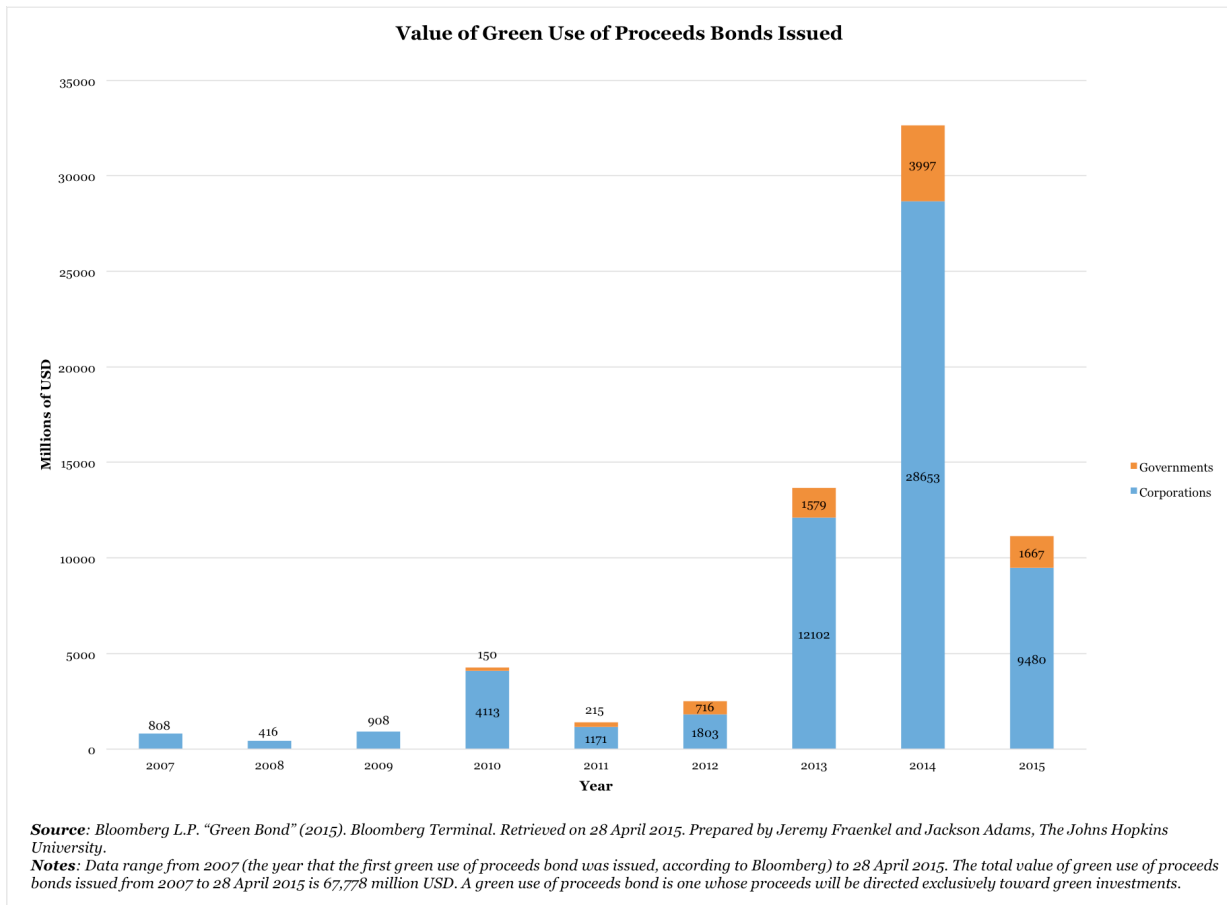
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Introduction

Cheap capital is the dream of every corporation, and the financing option *du jour* is green bonds. 2014 was a record year for new issuances (see Figure 1).

Figure 1



Green bond issuances often become oversubscribed within hours, or even minutes.¹ Thus, the cost of capital associated with green bonds is low, and the process of financing is relatively quick. Fixed income investors want green bonds because they are designed to have similar credit

¹ Leguet, Benoît. "Financing the Transition to a Green Economy: Their Word Is Their (Green) Bond?" Climate Brief. 1 May 2014. Accessed on 14 August 2014. http://www.cdcclimat.com/IMG/pdf/12-05_climate_brief_14_-_financing_the_transition_to_a_green_economy-_their_word_is_their_green_bond.pdf.

risks and returns when compared to conventional bonds, with the addition of an attractive environmental profile.²

What is a Green Bond?

So the obvious question arises: what makes a bond “green?” A few tentative definitions have been offered. For instance, CDC Climat says, “The term ‘green bonds’ applies to bonds aimed at financing investments with an environmental benefit or focus on reducing vulnerability to environmental changes.”³ Such academic definitions are, however, trite and imprecise. They fail both to create replicable market standards for what makes a green bond “green,” and to provide a metric by which to compare one bond to another. The impreciseness of the definition itself renders it hard to pinpoint when the green bond market came into existence. Some agencies such as CDC Climat believe that 2006 was the year of the first green bond, while others, such as Bloomberg News, claim it was 2007.^{4, 5} With no means of comparison, the market is a true Wild West. And without standardization, markets fail to mature. This paper therefore aims to find a meaningful metric by which all green bonds can be scrutinized.

Market Size and Composition

² "The Green Climate Fund (GCF): The Private Financial Sector's Perspective." UNEP Finance Initiative, August 2011. Web. 11 September 2014. <https://unfccc.int/files/cancun_agreements/green_climate_fund/application/pdf/unep_fi_submission_on_private_sector.pdf>.

³ Leguet, Benoît.

⁴ Bakewell, Sally, and Reed Landberg. "Green Bond Bankers in Japan, Sweden Beat U.S. to \$7 Billion." *Bloomberg*. 24 January 2012. Web. 27 August 2014. <<http://www.bloomberg.com/news/2012-01-23/green-bond-underwriters-from-japan-to-sweden-top-u-s-in-7-billion-market.html>>.

⁵ Leguet, Benoît.

As enthusiasm runs high for green bonds, it is particularly worth exploring just how large the green bond market is.⁶ In only a few short years, green bonds have come to constitute an extensive array of financing tools: green gilts, green retail bonds, green investment bank bonds, green infrastructure bonds, linked carbon bonds, climate bonds, etc.⁷ The US government has also added its fair share to the green bond list, including Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs), among others.^{8,9} This excludes other green financial instruments – like loans and equities – which are a different matter entirely.

The market for green bonds is by no means small. The 71 issuers of Green Use of Proceeds bonds alone dispensed the equivalent of more than 67 billion U.S. Dollars between May 2007 and April 2015. The most common issuers of green bonds to date are supranational organizations (41.1%), which are predominantly headquartered in Europe. For instance, the European Investment Bank was among the first to utilize the “green” designation for its bonds.¹⁰

Figure 2

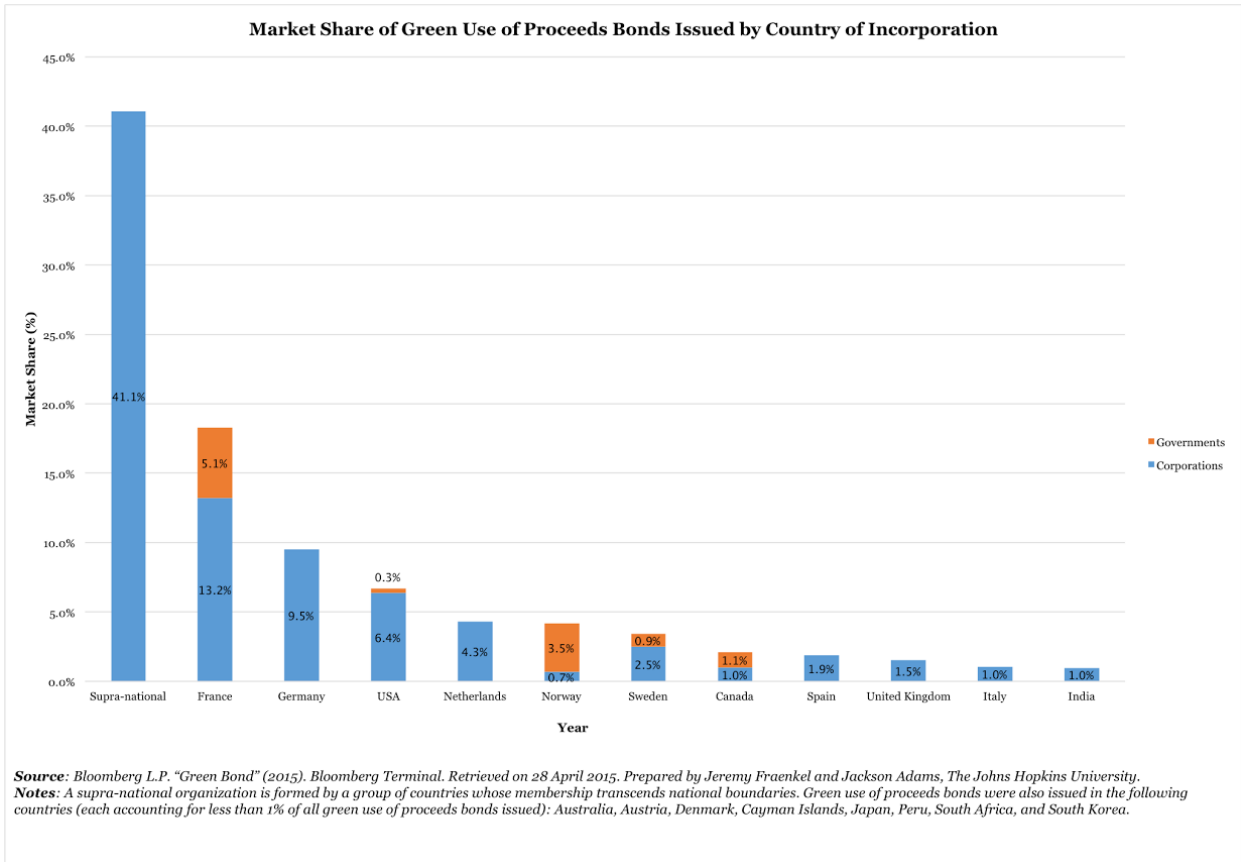
⁶ Atkins, Ralph. "Are Green Bonds a Fair Weather Phenomenon?" *Financial Times*. 29 January 2015. Web. 30 January 2015. <<http://www.ft.com/cms/s/0/af74028a-a708-11e4-8a71-00144feab7de.html#axzz3RVxaA47u>>.

⁷ Della Croce, R., C. Kaminker and F. Stewart (2011), "The Role of Pension Funds in Financing Green Growth Initiatives", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 10, OECD Publishing.

⁸ "Qualified Energy Conservation Bonds." DSIRE. 9 July 2012. Accessed on 20 August 2014. http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US51F.

⁹ U.S. Department of Energy. "Clean Renewable Energy Bonds." Energy.gov. Accessed on 20 August 2014. <http://energy.gov/savings/clean-renewable-energy-bonds-crebs>.

¹⁰ "Expanding Bond Market for Green Projects." *JP Morgan Chase & Co.* Web. 13 September 2014. <<http://www.jpmorganchase.com/corporate-responsibility/green-bonds>>.



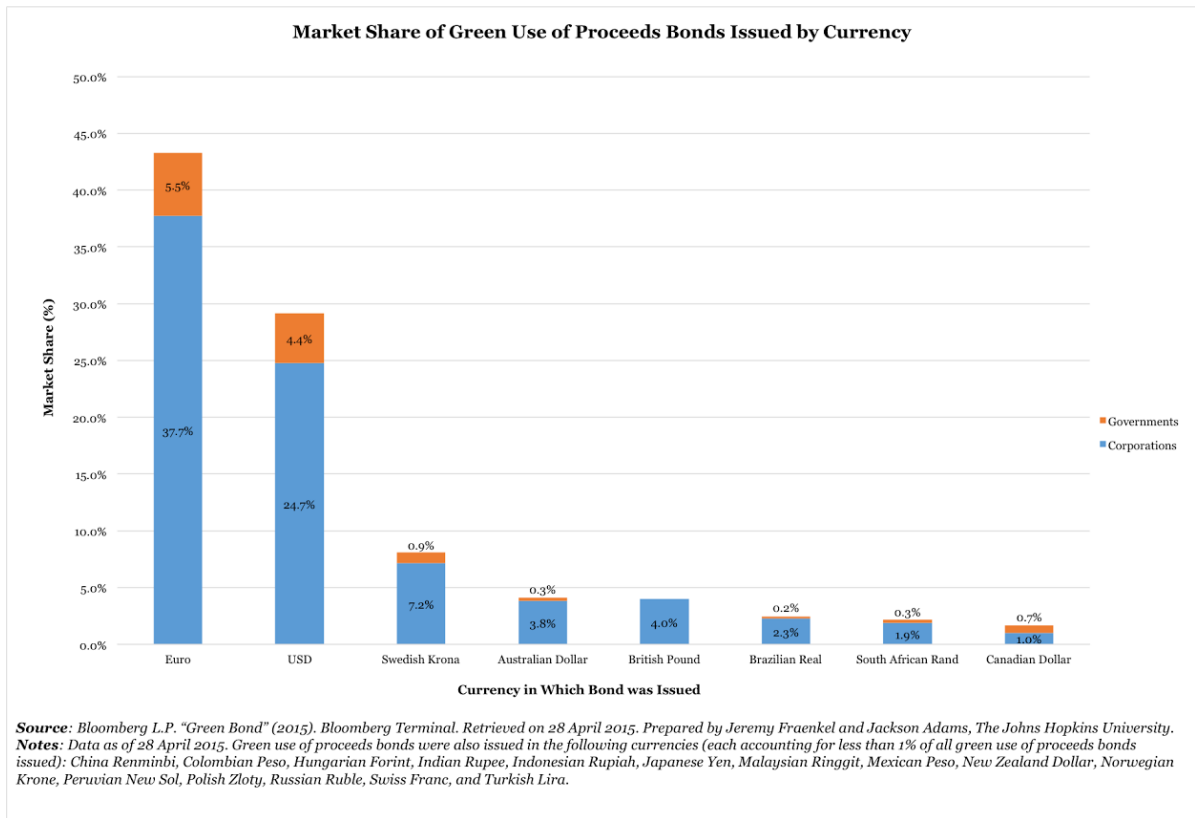
It thus comes as no surprise that 45.8% of green bonds are incorporated in Europe, as opposed to a mere 6.7% in the United States (see Figure 2).¹¹

Europe captures the currency market with 43.3% of the outstanding green bonds issued in euros, compared to only 29.2% in United States dollars (USD) (see Figure 3).¹²

Figure 3

¹¹ Bloomberg L.P. "Green Bond" (2014). Bloomberg Terminal. Johns Hopkins University, Baltimore, MD. Retrieved 28 April 2015.

¹² Ibid.



However, U.S. firms are slowly emerging in the green bond market, thus improving the likelihood of a larger portion of the green bond market being denominated in USD. Clearly the market for green bonds is fairly sizeable and is becoming increasingly diverse.

Green Ratings

Survey Method Used to Determine Companies' Green Bonds Standards

Replicability and transparency are both crucial in a world that mixes environmental science with multimillion-dollar business deals. Even as academics start to crack down on the shady issue of “irreplicability,” investors seem to have no qualms thus far accepting *ad hoc* definitions

of “green.”^{13, 14} With this in mind, we endeavored to survey a sizeable portion of the market to figure out what sort of standards issuers held themselves to when distributing *green* bonds. Our survey covered all 71 issuers of Green Use of Proceeds bonds between May 2007 and April 2015.¹⁵

The 71 surveyed companies were divided into two separate classes: those with clear methodology and those with unclear methodology. These categories were then subdivided into those who use versus those who do not use an external framework/third party review (see Table 1).¹⁶ The former group is comprised of organizations that rely on an external framework to define their green bonds, or have an independent third party reviewing their bonds. The two overarching classifications are defined as follows:

- A. Clear Methodology: There is little to no ambiguity regarding the impact of investors’ money. An investor can assess the direct environmental impact of his investment (e.g. how many tons of Carbon dioxide equivalent (CO_{2e}) will be reduced per dollar invested).
- B. Unclear Methodology: Companies do not satisfy the parameters of the “clear methodology group.” They fail to explicitly define the impact of the investors’ money.

¹³ "Metaphysicians." *The Economist*, 14 March 2014.

¹⁴ Many organizations and studies have pointed to the importance of reproducibility. Examples: SEM (Society for Economic Measurement) and Ioannidis JPA (2005) *Why Most Published Research Findings Are False*. *PLoS Med* 2(8): e124.

¹⁵ See Appendix B for an example of a sent letter.

¹⁶ No names of organizations are revealed in this taxonomy due to the many requests of anonymity. These values were retrieved on 28 April 2015.

Table 1

	Clear		Unclear	
	No Use of External Framework/ Third Party Review	Use of External Framework/ Third Party Review	No Use of External Framework/ Third Party Review	Use of External Framework/ Third Party Review
Number of Companies	1	1	25	44
Percent of Total	1%	1%	35%	62%

The table keeps all but one organization anonymous to avoid damaging the reputation of any company or organization. The African Development Bank (AfDB) is identified to provide a positive example of oversight in the issuance of green bonds. Over 97% of the surveyed companies use *ad hoc* or unclear definitions of the “green” appellation in the context of bond issuance. The data received from those 69 companies is vast and vague. Some organizations employ entire sustainability departments that were happy to offer an explanation of recent green bond issuances and send out accompanying investment presentations and bond prospectuses. Other companies contrastingly offered fairly generic public relations material. For instance, one company sent a video that had little to do with concrete *green* principles. However, all failed to offer a concrete methodology for measuring greenness. Examples of unclear responses are reproduced below:

1. *“[Our] green bond will finance projects that contribute to fight climate change.”*

This is arguably the vaguest response received. How can one quantify the bonds' success "fighting" climate change? What aspects of climate change (greenhouse gases, water pollution, etc.) will they focus on? This line is effective for marketing purposes but lacks substantive financial or environmental guidelines.

2. *“The funds of this bond issue will be used to finance [company name] growth not only in renewable energy projects such as wind farms and hydroelectric plants, but also in energy efficiency projects such as remote (smart) metering and the construction of integrated district heating networks powered by low-emission biomass plants.”*

This offers slightly more insight, but is still unclear as to what constitutes “energy efficiency” and “low-emission.” It is also vague in explaining what the actual environmental impacts of the projects will be. Offering a more thorough explanation of what green bonds fund is a good start, but this explanation still fails to provide key information to the investor regarding how “green” their bonds actually are.

3. *“At the moment, it is difficult to draw very specific boundaries around what could qualify as activities eligible to green bonds. What matters most at this stage of the market is that issuers be completely transparent as to what they intend to finance when issuing a bond that they label as 'green'. This will allow investors to make an informed decision based on their own perspective on green investments.”*

This particular company is transparent and admits there is no clear definition of “green” in the bond market. Unfortunately, admitting that the green bond market lacks standards does

not make the lack of standards any less problematic. Without offering a solution, pointing out an obvious problem does not mitigate the issue.

Other companies refused to respond. Many claimed that the framework is proprietary or still in development. Regardless of the reasoning, withholding green bond standards defeats the purpose of a sustainable investment. If a company decides to attach the prefix “green” to its bonds, it should disclose its standards. Otherwise the investor is accepting with blind faith that the company is accurately representing its bonds. It is not unlike a firm issuing bonds and promising its investors that it is creditworthy without offering any financial information to back up that statement. This leaves out crucial information and evidence.¹⁷

All of the “unclear” answers cited above fail to provide clear criteria to define *green* bonds. The fact is that no specific targets, numbers, percentages, impact factors, principles, parameters, etc. are offered.¹⁸ Not only is a majority of the previously-mentioned questions left unanswered, but the responses also fail to show the paradigm effect of these bonds – an investor’s impact on the environment. Caveat emptor is particularly appropriate in the green bond market. Indeed, it is the onus of the investor to complete the due diligence necessary before investing. This raises a troubling question: are companies concerned with the environment or do they use green bonds merely as marketing tools to rapidly raise cheap funds?

Despite the failure of most firms to provide or adhere to a replicable universal definition for green bonds, two of the seventy-one surveyed companies did provide clear methodologies.¹⁹ The

¹⁷ Several companies are shockingly not even aware of their own operations. For instance, we reached out to a particular company after verifying on *Bloomberg L.P.*, in newspapers (such as the *Financial Times*) and on documents published by a second-party opinion that they had been issuing green bonds. However, they categorically affirmed that they had never issued any such bonds. The name of the company is not listed to preserve its anonymity.

¹⁸ Hanke, Steve H., and Heinz Schimmelbusch. "On Measuring Greenness: A New Enabling Metric, Please." *Stern Stewart Institute Periodical* June 2014: 58-63. Print.

¹⁹ Only one of two companies/organizations classified as “Clear” is listed to provide an example. The other name is not listed to preserve anonymity of the 71 who were unclear.

African Development Bank (AfDB), for example, allows an investor to measure his/her impact factor.” The AfDB indeed provides a figure showing the tons of CO₂ (or equivalent) that will not be emitted to the atmosphere for every dollar invested (see Table 2).²⁰

Table 2

Amount Invested	Lifetime GHG emissions reduced or avoided (in tonnes CO ₂ e)
\$ 1,000	21 tonnes
\$ 10,000	208 tonnes
\$ 100,000	2,078 tonnes
\$ 1,000,000	20,783 tonnes
\$ 5,000,000	103,917 tonnes
\$ 10,000,000	207,833 tonnes

This is a transparent and replicable standard that could be adopted by other organizations. With this, investors are given a means to measure the true impact of their investment on the environment. These metrics also mean the organization is accountable to its creditors for reaching its goal. It cannot take the money and run, so to speak.

There remain, of course, some unanswered questions such as what threshold qualifies a bond as truly green. However, the market can work out such technicalities over time. If the AfDB impact factor measurements start to gain traction as the standard for evaluating green bonds, it is inevitable that this metric will enable the market to reach equilibrium for greenness. Although some organizations do report an annual or aggregate GHG (Green House Gas)

²⁰ "The AfDB Annual Green Bond Newsletter." *African Development Bank Group*, Issue 01, May 2014. Web. 26 August 2014. <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Green_Bonds_Newsletter_-_Issue_N_1_-_May_2014.pdf>.

emission reduction, the individual investor still cannot evaluate the impact of his own investment.²¹

Classification of Green Bonds by Third Party Agencies

Within the classifications of 'clear' and 'unclear', companies were further divided into whether or not they use an external framework. In total, forty-four companies referred to outside groups or frameworks in their green bond principles, such as Climate Bonds Initiative, Equator Principles, CERES, CICERO and LEED. Presently we will analyze some of these external frameworks and see why many suffer from the same drawbacks, namely irreplicability and a lack of standardization.

It should first be noted that using external frameworks has the potential to make direct comparison of different bonds possible. The “green” aspect need not be scrutinized if companies are not building their own framework. These external agencies offer a potential solution to the slew of ad hoc “*green*” definitions that have inundated the market, if they do not make the same mistakes that some of the issuing organizations have made.

CERES

The Coalition for Environmentally Sustainable Economies (CERES) is a charity that, according to its website, seeks “to bring environmentalists and capitalists together to forge a new sustainable business model, one that would protect the health of the planet and the long-term

²¹ "International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting." *World Bank*. August 2012. Web. 13 September 2014.
<http://www.worldbank.org/content/dam/Worldbank/document/IFI_Framework_for_Harmonized_Approach_to_Greenhouse_Gas_Accounting.pdf>.

prosperity of its people.”²² CERES publishes research on almost all economic sectors, including extensive work on the economics of environmental sustainability.²³ Among its publications is a yearly report on green bond principles. This piece contains important information regarding types of green bonds, reporting standards, etc. It provides a reasonable outline of the green bond market, albeit one lacking in specifics. Under the reporting section of the document, it is recognized that, “there is variability in impact measurement standards.” The report goes on to discuss that “much progress has been made,” but it has yet to solve the issue at hand.²⁴ This vacuum that exists in the stead of a clear definition or standard has attracted third parties (e.g. Sustainalytics) who offer “second opinions.” This is problematic given that, with no set of rules, these second opinion organizations are just as disparate in their standards as the primary organizations. Moreover, a sole primary source for a replicable standard would be far more effective. The roughly six pages of standards from CERES are used by Sustainalytics as an interpretive lens for a bond seeking green status, but the actual application of any of these guidelines is at the discretion of the Sustainalytics team.

CICERO

Another well-known “second opinion” group is the Center for International Climate and Environmental Research Oslo (CICERO). The latter strives to provide a second opinion on the viability of individual companies’ green frameworks through its own research.²⁵ This does not assuage replicability and subjectivity concerns, as CICERO bases its research on how well the

²² “25 Years of Impact.” Ceres. Accessed on 29 September 2014. <http://www.ceres.org/about-us/our-history>.

²³ “Supply Chain.” Ceres. Accessed on 29 September 2014. <http://www.ceres.org/resources/reports/supply-chain>.

²⁴ “Green Bond Principles 2014: Voluntary Process Guidelines for Issuing Green Bonds.” Ceres. 13 January 2013. Accessed on 29 September 2014 from <http://www.ceres.org/resources/reports/green-bond-principles-2014-voluntary-process-guidelines-for-issuing-green-bonds/view>.

²⁵ Bjørnæs, Christian, and Eilif Ursin Reed. “About CICERO.” Center for International Climate and Environmental Research Oslo. 16 May 2011. Accessed on 29 August 2014. http://www.cicero.uio.no/about/index_e.aspx.

green bonds match investors' environmental goals. CICERO also does not evaluate individual projects, creating the potential for demonstrably non-green projects to slip through the cracks. Thus, CICERO does not provide a standard so much as it provides peace of mind. As Stephan Libatore, a Managing Director with TIAA-Cref, said: "What's considered green is different for everyone...our investors need to be comfortable."²⁶ Essentially, he is suggesting that the CICERO second opinion just lends credence to the claim that a bond is *green* without setting out an explicit standard for all green bonds. He then goes on to say the following: "Reaching out to CICERO is a great first step. But I'm sure we'll evolve to a more common standard, to a standard that can be applied more broadly."²⁷ A second opinion is only valuable if it abides by a concrete standard. Like Sustainalytics, CICERO is merely interpreting *greenness* as it sees fit, the only difference being that CICERO does not purport to view greenness in light of the standards of another organization (namely CERES, in the case of Sustainalytics).

Rating Agencies Offer Their Input

Inevitably, any discussion of bonds will end up discussing rating agencies. Green bonds could feasibly be rated by a bond-rating agency. However, there are some reasons as to why this has not happened yet. The primary issue is that "green" industries are numerous and different, which is why no cross-industry set of standards exists. Nevertheless, some rating agencies stand out when looking specifically at individual industries.

²⁶ Nicholls, Mark. "Painting the Bond Markets Green." *Your SRI*. 1 June 2013. Web. 28 Apr. 2015. <<https://yoursri.com/media/download/topicofthemoth-june13-bondmarket-v1.pdf>>.

²⁷ Nicholls, Mark. "Painting the Bond Markets Green." Center for Social and Sustainable Products. June, 2013. Accessed on 29 September 2014 from <https://yoursri.com/media/download/topicofthemoth-june13-bondmarket-v1.pdf>.

LEED

Leadership in Energy and Environmental Design, more commonly known as LEED, is perhaps the most well-known rating agency for environmental building in the United States. While it does not rate bonds directly, it could be used to rate the environmental impact of the underlying project for green bonds. Created in 2000 by the U.S. Green Building Council (USGBC) – a Washington D.C. based NGO –, LEED has become synonymous with green building in the United States. To rate new developments and building retrofits, the USGBC created an extensive credit library. In effect, the USGBC has made their LEED standard universal by covering every possible aspect of a building including its construction process, accordingly assigning point values.²⁸

While the LEED certification has been successful enough to be adopted by more than 40 countries, it remains rather complex.²⁹ For one, the credit library includes points for items such as acoustic performance and thermal comfort. These criteria do not relate directly to the environmental impact of a building and yet still contribute to its LEED rating. Another issue has to do with distinguishing between the actual and the theoretical environmental impact. As Mireya Navarro, a housing reporter for *The New York Times*, reported in 2009, “the [LEED] certification relies on energy models to predict how much energy a planned building will use. However, both council officials and experts agree that such models are inexact.”³⁰ The article discusses a push to re-evaluate LEED certifications yearly – a policy that has yet to be implemented.

²⁸ LEED. (2014). Retrieved on 19 September 2014, from <http://www.usgbc.org/leed>

²⁹ Cidell, J. (2009). A Political Ecology Of The Built Environment: LEED Certification For Green Buildings. *Local Environment*, 14(7), 621-633.

³⁰ Navarro, M. (31 August 2009). Some Buildings Not Living Up to Green Lable. *The New York Times*. Retrieved on 2 September 2014, from [http://isites.harvard.edu/fs/docs/icb.topic1043659.files/11-4 Some Buildings Not Living Up to Green Label - NYTimes.pdf](http://isites.harvard.edu/fs/docs/icb.topic1043659.files/11-4%20Some%20Buildings%20Not%20Living%20Up%20to%20Green%20Label%20-%20NYTimes.pdf)

The final issue with the LEED certification is the associated costs. The mere application fee for this certification amounts to nearly \$3,000 dollars.³¹ One must additionally consider that the average cost of a LEED-certified building is 5.5% greater than that of a standard one.³² Nonetheless, just as there is incentive to issue green bonds, there is incentive to have green buildings (which can be, and frequently are, financed by green use-of-proceeds bonds). Cincinnati offers a tax rebate of up to \$500,000 over 15 years for new LEED-certified buildings, and San Francisco, starting in 2012, *required* all buildings 50,000 square feet and over to be at least LEED-certified Gold.³³ Miller and Florence (2009) noted in an article published by the American Real Estate Society (ARES) that “Even without higher rents, in recalcitrant markets there are higher occupancy rates and faster absorption, all of which translates into higher values that almost certainly exceed the marginal costs to go green.”³⁴ This suggests that the market sees LEED certifications as valuable. Raphael Sperry, a senior consultant with Simon & Associates Green Building Consultants, was quoted saying green building certifications are “becoming accepted as a badge of genuine quality,” which proves that there are indeed market incentives for going green.³⁵

³¹ LEED. (2014). Retrieved on 19 September 2014, from <http://www.usgbc.org/leed>

³² Miller, N., Spivey, J., & Florence, A. (2009). Does Green Pay Off. *American Real Estate Society*, 14(4), 385-400.

³³ Ibid.

³⁴ Ibid.

³⁵ Galbraith, Kate. (7 March 2012). International Interest Grows in Green-Building Certification. *The New York Times*. Retrieved on 12 September 2014, from http://www.nytimes.com/2012/03/08/business/global/international-interest-grows-in-green-building-certification.html?mabReward=relbias:s,{%22%22:%22RI:14%22}&_r=0&adxnml=1&module=Search&adxnmlx=1410534297-17vUnGWiwHv1xeX5+qRs2g

BREEAM

Several other organizations also cover green building certifications. Building Research Establishment Environmental Assessment Methodology (BREEAM) was founded in 1990 and has rated over 250,000 buildings.³⁶ New Zealand has its own building council that issues a Green Star to eligible buildings, and the U.S. Environmental Protection Agency offers its “Energy Star” rating to both buildings and home appliances.^{37, 38}

Despite their obvious success, green building-rating agencies are not the only type of rating agencies needed in the green market. Infrastructure projects, climate remediation projects and anything else that may be lumped in the *green* category needs to be assessed as well.³⁹

CBI

The Climate Bonds Initiative (CBI) is one of the organizations that step in where groups like LEED, BREEAM, etc. leave off. Qualified bonds get a seal of approval and all potential investors know that the bond in question is “climate bond certified.” The organization starts by providing a thorough taxonomy of green technology, so that no one is left questioning which projects can be funded with a “climate bond.”⁴⁰ The CBI then provides the requirements for a specific bond to receive their certification. The standards are reviewed by the board of the CBI – the members of which can be found on the CBI’s website – and the deliberations are open for

³⁶ "BREEAM." The BRE Group. 2014. Accessed on 29 August 2014. <http://www.breeam.org/>.

³⁷ “We Are the New Zealand Green Building Council.” (2014). Retrieved on 20 September 2014, from <http://www.nzgbc.org.nz/>

³⁸ ENERGY STAR. Retrieved on 20 September 2014, from <http://www.energystar.gov/>

³⁹ "BREEAM." The BRE Group. 2014. Accessed on 29 August 2014. <http://www.breeam.org/>.

⁴⁰ "Climate Bonds Taxonomy." Climate Bonds Initiative. 2014. Accessed on 24 September 2014. <http://www.climatebonds.net/standards/taxonomy>.

public comments. Thus, outside experts and potential investors can provide their input.⁴¹ The CBI also publishes working papers on its methods and standards to ensure the transparency of its seal of approval.⁴² Furthermore, the CBI does not simply concern itself with the results. The organization is also working on analyzing the supply chain for projects such as solar power, ensuring that the greenness of suppliers is not left out of the equation.⁴³ Moreover, the cost of a climate bond certification is relatively minimal: 1/10th of a basis point on the bond offer price, plus the market rate of the third party evaluator.⁴⁴ This price signifies the CBI accepts the variability of the market in determining pricing, and maximizes the benefit of the certification itself. The CBI is a model for how a rating agency should be run, but it has not yet permeated the market enough to be seen as an industry standard.

One problem with many rating agencies that attempt to rate green bonds is that they work corporate governance into the equation. Corporate governance refers to the "set of systems, principles and processes by which a company is governed."⁴⁵ While this is not an inherently flawed field, rating agencies tend to mistake adequate corporate governance for greenness. As Windolf (2011) puts it, "when creating a single score of the individual measures across the triple bottom-line, raters assume that 'values can be reduced to one dimension.'"⁴⁶ The triple bottom-line she refers to is Environmental, Social, *and* Governance metrics. Windolf suggests that while

⁴¹ Kidney, Sean. "Green definitions for transport: Bus Rapid Transit (BRT) eligibility criteria under Climate Bonds Standard out for public comment." Climate Bonds Initiative. 2014. Accessed on 24 September 2014. <http://www.climatebonds.net/2014/05/green-definitions-bus-rapid-transit>.

⁴² Oliver, Pdraig. "Solar Energy and the Climate Bond Standard." Climate Bonds Initiative. July, 2013. Accessed on 24 September 2014. http://www.climatebonds.net/files/page/files/solartwg_backgroundpaper_8july13_final.pdf.

⁴³ "Solar." Climate Bonds Initiative. 2014. Accessed on 24 September 2014. <http://www.climatebonds.net/standards/standard/solar>.

⁴⁴ "How to Get Certified." Climate Bonds Initiative. 2014. Accessed on 24 September 2014. <http://www.climatebonds.net/standards/certification/get-certified>.

⁴⁵ Thomson, Lisa Mary. "What Is Corporate Governance?" The Economic Times, 18 January 2009. Web. 15 November 2014. <http://articles.economictimes.indiatimes.com/2009-01-18/news/28462497_1_corporate-governance-satyam-books-fraud-by-satyam-founder>.

⁴⁶ Windolph, Sarah Elena (2011) "Assessing Corporate Sustainability Through Ratings: Challenges and Their Causes." *Journal of Environmental Sustainability*. Vol. 1: Iss. 1, Article 5.

the temptation to reduce these three metrics to one dimension is strong, it should be avoided. Oekom Research is one of the organizations facing this problem. While it is one of the “world’s leading rating agencies” (a self-proclaimed title), they aim at aggregating one score for climate and governance, i.e. “shortcomings in one dimension may be compensated by a better performance in another.”^{47, 48} While this sort of rating agency is acceptable for funds that focus primarily on Environmental, Social, and Governmental (i.e. corporate) sustainability, it is less than ideal for an investor who focuses on green bonds alone.

Sustainalytics

Another idiosyncrasy with many green rating agencies is that they simply act as a third party assessor for green bond frameworks. For instance, Sustainalytics, a group that provides securities research for Environmental, Social and [corporate] Governance (ESG) investors, also handles “second opinion” framework assessment.⁴⁹ This is not an innate problem on its own, but contributes to organizational inefficiency. It may stand to reason that a company that analyses sustainable equity already understands and considers the environmental aspect of rated securities, and therefore should be able to relatively efficiently determine whether or not a bond is green. However, the inefficiency lies in the fact that they then refer back to guidelines created by CERES or other external agencies.

Rating agencies may be the most efficient way to evaluate bond greenness in the future, but separation of environmental, societal and governmental sustainability is crucial. The other two

⁴⁷ Windolph, Sarah Elena (2011) "Assessing Corporate Sustainability Through Ratings: Challenges and Their Causes." *Journal of Environmental Sustainability*. Vol. 1: Iss. 1, Article 5.

⁴⁸ “Oekom Green Bond Services.” Oekom Research. Accessed on 27 September 2014 from: <http://www.oekom-research.com/index_en.php?content=corporate-rating>

⁴⁹ "Sustainability Bond Services." Sustainalytics. 1 January 2014. Accessed on 29 September 2014. <http://www.sustainalytics.com/sustainable-bond-services>.

are inherently subjective and therefore contaminate any green rating. They also get in the way of a clear rating for investors who are primarily interested in meeting environmental goals.

Market Solution

Cobin on Rare Coins

While there are many schools of thought on how to create universal guidelines that would mitigate the ambiguity associated with green bonds, the history of markets has shown that where the need arises for grading, the market will spontaneously put forth a solution. Professor Cobin's (2014) research on rare coins attests to this fact. As he explains in his paper *Rare Coin Grading: A Case of Market-Based Regulation*, market regulation of the rare coin rating industry has led to the most efficient and accurate rating solutions.^{50, 51} While the rare coin industry may seem unrelated to the market for green bonds, both are generally accretive assets, which can be comparatively graded for quality against the rest in their respective markets. When something needs to be graded or priced, the free market will generate a solution (e.g. diamonds, rare coins, soft/hard wheat, grain). In the absence of externalities, this solution is by necessity optimal.

Professor Cobin addresses other rating options including governmental oversight, but he explains that one must be wary because the government lacks the incentive of competition, tends to be slow, and often has politicized standards. Independent rating agencies, on the other hand, lean toward most effective and fairly priced systems. “Without rigorous competition, which is also rivalry for reputation, there can be no certainty that standards will be set optimally, that is, without serving private interests of a single firm or industry that is resting on political

⁵⁰ Cobin, John M. "Rare Coin Grading: A Case of Market-Based Regulation." *Cato Journal*. 1 January 2014. Web. 24 October 2014. <<http://object.cato.org/sites/cato.org/files/serials/files/cato-journal/2014/9/cj34n3-9.pdf>>.

⁵¹ Ibid.

privilege.”⁵² Of course, *with* rigorous competition, these pitfalls can be avoided.

Professor Cobin concludes that if the market process works for the grading of rare coins, the market process should create efficient standards for regulating quality in all industries: “What is clear from the study of grading services in the rare coin industry is that the market process has successfully made provision for setting standards and regulating quality without any reliance on government. Market-based regulation is not only possible, it is likely, and it emerges without public policy to satisfy consumer demand efficiently.”⁵³ Therefore, even though green bonds are still in their infancy, competition in the green bond-rating universe will eventually produce a clear and market-approved set of guidelines that will efficiently rate bond quality.

The Advantages of Investor-Driven Rating Initiatives

Della Croce, Kaminker and Stewart suggest OECD countries should “support investor-driven rating initiatives such as the Climate Bonds Standards Scheme.”⁵⁴ This notion offers a simple, cheap and market-driven solution to the lack of framework. Climate Bonds Initiative is currently at the forefront of creating a universal framework and of standardizing the green bond industry.⁵⁵ In industries where innovation is essential, rapid response capacity is of the utmost importance. As shown in the two charts at the beginning of this paper, the percentage of green bonds issued by governments is insignificant compared to that of the private sector. This suggests governments should not be given disproportionate power to make decisions in the green bond market.

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Della Croce, R., C. Kaminker and F. Stewart (2011), "The Role of Pension Funds in Financing Green Growth Initiatives", *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 10, OECD Publishing.

⁵⁵ "Climate Bonds Initiative." 1 January 2014. Accessed on 19 August 2014. <http://www.climatebonds.net/>.

Conclusion and Potential Solutions

Dollar Invested Methodology

For an industry like the green market whose lifeblood is innovation, a rapid response is key. It is only a matter of time before universal standards are required. Therefore, it is important to begin assembling rating standards now. A reliable framework should be based on empirical data: what will the correlation be between the money invested and the reduction in greenhouse (GHG) gas emissions? What is the threshold for the release of CO₂, methane, chlorofluorocarbons and other harmful gasses before a project can no longer be labeled “*green*”? Can nuclear and solar technologies be considered truly *green*? How much does a project need to exceed current environmental standards to be “green”? This industry needs to be subdivided into various categories devoted to ecological-friendliness and to a reduction in carbon footprint. From there, parameters specific to each industry can be crafted so that these bonds are legitimized. Although green bonds could be classified according to different parameters, we suggest the use of a “dollar invested” metric because it reports a clear and easily measurable impact of one's money. The AfDB already uses this methodology, and with a more widespread adoption, investors would have a simplified way to compare bonds across different sectors and organizations.⁵⁶

Hanke-Schimmelbusch's Methodology

Once information regarding investors' dollar/impact is made available, it will be exponentially easier to rank companies' *greenness*. Professor Steve H. Hanke and Dr. Heinz Schimmelbusch (2014) recently developed a model for ranking companies based on their CO₂

⁵⁶ Even though most companies/organizations surveyed present some figures pertaining to nuclear energy, or on the reduction of gasses, etc. almost all of them (69 out of the 71) fail to present empirical data of the impact of an investor's dollar on a specific aspect of climate change (reducing levels of carbon dioxide, for example).

emission levels.^{57, 58} Contrary to other analysts, they start at the beginning of the supply chain, where critical materials and CO₂ are produced, and they end with the final users of the critical materials, which enable reductions in CO₂. In short, Hanke and Schimmelbusch calculate the net reduction that is enabled by the use of critical materials. So, their proposed ratio measures, on a net basis, the level of greenness “enabled” by the bond and can be extrapolated to other green objectives.⁵⁹

$$\textit{Enabling Ratio} = \frac{\textit{Net CO}_2 \textit{ Reduction}}{\textit{Total Assets}}$$

This ratio describes the net CO₂ reduced by total assets. By placing total assets in the denominator, the ratio takes into account a company's size, thereby providing a solution for the current dearth of green bond rating systems. Their suggested methodology can be applied with precision. Hanke and Schimmelbusch used the Advanced Metallurgical Group (AMG) to illustrate their example. Table 3 contains their results.

⁵⁷ Heinz Schimmelbusch is the chairman and CEO of Advanced Metallurgical Group (AMG)

⁵⁸ Steve H. Hanke is a Professor of Applied Economics at The Johns Hopkins University in Baltimore, MD. He is also a member of the Supervisory Board of AMG.

⁵⁹ Hanke, Steve H., and Heinz Schimmelbusch. "On Measuring Greenness: A New Enabling Metric, Please." *Stern Stewart Institute Periodical* June 2014: 58-63. Print.

Table 3

Enabling Greenness Metrics: Advanced Metallurgical Group

Product Enabled	Total Equivalent CO ₂ Emissions Reduced (millions of metric tons)							
	2010	2011	2012	2013	2014	2015	2016	2017
Ford F-150						.68	1.37	2.05
Graphite	.93	1.87	2.80	3.74	4.67	5.61	6.54	7.47
Transmission Heat Treatment		.42	.84	1.26	1.68	2.10	2.52	2.94
Fuel Injectors		.88	1.75	2.63	3.50	4.38	5.25	6.13
Aerospace Ti Alloys	5.17	6.20	7.23	8.27	9.30	10.75	12.28	13.89
Aerospace Coatings	.83	.96	1.10	1.24	1.38	1.58	1.79	2.01
Gamma Ti Aluminide								4.13
<i>TOTAL CO₂ Emissions Reduced</i> <i>(millions of metric tons)</i>	6.93	10.33	13.73	17.13	20.53	25.09	29.74	38.62
<i>TOTAL CO₂ Emissions Produced</i> <i>(millions of metric tons)</i>	.12	.15	.48	.58	.68	.77	.87	.97
<i>NET CO₂ Emissions Reduced</i> <i>(millions of metric tons)</i>	6.80	10.18	13.25	16.55	19.85	24.32	28.87	37.65
TOTAL ASSETS	855.075	900.797	947.921	832.216	929.436	1026.656	1123.876	1221.096
Metric Tons of CO ₂ reduced per \$1,000 of Assets	7.96	11.30	13.98	19.89	21.36	23.68	25.69	30.84

Source: Advanced Metallurgical Group and calculations by Prof. Dr. Steve H. Hanke and Dr. Heinz Schimmelbusch.

Notes: These data assume that all products produced since 2008 are still in use by 2017. All data from 2014-2017 are estimates made by the authors.

While this ratio could be used to screen or "grade" companies according to *greenness*, it is not sufficient for the single investor, who still needs a reference to gage his impact per dollar

invested.⁶⁰ However, both methodologies are targeted toward one specific sector of the green industry, (i.e. climate change mitigation – reduction of CO2 emissions) and can be extrapolated for use with other green initiatives (i.e. climate change adaptation – reducing the vulnerability of natural systems to the impacts of climate changed related risks by increasing adaptive capacity and resilience).⁶¹

Clearly the green bond market is relatively immature, as highlighted by a recent *Wall Street Journal* reportage.⁶² A replicable standard for greenness must soon come to the fore so that investors can discern an actual green bond from a thinly veiled marketing scheme. *The Economist* came to a similar conclusion through its research, which it published about a month after green bond research started at the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise. If academic institutions are noticing inconsistencies in a bond market, bank and fund managers across the globe are definitely noticing the discrepancy as well.⁶³ Consequently, it is only a matter of time before standardization occurs. There are a few strong contenders for a replicable standard including the Climate Bonds Initiative, the African Development Bank as well as the green enabling ratio established by Professor Hanke and Dr. Schimmelbusch. Only time will tell which one the markets prefer, and in what manner green bonds will finally become standardized.

⁶⁰ Ibid.

⁶¹ "The AfDB Annual Green Bond Newsletter." *African Development Bank Group*, Issue 01, May 2014. Web. 26 August 2014. <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Green_Bonds_Newsletter_Issue_N_1_-_May_2014.pdf>.

⁶² Cherney, Mike. "Green Bonds' for a Parking Garage?" *The Wall Street Journal*. 15 March 2015. Web. 28 April 2015. <<http://www.wsj.com/articles/green-bonds-for-a-parking-garage-1426176294>>.

⁶³ "Green Grow the Markets, O." *The Economist*, 5 July 2014.

Appendices

Appendix A: List of Organizations Surveyed

Abengoa Greenfield SA
African Development Bank
Agence Française de Développement
Anstock II LTD
Arise AB
Asian Development Bank
Bank of America
Berlin Hyp AG
BKK AS
City of Gothenburg, Sweden
City of Johannesburg, South Africa
City of Orebro, Sweden
Credit Agricole Corporate & Investment Bank
Department of L'Essonne, France
Development Bank of Japan Inc
DNB Bank ASA
Électricité de France
ELY SpA
Energia Eolica SA
Enna Energia SRL
European Bank for Reconstruction & Development
European Investment Bank
Export Development Canada
Export-Import Bank of India
Export-Import Bank of Korea
Fastighets AB Forvaltaren
GDF Suez
Hera SpA
Iberdrola International BV
Innovatec SpA
International Bank for Reconstruction & Development
International Finance Corporation
KFW
Kommunalbanken AS
Landwirtschaftliche Rentenbank
Massachusetts Institute of Technology
National Australia Bank Ltd
Nederlandse Financierings Maatschappij voor

Ontwikkelingslanden
Nederlandse Waterschapsbank
Nordic Investment Bank
Nord-Troendelag Elektrisitetsverk Holding AS
NRG Yield Operating LLC
NRW Bank
Overseas Private Investment Corporation
Paprec Holding
Province of Ontario Canada
Rapid Holding GmbH
Regency Centers LP
Region of Ile de France, France
Region of Nord-Pas de Calais, France
Region of Provence Alpes Cote d'Azur, France
Rikshem AB
Rodamco Sverige AB
Skanska Financial Services AB
SolarCity Corp
Stockholms Lans Landsting
Stockland Trust Management Ltd
Svenska Cellulosa AB SCA
TerraForm Power Operating LLC
THP Partnership
Toronto-Dominion Bank
Transport for London
Unibail-Rodamco SE
Unilever PLC
Vardar AS
Vasakronan AB
Verbund AG
Vestas Wind Systems A/S
Vornado Realty LP
Wallenstam AB
Yes Bank Ltd

Appendix B: Sample of Letter Sent

"Dear Mr./Ms. XXX,

My name is Jeremy Fraenkel. I am currently a student at Johns Hopkins University, working on a research paper with Professor Steve Hanke. I am tracking organizations issuing green bonds. For this project it is critical that we have the most precise definition possible for what "green" means for each and every organization that issues green bonds.

If possible, would you please explain your criteria for defining a bond issuance as “green”?

Many thanks,
Jeremy Fraenkel

Research Assistant
The Johns Hopkins University
Institute for Applied Economics, Global Health, and the Study of Business Enterprise "