

# 2021 Cambridge - McKinsey Risk Prize Bio-sketch and Photo Page

Photo



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**Title of Submission:** \_\_\_Green Project Bonds for  
the developing world, reducing risk with Carbon Credits

**I am a candidate for the degree:**

\_\_\_MBA\_\_\_\_\_

Bio-sketch (Approximately 150 words)

Tate Lavitt is a candidate for the MBA at Cambridge Judge Business school. He holds and MPhil from the University of Cambridge in Biology and a B.S. from Cornell University in Entomology.

Prior to attending Cambridge for his MPhil, Tate Lavitt authored a publication describing a new species of *Eupsilia* moth to science and was a top producer in biotechnology sales in Boston.

Following his MBA, Tate Lavitt hopes to return to Boston in a business role related to biotechnology.



# 2021 Cambridge - McKinsey Risk Prize Declaration Form

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**Title of Submission:** \_\_\_ Green Project Bonds for the developing world,  
reducing risk with Carbon Credits

**Number of words of submission:** \_\_\_\_\_2838\_\_\_\_\_

**I am a candidate for the degree:** \_\_\_MBA\_\_\_\_\_

**Academic Institution/Department:** \_\_\_Judge Business School\_\_\_\_\_

## Declaration

I confirm that this piece of work is my own and does not violate the University of Cambridge Judge Business School's guidelines on Plagiarism.

I agree that my submission will be available as an internal document for members of both Cambridge Judge Business School and McKinsey & Co's Global Risk Practice.

If my submission either wins or receives an honourable mention for the Risk Prize, then I agree that (a) I will provide a recorded 2 minute overview of my paper, (b) my submission can be made public on a Cambridge Judge Business School and/or McKinsey & Co websites.

This submission on risk management does not exceed 10 pages.

Signed (Electronic Signature)

## **Executive Summary**

We are at risk of not meeting our multi-lateral governance goals, e.g. The Paris Agreement, to abate climate change. While this question will require a multi-faceted response, the widespread adoption of a simple financial instrument may prove useful. It is clear that infrastructure needs to be improved, and the standard avenue for funding these types of projects would include governments issuing debt in the form of treasury bonds. While green finance is a growing area with billions more being invested each year, I believe this idea is incomplete. At present, investors are often incentivized with tax credits to invest in green projects, and unless there is a mass creation of green bonds, we will not be able to meet our Sustainable Development Goals. I propose a structured bond linked specifically to initiative targets, issued and backed by governments. They will lower risk to the investor and the country issuing them. These benefits to investors could galvanize the carbon credit market and prove an easy to adopt tool for the governments of the world to achieve their SDGs.

## **Context**

Currently we do not tackle Sustainable Development Goals (SDGs) in an adequate way. Introducing a structured green project bond for infrastructure projects could fund said projects, while benefiting governments and investors in a greater way than current Social Impact Bonds (SIBs) and other financial instruments. While there are project bonds and green bonds, they are seemingly discrete investments in the right direction, no bond at present holds countries accountable to their goals as nations.

## **Problem Definition**

Humans have drastically changed the planet for generations (IPPC, 2019) and currently use more than 70% of the ice-free land surface worldwide (IPPC, 2019). Climate and environmental change are drastically transforming conditions for species worldwide (Houghton et al., 1996). Changing climate has impacted food security, terrestrial ecosystems, desertification, land degradation, and the frequency and intensity of extreme events (IPPC, 2019). To combat climate change, The World economic forum suggests \$700 billion per year needs to be invested in clean energy, transportation, and forestry (Moskowitz, 2021). The international energy agency recommends an investment of \$1 trillion per year towards a low carbon economy by 2035 (Moskowitz, 2021).

It is currently estimated that globally, biodiversity conservation receives 4% of bond proceeds and sustainable land use benefits from only 2% of bond proceeds (Treasury, 2021). While the risk to global markets may not be immediate, climate change will affect energy prices, commodity prices, corporate bonds, and other financial instruments; if portfolios do not align with expected pathways this risk will be abrupt (Treasury, 2021). The entire green finance market is about US\$10bn (Treasury, 2021).

## **Interventions Under Consideration**

There are many financial instruments that have been created for the purposes of achieving SDGs. Debt for nature swaps were a simple example (“Debt for nature swaps,” 2021). This is simply a government agreeing to protect part of the environment in their country in exchange for an investor purchasing their debt. Unfortunately, debt for nature swaps are not exceptionally enticing for investors due to the lack of returns. The world bank issued the first official green bond in 2009 (“Green Bond Definition,” 2021). In 2018 alone green bond issuance was \$167 billion (Initiative, 2021). Green bonds are usually backed by the issuing entity’s balance sheet and therefore usually carry the same credit rating as their issuer’s other debt



obligations; (“Green Bond Definition,” 2021). These bonds usually have tax incentives making them attractive when compared to similar bonds with similar yields. The world bank is a major issuer of green bonds with \$5.3 billion in the US between 2008 and 2014 and over 2.7 billion rupees in India (“Green Bond Definition,” 2021). Private firms also issue green bonds. In 2013 Tesla issued a \$660 million convertible green bond and in 2014 Toyota issued an asset-backed security to finance hybrid vehicle loans (Moskowitz, 2021). Overall, green bonds have become an attractive and ever more common investment tool. Unfortunately, there are not many of them, they are labor intensive to create, and there are not many issued in the developing world.

### **Project Bonds**

Understanding project bonds will be integral to understanding the interventions planned with green bonds. Governments will issue project bonds to fund large projects like improvements in infrastructure. This has the benefit to the country that it does not have to pay the upfront cost for that project which may simply be impossible for some governments. These tend to be attractive bonds for investors because the government itself has backed the bond. Project bonds are regularly issued to fund infrastructure projects in Europe and America, Kenya, and Nigeria (Deloitte, 2021). South Africa for example has a 4 trillion rand infrastructure program, a bond was the only way to reasonably fund this project (Deloitte, 2021).

### **Other Financial Instruments**

The number of financial instruments appears to have seemingly no end. Each has its own risks and benefits, but overall many of these bonds aim to reduce the risks associated with investing. An index linked bond is a bond where the payment of interest is related to an index to reduce the risks of inflation (Investopedia, 2021b). Floating rate notes are bonds with interest rates tied to a benchmark rate (Investopedia, 2021a). Floaters may have a cap and a floor interest rate.

GDP bonds are a debt security with coupon payments linked to the issuing country’s GDP (Bowman & Naylor, 2016). This is an attractive bond in developing countries because the payments move with the country’s economic growth, however, variable repayment requires a premium. Argentina 2005, Greece 2012, and Ukraine in 2015 are examples of when GDP bonds were issued. With GDP linked bonds, the government burden of servicing its debt is lessened during an economic downturn and the ratio of debt to GDP is more stable than using conventional bonds holding all else constant (Bowman & Naylor, 2016). One study found that GDP linked bonds could increase the amount of debt a govt could sustainably service by up to 100% (Barr, Bush, & Pienkowski, 2014; Bowman & Naylor, 2016). For investors, GDP linked bonds provide an opportunity to benefit from economic growth (Bowman & Naylor, 2016).

Carbon Credits are a relatively new financial instrument with variations being proposed from the Kyoto protocols in 1997 to the Paris agreements in 2015, and the Doha agreement in 2020 (“Carbon Credit Definition,” 2021), and the EU Emissions Trading System (European Union, 2021). 2020 even saw the birth of the KFA, a Global Carbon Credit ETF (Siddarth Shirkanth, 2020). Nobel Prize winning economist Robert Engle is hopeful that carbon credits will be successful as more governments begin to engage (Siddarth Shirkanth, 2020). In January of 2020, the global market for carbon credits was worth over \$215.1bn (Carbon Pulse, 2019). In July 2020, EU carbon credits were at an all-time high of \$36.73 (€31) (Camilla Hodgson, 2020).

Governments issue Social and Development impact bonds, specifically targeted at projects that deliver social and environmental outcomes (UNDP, 2021). Unfortunately, these bonds can be dubious as they are



often structured in such a way that the investors lose interest and some of the face value of the bond should the project be a failure (UNDP, 2021).

### **ENEL SDG Bond**

When reviewing the current economic and physical environmental climate, and the current smorgasbord of financial instruments to choose from, it would seem self-evident that corporations would begin issuing bonds aimed at financing infrastructure to achieve these SDGs and attempt to make those bonds attractive to investors. One company, ENEL, appears to be a bellwether, issuing a world first sustainability linked bond, targeted at improving their own power generating infrastructure and linking to coupon of the bond to those targets: “The interest rate will remain unchanged to maturity subject to achievement of the sustainability target indicated above as of December 31st, 2021. If that target is not achieved, a step-up mechanism will be applied, increasing the rate by 25 bps starting from the first interest period subsequent to the publication of the assurance report of the auditor.”(ENEL, 2019).

### **Government SDG linked Bond**

Distilling the available financial instruments, a financial tool that can be used by governments to invest in infrastructure, tied to SDGs, unique to governments, and attractive to investors would have a large, beneficial impact on markets and peoples’ lives. While SIBs exist in many forms, carbon credits have never been more popular, and every country is committed to SDGs, there appears to be a lack of widespread uptake. I propose that a sustainability goal linked green project bond in part financed by carbon credits previously untapped by governments could be a useful financial instrument to help meet much needed SDGs for the planet while positively impacting the global financial market.

Social impact bonds are difficult to create, are difficult to monitor, and often do not have an underlying asset to fund the bond should the program fail. An example of a social impact bond would be a series of contracts to fund programs to reduce recidivism. In this case, a project is funded that will hopefully reduce strain on a local prison system. This is costly, difficult to reliably assess, and difficult to implement. In practice, these bonds are never below a threshold of price due to the scale necessary to fund auditors and organizers, but have difficulty growing at scale due to the complexity of the projects. These difficulties are taken away when governments issue them, attach them to physical infrastructure projects, and monetize another asset in the form of carbon credits.

Governments have tools available to them that private corporations do not. The coupon of a bond will be associated with the underlying risk associated with a similar investment. This risk is calculated with the underlying asset and the ability for the issuer to pay the coupon. The benefit of governments issuing bonds for infrastructure is that the underlying asset and the government itself are backing the bond. Further, governments have access to assets that can produce carbon credits and the issuance of those credits, but many are yet to tap into them. In 2015, a conservative estimate of the carbon credits associated with National Parks in the US were valued at over \$707m (Banasiak, School, & Loomis, 2015), but these have not been sold on the market yet.

I propose a bond backed by governments in which the coupon was tied to the goal, the coupon payment would be higher if the project did not achieve the goal and lower if it did. In this way, it is a win-win; investors are compensated financially if the project is mismanaged, they are also rewarded physically with the benefits to society and the environment if the project is a success. If the project reaches its goal, the government benefits financially with an infrastructure project that may not have existed and its citizens



benefit. If the project fails, while this would be an unfortunate outcome, one small benefit would be the wealth of the investors is increased, and the government may see some of that investment in taxes. In this way, these bonds should be very attractive for investors, and very attractive for governments as they should be low risk and if backed by unused carbon credits, less expensive to finance than even simply issuing treasury bonds. Further, there is an opportunity for developing countries in particular tie the value of their bonds to debt-for-nature-swaps and carbon credits.

### **Recommended Intervention**

Not only can these bonds be backed by the governments that issue them, but if a government decided to tie carbon credits to these bonds, they would have even less risk for the government. The bond will be backed by the government, the asset, and carbon credits, all of these allow for a lower risk especially when issued in developing countries. While moral hazard may be a problem in many countries, if these bonds are issued on a large enough scale, proper auditing should reasonably be able to take place. In February 2021, the UK announced it would launch its first sovereign green savings bond (Camila Hodgson & Oliver, 2021). This would allow investors to purchase bonds targeted at renewable energy schemes and other projects. This bond is of undetermined size and structure and will be offered through National Savings & Investments. Rules regarding how the money can be spent and how that spending will be reported is unclear, however, there are guidelines from the International Capital Market Association and Loan Market Associate.

Using Madagascar as a case study, Madagascar uses 1.59 bn kWh per year (WorldData, 2021). One project to install a 20mw solar array cost \$29.29 mil (Bellini, 2019). Makira national park is 400,000 hectares, 710,588 carbon credits. At \$36.73 in 2021 that is a value of \$26,099,897.24. Assuming 8 hours of sunlight a day, 365 days per year, requires 544.5 mw to equal the 1.59 million mega watts for Madagascar to be completely renewable. This would cost \$797.52 mil. That project if backed by just carbon credits, 4% of the bond would be guaranteed with a financial instrument that will potentially increase in value. In February 2020, the yield was 7.1% for the 10 year bond (Moody's, 2021). The life of the solar panel is about 25 to 30 years (Nate Berg, 2018), with the cost of electricity at \$0.119 per kWh, that is a \$189,210,000 per year in potential revenues from this project. This appears to be a reasonable project that would pay for itself in 4.21 years and generate green, profitable energy for another 20-25, however, there are many caveats and assumptions we have made. In 2019 the risk premium on lending in Madagascar was 42.37% (Bank, 2021) and in the USA was 3.2108% in 2019 (Trading Economics, 2021). Premiums on GDP linked bonds need to be given for liquidity, novelty, default, and growth risk; further, the IMF average for the real rate of return is a good heuristic to begin with (Bowman & Naylor, 2016). The reason for the high premium in Madagascar is the risk of the investment. An investment this large, even though it could potentially pay for itself in about 5 years is still highly risky to the investor, therefore premiums will need to be implemented.

### **Implementation Plans**

While all energy produced for the Madagascar market is a sizable goal, a more reasonable goal might be to make Madagascar a world leader in renewable energy which would be above 12.74% (Smart Energy International, 2020), current production is about 2% (WorldData, 2021). Using the Enel bond as a foundation, Madagascar could create a 10-year bond in which the interest rate will remain unchanged at the standard 7.1% on treasury bonds. Should they not meet targets, perhaps within 5 years producing over 12.74% of the energy in Madagascar as renewable energy, then a step-up mechanism of 71 bps would be commensurate with the step up in the Enel bond, starting from the first interest period would be applied. This project would cost about \$85.73mil to get to 12.75% renewable energy. Using carbon credits in Makira national park would fund 30.44%. The risk to the investor is reduced because the bond is backed by the



government, carbon credits, and the project itself is based in infrastructure that could be sold if need be. If Madagascar did not meet its goal, it would pay the investor 71bps above the standard yield of a 10-year bond from Madagascar. This is effectively guaranteed to the investor. If Madagascar meets its goals, that would be 71bps below the 7.1% yield. This benefits society due to the increase in renewable energy, this benefits Madagascar because the bond was less expensive for them, and the investor is pleased because this is a bond that will potentially have a value of 71bps below the 10 year bond, but be guaranteed because the project that is successful would pay for itself. Finally, the use of carbon credits for backing the project would protect the land that the carbon credits were issued for. This is just one example of a potential framework for a bond and could be applied to nearly any country with nearly any type of sustainable development project (Figure 1).

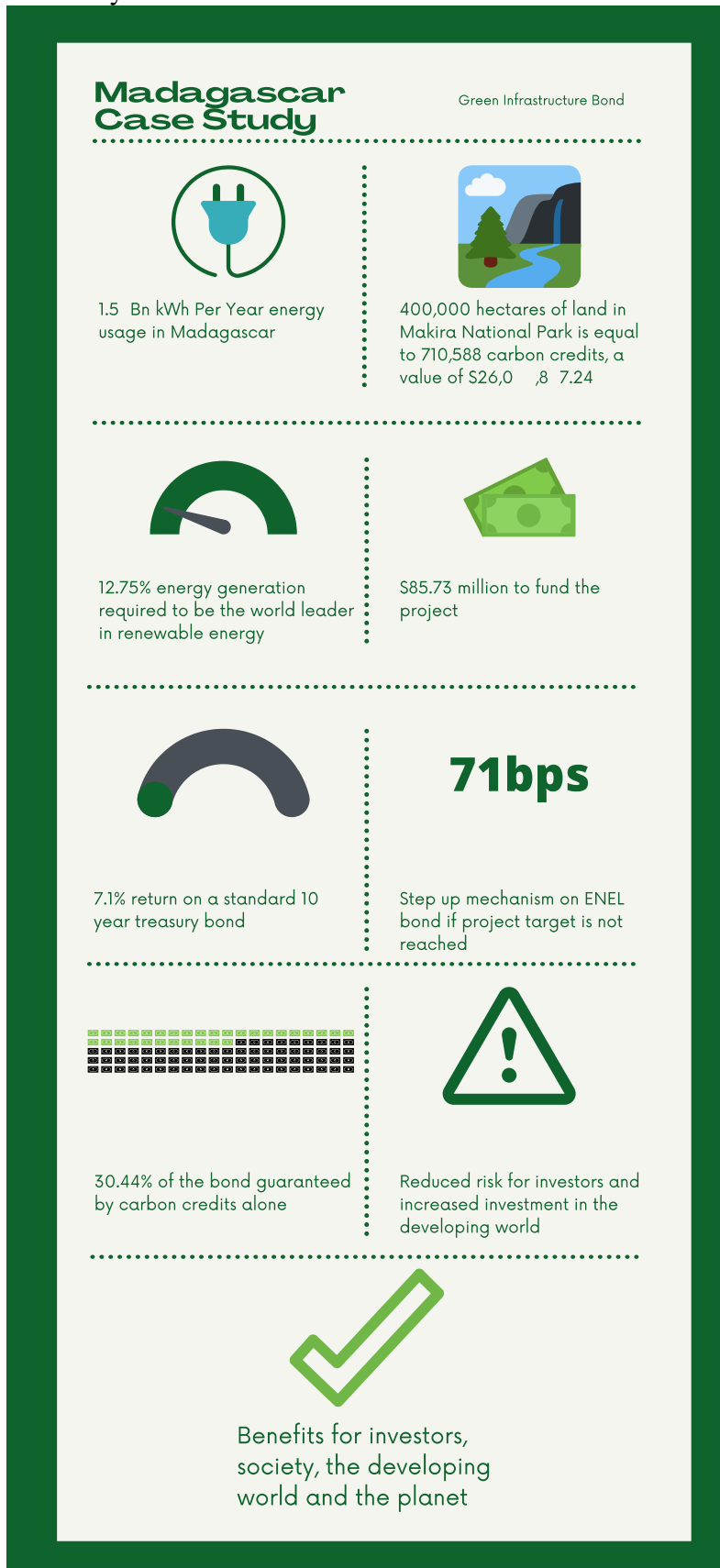
### **Conclusion**

While a floating rate green project bond may not be a perfect solution to our sustainable development goals, and there is a potential risk of flooding markets with too many projects and carbon credits, it appears to be a relatively easily implemented tool to combat climate change and improve infrastructure. At present, no bond is issued by governments specifically holding the governments accountable for their goals, only an amalgamation of green initiatives that may help achieve those goals. The World Bank is a producer and investor in SDG projects. If the World Bank and other international organizations like the UN saw that these were investments in beneficial projects for developing nations, in addition to the benefits of carbon credits protecting the environment and tax benefits in many countries for green investing, this could be a financial instrument to reduce the risk of not meeting our sustainable development goals.



**Appendix**

Figure 1: Madagascar Case Study





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