ABSTRACT

GREEN BONDS AND CLIMATE CHANGE:
STATE OF THE ART OR ARTFUL DODGE?

by Irene T Queen

Debt-finance is a growing opportunity to fund environmental solutions. Green Bonds are being used by investors wishing to improve their Corporate Social Responsibility positions while maintaining valid returns on their investments. Based on the well-established bond-finance model, Green Bonds put money into diverse environmental projects addressing impacts from climate changes, depletion of natural resources, biodiversity loss, and pollution control. “Green” is a voluntary designation, based on a set of guidelines known as the Green Bond Principles. With varying degrees of clarity regarding their use and environmental impact and whether they are a viable solution to climate damages or merely a “greenwashed” ploy used by some issuers to appear more sustainable were questions examined as part of this research. A concise summary briefing (Appendix A), case study draft, and targeted public engagements were completed. Adaptability and responsiveness, sustainability, credibility, legitimacy, and opportunity for social transformation through the use of Green Bonds were reviewed using a case study analysis method. A unique pool of investment capital being mobilized by Green Bonds is emerging through motivated environmental investment coalitions. A review of the integrated impacts of Green Bonds as well as practical knowledge for their issuance is described here.
This Practicum Report titled

GREEN BONDS AND CLIMATE CHANGE:
STATE OF THE ART OR ARTFUL DODGE?

by

Irene T Queen

has been approved for publication by

The College of Arts and Science

and

Department of the Institute for the Environment and Sustainability

____________________________________________________

Dr. Steven Elliott

____________________________________________________

Dr. Sarah Dumyahn

____________________________________________________

Dr. David Prytherch
# Table of Contents

Introduction .................................................................................................................. 1  
About the Project ......................................................................................................... 2  
What is a Green Bond? .................................................................................................. 4  
Green Bond Process .................................................................................................... 5  
Assessing Green Bonds ............................................................................................... 6  
Case Study Research Methods ...................................................................................... 8  
Two Green Bond Issuances: Massachusetts & DC Water .............................................. 10  
  Massachusetts Green Bonds ......................................................................................... 10  
    Summary ................................................................................................................ 10  
    Analysis ................................................................................................................. 11  
  DC Water Green Bonds .............................................................................................. 15  
    Summary ................................................................................................................ 15  
    Analysis ................................................................................................................. 16  
Discussion & Analysis - Green Bonds ........................................................................... 20  
  Looking ahead: Possibilities & Pitfalls ...................................................................... 22  
IES Reflection .............................................................................................................. 25  
References .................................................................................................................... 26  
Appendix A. Green Bonds Sustainability Briefing ......................................................... 29  
Appendix B. Climate Solutions New England Core and Network Teams ..................... 35  
Appendix C. Interview Questions ............................................................................... 37  
Appendix D: Targeted Communication to Key Stakeholders & Professionals .............. 39  
Appendix E. Criteria for Integrated Solutions ............................................................... 41  
Appendix F. DC Water Interview (Full text) ................................................................. 43  
Disclaimer ..................................................................................................................... 48
List of Figures

Figure 1. Differences between a Bond & Green Bond .......................................................... 1
Figure 2 Potential Case Study Topics .................................................................................... 3
Figure 3. Green Bonds – How it works .................................................................................. 4
Figure 4. (Labeled) Green Bond Global Issuance (Climate Bonds Initiative) ...................... 5
Figure 5. Growth of the Green Bond Market (World Bank) ............................................... 6
Figure 6 Some Green Bond Financed Projects in Massachusetts (Massachusetts Bonds) .......................................................... 13
Figure 7. Clean Rivers Project Tunnel Boring Machine (DC Water) ................................. 15
Figure 8 Themes ................................................................................................................. 17
Dedication

For Sophie, my loyal friend from fifth grade, who encouraged me to go back to school.
Acknowledgements

I would like to express my deepest appreciation to the team at Climate Solutions at the University of New Hampshire’s Sustainability Institute. Over the course of this Fellowship I enjoyed meeting and working with everyone there, and especially appreciated the guidance and support of Jennifer Andrews, Climate Fellows Program Coordinator, Climate Scientist and Research Professor Dr. Cameron Wake, my co-researchers on the case study projects, Climate Solutions New England Research Assistant Sarah Large and Co-Climate Solutions New England 2015 Climate Fellow Henry Herndon, and all of the other Fellows, the Climate Solutions New England Network and Core Teams, and the many individuals who took time from their busy schedules to interview with me.

“The emergence of Green Bonds represents one of the most significant developments in the financing of low-carbon, climate-resilient investment opportunities.”
-Climate Change Support Team, United Nations, October 9, 2015¹

Introduction

The sustainable use of natural resources is a subject of social, environmental, political, and economic complexities. Climate damage creates enormous vulnerabilities in all of these areas as natural resources of land, water, and air are threatened. Coastal and inland waterway protection, land management, clean air, and preservation of drinking water supplies are all vulnerable to rapidly changing and unpredictable variations in climate. Solutions can be implemented from numerous individual administrative avenues but addressing solutions effectively and cooperatively becomes critical as climate response action grows more urgent. Large sums of capital are needed to finance responses to and preparations for changes in climate. In order to connect the money to the solution, the investment product must align with the needs of the investor. Capital is available in pension funds, endowments, from

asset managers, and sovereign wealth funds. Green Bonds are the tool that may be used to reach these investors and collaboratively finance low-carbon, and climate resilient solutions (Fig. 1).

Green Bonds emerged from a modification of the existing, well-established bond structure, in response to investor demand for more transparency in investments. Bonds are available in a variety of issuance types and denominations and have traditionally been used to finance roads, bridges, and other infrastructure. Green Bonds are designed with an additional layer of transparency: to specifically finance energy conservation and efficiency, water management and competence, rehabilitation of climate vulnerable roads and bridges, land management improvements, and renewable energy. Green Bonds have the potential to not only broaden and diversify investor bases to address damages to climate, but also have potential to impact social change in the use of resources. The expanded influence of Green Bonds, and their additional iterations of Climate, Water, and Transportation Bonds, with adoption in a broad social, environmental, political, and economic arena may promote more sustainable use of natural resources.

A current challenge to both investors and issuers of Green Bonds is that validity and liquidity of these bonds are threatened by lack of a standardized assessment. An additional challenge to investors is that the availability of Green Bonds is not meeting their demand, and when issued, become frequently oversubscribed. Due to their innovation and variations in use many issuers lack knowledge about how to issue a Green Bond. This report will study several initiatives that have begun to increase clarity in the use of Green Bonds through certifications, second party opinions, indices, and defining principles, and will examine an assessment tool which was under development during this Fellowship in collaboration with a team of researchers at Climate Solutions New England.

Finding the resources to finance environmental solutions is a challenge. An emerging group of investors is interested in mobilizing long-term, fixed-income assets towards prevention of and solutions to damages from climate. Collaboration by these investors in financing solutions to impacts from climate damages may be facilitated through the financial tool of Green Bonds. The integrated impacts of Green Bonds are qualitatively reviewed here, and whether multiple benefits resulted from their use, as well as practical knowledge that can be used to issue and implement the tool.

About the Project

The Fellowship on which this practicum is based was awarded from Climate Solutions New England (CSNE). CSNE is led by faculty and staff from the Sustainability Institute and the University of New Hampshire. The goal of CSNE is to coordinate and

---

4 United Nations
collaborate with numerous entities across geographical, political, and economic boundaries. This collaborative vision is comprehensive and includes consideration of a community’s health and wellness, its sustainable uses of resources, presence and preservation of historic sites, promotion of a sense of community, and mobilizing this collaboration in a cost-effective manner. Priorities include addressing energy self-reliance of the region, improving regional weather resilience, and fostering sustainable communities. Of utmost importance is to facilitate cooperation and participation across sector and scale, from government, business, and not-for-profits, to individuals & families. The importance of understanding the characteristics of initiatives that address climate solutions with multiple and integrated benefits is the basis of this case study project.

The project was designed as a case study research that would examine initiatives that address solutions to climate damages. Using a qualitative approach, the theme that was explored was whether multiple, or integrated, benefits associated with select criteria appeared to be linked to climate solution initiatives. A number of case study topics had been selected by a network team at CSNE (Figure 2.) prior to the Fellowship, and the topic of Green Bonds was chosen for this research.

---

What is a Green Bond?

Green Bonds were initiated in 2008 from demand by some investors to address climate damages. Green Bonds are a term for bonds that claim to finance projects or assets that benefit the environment. Investors’ interests in the environmental, social and governance (ESG) issues related to climate damages led to development of this asset class which was designed to increase allocations toward climate solutions. The World Bank issued the first Green Bond in 2008 with a triple A rated, fixed-income product meant to implement a strategy that would stimulate and coordinate public and private partnerships to address greenhouse gas reduction and associated climate damages.

General Obligation

Municipal bonds have traditionally been an attractive long-term, highly rated product in the United States. Investors seeking fixed-rate, long-term investments often chose municipal and corporate bonds. Most municipal bonds have the advantage of a non-taxable interest. Within this ~$100 trillion worldwide bond market, the aggregated financial structure of these bonds was such that traditionally there had been no way to track the projects where bond dollars were being invested. Socially Responsible Investors (SRI) who wanted more transparency in investment had been unable to track spending or impact on their investments in bonds within that structure. Investors were aware that some of these dollars were already being directed to environmental projects, but this spending was not transparent. Driven by the goal of

---

directing the spending of bond funds toward climate solutions, and in fulfilling Corporate Social Responsibility (CSR) goals, investors contacted issuers to negotiate for modification in the design of bonds in order to reveal transparency and targeted impact of spending. This transition whereby funds raised through bond finance would be isolated or “ringfenced” into a Climate or Green Bond began internationally by the World Bank in 2008.

Green Bond Process

A Green Bond is developed as a loan that finances or refines an environmental project. It is similar in structure, rating, term, and return to a comparable bond, but with added transparency, tracking, and impact reporting. It is an innovative fixed-income product that increases financial transparency, mobilizes capital dollars to fund climate projects, offers portfolio diversification into “green” investment for investors, provides a Corporate Social Responsibility (CSR) investment opportunity, and can mobilize funding sources to update aging infrastructure, coastal flood adaptation, and habitat restoration. Green Bond Principles suggest a broad and voluntary guidance to the process for issuers.

The Green Bond “team” has a diverse membership. Bond issuers include governments, banks, states, municipalities, corporations, universities, and utilities. Investment brokers, bond certifiers or organizations that develop second party opinions work with bond issuers to develop the financial product that will be issued to raise funds for the projects and to assess the issuer and project, in terms of “greenness.” Ratings agencies, such as Standard and Poor’s, issue credit ratings for issuers in which their ability to pay back loans obtained through sale of bonds is assessed. Investors buy these bonds from the bond issuers, resulting in an input of money to the states, municipalities, and other issuers. Funds are disbursed by the issuer to bond fund borrowers, such as engineers, designers, and the project builders. The bond fund repayers include the citizens who pay taxes and benefit from the projects, and can also be from revenue generated from the project. Other stakeholders include future generations who will benefit from the projects funded by the Green Bonds: energy efficiency, clean drinking water, biodiversity, clean water, and recreational water use.

---

Assessing Green Bonds

Issuance of Green Bonds as of July 2016 is at 38.43 billion, nearly matching the $41.8 billion 2015 total halfway through 2016 (Figure 4). The growth of Green Bonds since their initiation has been exponential (Figure 5). This rapid growth has been met with a mad scramble to ensure validity and liquidity of a product that has enormous potential to provide a much needed capital resource for environmental adaptation, mitigation, and preservation of natural resources. Numerous organizations are developing certification and assessment processes in order to ensure the beneficial development of this financing tool.

As this new asset class emerged, assessments that define the validity and transparency of Green Bonds also emerged. One of the first of these was the development in early 2014 of the Green Bond Principles. The Green Bond Principles were developed by the International Capital Markets Association,\(^\text{12}\) a financial stakeholder association, which put forth voluntary guidelines for the issuance of Green Bonds. These Principles consisted of guidelines for use of proceeds that included but were not limited to renewable energy, energy efficiency (including efficient buildings), sustainable waste management, sustainable land use, conservation, clean transportation, and clean water.

Climate Bonds Initiative (CBI) is an investor-focused, not-for-profit organized with the intention to promoting investment in the low-carbon economy on a broad scale. CBI drafts proposals for governance that address regulatory mechanisms, standards, tax policies, and green banks with a goal to rapidly increase green investment through debt

\(^{12}\) ICMA. http://www.icmagroup.org/About-ICMA/
finance into renewable energy, energy efficiency and forestry. CBI has developed a Climate Bonds Standard\(^{13}\) screening tool for investors and governments wishing to support a Low Carbon Economy.

Certifications and Second Party Opinions, which also verify the bonds “green” validity, began development by certifying agencies such as Vigeo,\(^{14}\) Sustainalytics,\(^{15}\) DNV GL,\(^{16}\) and others.\(^{17}\) Development of indices which review sustainability of Green Bonds expanded assessments even further. Bank of America Merrill Lynch Green Bond Index was launched October 30, 2014 and Barclays MSCI Green Bond Index followed in November, 2014. Standard and Poor’s Green Bond Index was launched on July 21, 2014 and S & P Project Index followed on September 16, 2014.\(^{18}\)

An assessment tool that addresses analysis of the integrated “collective impact”\(^{19}\) of Green Bonds upon environmental, social, and economic sectors of the New England region was begun during this fellowship and will be addressed in this report. The assessment tool that was used in this case study is one drafted by a core team and fellows to examine the depth of integration of climate solution initiatives, in this case – Green Bonds, into broader comprehensive benefits.

In 2013, Green Bonds were introduced in the United States in Massachusetts, followed by Connecticut in 2014. In 2015 Rhode Island also followed the international trend that the World Bank began in 2008.\(^{20}\) These states found a way to “ringfence” or isolate funds that were raised from the sale of bonds, and to track the spending and impact of these funds on environmentally beneficial projects. Like social media marketing on a large scale, each bond issuer built on the other’s experience with Green Bonds and modified the financial tool to their own needs.

This practicum case study research was initiated by CSNE in response to collaborative efforts of a network of organizations across New England which sought to learn of initiatives with collective impact, or which addressed multiple environmental problems in the area of climate changes and damages. This Green Bond case study research project is part of a larger initiative of CSNE to examine solutions to climate change which incorporate the concept of collective impact.\(^{21}\) The hypothesis addressed in this case study is whether Green Bonds are a viable solution to climate damages, and if


this is a solution with multiple or integrated benefits. Two examples of issuances of Green Bonds in the United States will be examined in depth.

**Case Study Research Methods**

This Green Bond Fellowship case study project began with review of a pool of initiatives (Figure 2) that had been recommended by Network Design and Network Core Teams (Appendix B) from the University of New Hampshire Sustainability Institute. In collaboration with two CSNE Fellows, this broad group of potential initiatives for case study was then reviewed using a selection process to reduce personal bias, as recommended in *Case Study Methods* by Robert Yin, in which a detailed process of design, selection, analysis, and reporting was completed. Case studies, internet sources, published periodicals, books, academic journals, and partner groups which addressed climate change solutions were included in this review. Each Fellow chose topics to explore in more depth, and this author chose the topic of Impact Investment – Green Bonds for research.

Institutional Review Board Training was completed, and a protocol and list of questions were developed by this researcher and associate Fellows. These were approved by Network Core colleague Dr. Catherine Ashcroft, and the University of New Hampshire IRB Review Board (Appendix C, Interview Questions). Interviews were generally conducted with two Fellows present – one completing the interview by phone, or in person and the second taking notes. Interviews lasted from 30 minutes to one hour and took place during the period from June 1 through August 14, 2015. Scribed interviews were reviewed by the interviewer, verified with the scribe, and forwarded to the interviewee for input and clarifications. Interviews were then stored electronically in an anonymizing fashion and only interviews with signed releases for identification were used. Interviews were then coded and themes were identified. For the Green Bond research, ten semi-structured interviews were completed, two of which are presented in depth in this report. Throughout this process weekly meetings to review progress and process of the research were held with one or more members of the Network Core Team, and daily meetings were held with other Fellows.

Fellows collaborated with a Network Core and Network Design teams to achieve continuity in the individual case study research projects and design, and each Fellow was responsible for one initiative with the support of the network team. Additional Green Bond client deliverables included a Sustainability Briefing (Appendix A) and Targeted Public Engagements (Appendix D).

---

22 Sarah Large, 2014 CSNE Fellow & Henry Herndon, 2015 CSNE Fellow collaborated in development of the case study methods and interview questions, and assisted in interviews, and then each Fellow developed individual case studies with feedback from each other and Network Core and Design Teams.


24 Sarah Large & Henry Herndon

25 IRB # 6278, issued by University of New Hampshire. Approved IRB protocol allows for the identification of the interview.
One of the goals of the study was to examine the initiative of Green Bonds to determine if certain criteria observed might lead to more preferable outcomes. Categories that were assessed in each of the case studies included how well planning of the initiative was connected to its outcome; whether or not the initiative implemented a systems approach with a mapping process and intentional multiple benefits, whether the initiative was responsive and fully considered different perspectives, including “winners and losers”, whether a diversity of interests was represented with members on the project from different initiatives in a range of participation, whether the initiative was contextualized and place-based to its specific location and surroundings, and whether the initiative was anticipatory and factored in “critical uncertainties” over time, building into the plan things that could change in the future.

Following the identification of these categories, the initiative was further examined to understand whether it had succeeded in being adaptive in its process, through adaptive management, technology, and governance, whether it resulted in public health or increased individual wellness benefits, whether the initiative succeeded in its mitigation efforts, whether the initiative increased adaptation efforts towards increasing resiliency or decreasing vulnerability, whether the initiative succeeded in improving economic development through jobs or opportunities, whether the initiative was economically viable and sustainable and able to operate cost effectively, whether the outcome was socially equitable and just and increased social and community resiliency, and whether the outcome was successful in solving multiple problems as evidenced by its internal monitoring, evaluation and feedback.

Interviewees were chosen from practitioners or partners from local, state and federal governments, NGOs, community leaders, other universities, or other individuals with knowledge of specific interventions. Through interviews with relevant financial stakeholders, the study of Green Bonds as a tool that identifies and finances infrastructure improvements and sustainable use of resources and an analysis of its resulting degree of social, economic and environmental impact and integration were researched.

Since the Green Bond case study would include various iterations of the bonds in different venues, a multiple-case study approach suggested by Robert K. Yin for these types of studies was followed (Yin, 2004). Yin suggests that in a multiple case study, variation in geography and size, or other related variation should exist among the cases. In the case study research, multiple sources of evidence were used in order to identify similarities. Evidence included news articles and reports, archival documents, and, incorporating ethical, safety, and legal permissions in collecting data via IRB26 approval, interviews were conducted.

A formal data collection tool was designed that would provide information in the desired categories (Appendix E). Interviews were assessed and analyzed to identify instances of repetition and similarity.27 An in-depth summary of two Green Bond issuances is included here, followed by analysis of themes that were identified.

---

26 IRB# 6278, University of New Hampshire
27 Ryan & Bernard
Two Green Bond Issuances: Massachusetts & DC Water

Massachusetts Green Bonds

Summary

Massachusetts issued the first Green Bond in the United States in 2013. Based on a close relationship with investors from previous bond issuances, Former Massachusetts Assistant Treasurer of Debt Management Colin MacNaught learned that they were looking for financially transparent, socially responsible, environmental projects for their investments. It seemed that Green Bonds would fit the bill to finance these environmental projects that were already in the state’s capital budget.

“The motivation was to align with investors who wanted to invest,” said MacNaught.

“For credit purposes the bonds are standard Massachusetts State Government Bonds. The difference is that the State is guaranteeing to use the proceeds to finance "environmentally beneficial" projects.”

MacNaught reached out to the World Bank, and based on their successful Green Bond model began to develop the Massachusetts Green Bond that would connect the private and corporate capital market to environmental and energy efficiency projects in Massachusetts. The World Bank was available as a resource to MacNaught during this process.

Green Bonds developed by Massachusetts had the same security, rating, and liquidity of any other comparable bond. The Massachusetts Green Bonds were developed to fund projects that were already in the state’s capital budget, but identified as “Green,” and as such would fulfill investors’ socially responsible investment (SRI) needs. Massachusetts’ goals were to establish leadership in using an innovative financing tool in the US and to attract new investors, which could potentially increase available capital for future projects. For the inaugural issuance of Green Bonds, the State Treasurer’s Office used a systems approach. Besides communicating with the World Bank, included were the Executive Office for Administration & Finance and the Executive Office for Energy & Environmental Affairs.

Massachusetts studied the World Bank Green Bond process and constructed a framework to identify eligible project categories for investors in the Green Bond Preliminary Official Statement. The funds would be allocated to four categories: clean

---

28 Kidney, Sean. “Massachusetts to issue AA+ $100m Green Bond on 4 June.” CBI 2013. http://www.climatebonds.net/2014/05/massachusetts-issue-aa-100m-green-bond-4-june
Retrieved May 2016.
and drinking water, land acquisition/open space protection, river revitalization/habitat protection, and energy efficiency and conservation. When the market was opened for the sale of $350 million worth of Green Bonds in the Commonwealth in September, 2014, the Massachusetts Treasury was inundated with $1 billion in buy orders from investors.  

Analysis

In determining how well Massachusetts Green Bonds met categories that the CSNE assessment identified as “integrated solutions,” criteria, analysis of responses to questions posed in the interview were reviewed by coding for recurring concepts or themes.  

Connection to Implementation

This analysis showed that Massachusetts Green Bonds were well-connected to their implementation. They had been issued in order to show leadership in policy that financed environmental projects and to diversify and increase the investor base. This outcome was achieved. Outcomes were aligned with planning and proposed outcomes and the project had an extensive planning and review phase. The project leader had a long relationship with stakeholders (investors) and took time to assess and model components of the project against the World Bank Green Bond model. The project leader did “due-diligence” to determine why Green Bonds would be a good initiative for Massachusetts. Massachusetts was already a large player in the municipal bond market with $2-3.5 billion issued in the several previous years before the Green Bond project.  

Systems Approach and Complexity

The bond system is intrinsically a complex and integrated system which includes issuers (Massachusetts), investors (private individuals and corporations which issue the bonds or loans to finance projects), ratings agencies (i.e. Standard & Poor’s, etc.), indices (i.e. Barclays – assess quality of investment), and investment bankers (i.e. JP Morgan – who design and market the bond product to investors). The Green Bond model adds layers of complexity and increases systems of integration as it adds components to the system: transparency of what is being financed, tracking of spending, and reporting of environmental impact of investment in some cases. In addition, silos within and associated with the issuing organization must collaborate in designing and funding the environmental project and in coordinating sustainable management of the project. The system has multiple intentional benefits which are defined in the diverse environmental projects that were chosen to be financed.

Responsive

Massachusetts responded to demand for initiation of the Green Bond from investors for increased opportunities to invest in Socially Responsible Investments within the fixed income asset bond market. Green Bonds would provide an opportunity to invest in this market with the same risks and benefits of General Municipal bonds but with the added transparency, reporting, and impact that investors were seeking. Responsiveness

30 Lofgren
31 MacNaught, Colin. Personal interview.
32 Environmental impact reporting is an area of weakness and an opportunity for future research.
during the implementation occurred when demand was high, so a larger bond than had been planned was issued.

**Participatory**

The project initiative included the same team that would collaborate on a General Municipal bond, but in addition, many other silos, both within the Massachusetts Treasury department and among other agencies in the Commonwealth, participated in the project.

**Contextualized/ Place Based**

Massachusetts Treasury had already identified environmental projects in the Commonwealth within its capital budget that would be funded by General Municipal Bonds in Massachusetts. Green Bonds added the elements of transparency, tracking, and impact reporting that were identified as desired by investors in Massachusetts bonds that had previously been issued. The Green Bonds were place-based in the context of environmental projects that were specific to Massachusetts.

**Anticipatory**

Massachusetts Green Bond initiative was anticipatory in two contexts – both in demand from investors (demand was over 1 billion for 350 million availability when Green Bonds were issued in 2014) and in increased source of funding for environmental projects - private capital.

"Green Bonds have the potential to increase states’ capital budgets from current 10-20% on environmental issues to 40-50%," - Colin MacNaught, Former Massachusetts Assistant Treasurer of Debt Management

**Mitigation and/or Adaptation**

Basing its monitoring system on the one defined in the World Bank Green Bond Model, Massachusetts identified the mitigation and adaptation goals in its capital budget, along with expected achievements. These are still in the process of being reported and data is available in reports published by the Commonwealth (Figure 6).³³

**Economic Development and Opportunity**

Green Bonds financed site-specific audits at over 149 hazardous waste sites across the Commonwealth and well as the initiation of a project to update electronic permitting and compliance forms at Massachusetts Department of Environmental Protection. Finance for these projects supported economic development and opportunities.

**Outcome Equity**

Green Bonds will contribute to finance of non-development alternatives to farmers and owners of other agricultural land regarding future use and disposition.\(^{34}\)

**Public Health Improvements**

The initiative will contribute to and improve local public health by reducing greenhouse gas emissions through investment in energy efficiencies and renewable energy. Environmental investments also address the need for clean water and habitat diversity (Figure 6).

Environmental Remediation spending includes remediation of Charles Upper Basin fuel tanks, removal of lead paint from Peddocks Island Chapel, remediation of asbestos conditions at Ames Mansion in Borderland State Park, waste disposal of catch basins and...
street sweeping residuals, and removal of hazardous waste from former Almy’s building on Soldiers Field Road.  

**Economic Viability and Sustainability**

In order for municipalities and businesses to take action on initiatives that work to mitigate and adapt to climate change, projects need to be economically viable. Green Bonds are a viable tool for investors to do this, but in order for them to continue to be a sustainable supply of financing from private and corporate investors, and in order for them to increase the number and diversity of investors; they must maintain their validity through continued transparency, tracking and impact reporting of verified environmentally beneficial projects. Massachusetts has issued two Investor Reports on Green Bond spending, but overall environmental impact reporting of the investments is an area of weakness.

**Community Resiliency**

Massachusetts Green Bonds support the community’s resiliency to climate change by assuring financing of a diversity of environmental projects.

**Solving Multiple Problems at Once**

Mass Green Bonds address multiple issues and challenges that climate change imposes on communities by the diversity of environmental issues that are addressed. Agencies work together to define projects that are funded by Green Bonds. These include those that address improvement to public health with remediation projects, protection of the deterioration of agricultural land, and investment in alternative energy and energy efficiencies. This has the added effect of increasing awareness of the opportunity for investors to fund environmental projects.

**Monitoring, evaluation, review/feedback**

The bond process is fundamentally a process that is monitored and evaluated. The monitoring, evaluation, and review and feedback of the additional “Green” impact of the Green Bond investment need to be strengthened. Massachusetts did not requisition the services of a third party certification, or a second party opinion provider. This is another area of weakness in Green Bond issuance. Although the Massachusetts issuance of its Green Bond was carefully constructed to meet high standards of environmental problem-solving, the best practice to ensure this kind of verification would be to use second and third party review or certification. Even stronger support would be if the Green Bond verification was not voluntary, but rather if there was a regulatory requirement regarding use of the label. Regulation in verification or certification before labeling would be a key deterrent to issuances of bonds that are “greenwashed,” and would help to solidify the validity of Green Bonds when financing critical environmental issues. This would be an added attraction to mobilize additional investors into this market.

**Quality of Life Impacts**

Although all of the projects financed by Mass Green Bonds could be identified as improving the quality of life, these projects were already determined to be funded within the Commonwealth budget, and were not specifically identified to be funded by Green

---

35 “Mass Green Bonds” 2013 Series D First Quarterly Investor Impact Report
36 “Mass Green Bonds”
Bonds. In the future, this may change, but to specifically state that the fact that the bonds were “Green” as being the reason to change the quality of life would be difficult to verify as the projects were already identified and approved to be financed with General Municipal Bonds. The “Green Bonds” were implemented to increase investor number and diversity and to show leadership.

**Adaptive in Process**

In the development of its Green Bond financing projects, Massachusetts illustrated an adaptive process by increasing the amount of Green Bonds offered when faced with high demand. Later issuances also added Land Protection Grants programs. Criteria were all met to the highest degree based on the design and goals of the project. Innovation and creativity were key elements in introduction of this initiative in the United States by Massachusetts.

**DC Water Green Bonds**

**Summary**

An aging infrastructure in Washington, D.C. created risk from severe and frequent storms. Washington, DC had been diverting three billion gallons of raw sewage into its rivers annually, mostly to the Anacostia’s slower and shallower rivers, adjacent to some of the most economically disadvantaged areas of the city. The plan for adaptation & mitigation was to build a tunnel to retain water from combined sewer overflow, releasing it when the rains subsided after wastewater treatment. Part of the project would be funded by a 100 year, Green Bond. A $300 million dollar bond was planned, but high investor demand enabled DC Water to decrease the interest rate it would pay on funding the project, and to increase the bond to $350 million. When completed in 2030, the project will reduce combined sewer overflows to the Anacostia River by 98 percent.

**DC Water – Clean Rivers Project**

*First 100-Year Bond*

- Aging infrastructure created risk from severe and frequent storms
- DC Clean Rivers Project – Construction of a 13 mile tunnel
- 2014- $350 million

*Figure 7. Clean Rivers Project Tunnel Boring Machine (DC Water)*

---

38 Kim, Mark, DC Water CFO, Full text interview, Appendix F
Analysis

Connection to Implementation

Green Bonds were issued by DC Water to share intergenerational equity (and responsibility) over the life of a long-lived environmental project, construction of a 13 mile diversion tunnel to retain stormwater runoff from increasingly frequent and severe stormwater events that were increasing combined sewer overflow into the waterways of Washington, DC, and to diversify and increase the investor base. The outcomes of the project aligned with its

Themes

Creativity
- “There had only been six Green Bond deals in the US when we did our transaction: two municipal (MA and NY) and four corporate deals.”
- “The municipal market itself is not liquid in the 100-year space, so we didn’t issue it in the municipal space. We issued a taxable bond instead of a tax-exempt bond. Since the market we needed didn’t exist, we went to another market. We went to the corporate market.”

Leadership
- “This didn’t make financial sense for DC Water. It was not fair to ratepayers. We’re supposed to balance our assets with our liabilities. So that was the genesis of the Century Bond – to allow DC Water to better match our assets and liabilities”
- “We picked Goldman Sachs and Barclay because they are really leaders in their fields. Issuing a 100-year bond is not an easy thing. No utility had ever done it in the US. Their expertise was critical to the success of this project as well.”
- “It was challenge after challenge after challenge to get this deal done. Cultural challenges – Get people to think differently. First – the coordination between departments (e.g. engineering, finance, accounting). We were remarkably successful in working across silos and have everyone understand what we were trying to accomplish with this project. The most important tool was common sense. It became very clear to me that doing what we always did and using traditional thinking was going to yield a sub-optimum result for DC Water and our ratepayers.”

Multiple benefits
- “This project addresses water quality, climate resilience, and quality of life.”
- “So when we clean up the river there will be a huge increase in quality of life for local residents along with economic development opportunities. Also improved biodiversity, the (eventual) ability to eat the fish, the ability to swim or use them for recreational uses”

Untapped Potential
- “There are lots of other projects at DC Water that would qualify for Green Bond funding but we have made the decision to limit our Green Bond program to finance our Clean Rivers Project at the present time. We had extraordinary demand for our deal. We had initially structured it as a $300 million bond; we went to market and received over a billion in investor orders. We increased it to $350 million as a result and lowered the interest rate.”
New collaborations
- “The usual cast of characters plus a few new ones on our finance team to get this deal executed: DC Water Finance Team, DC Water Engineering.”
- “We brought in Vigeo, a sustainability consultant. They were involved at the very beginning, along with Goldman Sachs & Barclay.”

Figure 8 Themes

planned and proposed outcomes. This project had a long planning and review phase. From conception to execution the deal took approximately 15 months, whereas a traditional bond deal could be completed in around 12 weeks. The project leader developed a relationship with stakeholders (investors), investment bankers (Barclays and Goldman Sachs), and a Second Opinion Provider (Vigeo). Assessment and modeling of the initiative was carefully developed and implemented. The project leader did “due-diligence” to determine why Green Bonds would be a good initiative for the DC Water Project. DC Water was already a bond issuer and the Clean Waters Project was a very large project and would fit the model established by the World Bank and the Green Principles as a green project with environmental benefits.

Systems Approach and Complexity
The Municipal Bond System is intrinsically a complex and integrated system which includes issuers (DC Water), investors (private individuals and corporations which issue the bonds or loans to finance projects), ratings agencies (i.e. Standard & Poor’s, etc.), indices (i.e. Barclays – assess quality of investment), and investment bankers (i.e. in this case Barclays & Goldman Sachs—who design and market the bond product to investors). As DC Water prepared for its second Green Bond issuance, this system continued expanding in its complexity to include Bank of America Merrill Lynch as lead manager on the transaction, with Barclays, Goldman Sachs, Loop Capital Markets, Ramirez, Citigroup, JP Morgan, Morgan Stanley and US Bancorp also acting as managers.

The Green Bond model adds layers of complexity and increases systems of integration as it adds components to the system: transparency of what is being financed, tracking of spending; and reporting of impact of investment. In addition, silos within and associated with the issuing organization must collaborate in designing and funding the environmental project, and in coordinating sustainable management of the project. The system has multiple intentional benefits: stormwater retention to increase water retention during severe and frequent storm events due to climate change and increased population, increase of investor base diversity, increase of investor numbers, and increase in equity and responsibility for the utility project over multiple generations, as shown in its 100 year term.

Responsive
Massachusetts had set the stage to offer an environmentally responsible project to investors who wished to invest in environmental projects. The high demand for this type of bond preceded DC Water’s issuance and DC Water responded by developing their own Green Bond which was different, though still met the requirements of an environmentally beneficial project as identified by the Green Principles.
The municipal market was not liquid in the 100-year space, according to Kim, so DC Water didn’t issue it in the municipal space. They issued a taxable bond instead of a tax-exempt bond. Since the market they needed didn’t exist, they went to another market - the corporate market.

**Participatory**

The project initiative included the same team that would collaborate on a General Municipal bond, but in addition, many other silos outside of DC Water’s Financial Department, participated. Some of these included Second Opinion Provider, Vigeo, Barclays Financial, and Goldman Sachs.

“It was challenge after challenge after challenge to get this deal done,” said DC Water CFO, Mark Kim. “First, the challenge was the coordination between departments (e.g. engineering, finance, accounting). We were remarkably successful in working across silos and have everyone understand what we were trying to accomplish with this project.”

**Contextualized/ Place Based**

The DC Water Green Bond financed a part of the DC Clean Rivers Project, a $2.6 billion construction of a deep tunnel system to transport and treat combined stormwater and sewage in order to reduce combined sewer overflows (CSOs) to area waterways. DC Water had already identified its Clean Water projects and DC needed updated infrastructure.

**Anticipatory**

DC Water’s Green Bond initiative anticipated demand from investors and was able to provide an increased source of funding from the bonds for the environmental project. Original issuance was planned at $300 million but was increased to $350 million due to high demand. It addressed threats to water quality, increasing resilience to climate change, and improving quality of life for DC citizens.

**Mitigation and/or Adaptation**

The project financed by the DC Water Green Bond will support mitigation of the pollution effects of combined sewer overflow in DC by retaining stormwater within the new 13 mile underground tunnel before it is treated and released into area waterways. It will also support adaptation to climate change by increasing the region’s resilience to increased water from extreme and more frequent storm events, and from increased population. It is on track to address both mitigation of pollution effects of combined sewer overflow and adaptation to increased frequency and severity of storms, and so meets this outcome with a high degree.

**Economic Development and Opportunity**

Improvement in the water quality in the areas where combined sewer overflow has a detrimental effect will provide opportunity for economic development as those areas of outflow (i.e. Anacostia River) begin to exhibit improved water quality when the 13 mile tunnel is completed.
Outcome Equity
DC Water Green Bonds offer intergenerational equity and responsibility due to its unique 100 year term. The total cost of the project is expected to be ~ $2.6 billion. The Clean Waters Project will benefit multiple generations, and will be paid for by multiple generations.

Public Health Improvements
The initiative will contribute and improve local public health by improving water quality of the rivers of the DC region and reduce overflow of sewers by retention and treatment of this water during extreme storm events.

Economic Viability and Sustainability
Green Bonds must maintain their validity through continued transparency, tracking and impact reporting of verified environmentally beneficial projects. DC Water differed from Massachusetts in that DC Water retained the services of a Second Opinion Provider, Vigeo. Vigeo is a firm that assesses a project’s validity as a Green project, and assesses an issuer in terms of Environmental, Social and Governance (ESG) criteria. This assessment becomes part of the Official Statement when the bond is offered for sale. This practice is one that will contribute to the stability, validity, and sustainability of the practice of issuing Green Bonds. Evidence of sustainability of the initiative is DC Water’s preparation to issue a second Green Bond at the time of this research.

Community Resiliency
DC Water’s Green Bond supports the development of resilience in the community against effects of frequency and severity of storms. Sustainability ratings agency, Vigeo, has provided an outside opinion and has assessed that DC Water's commitments to environmental, social and governance issues are robust, and that its Green Bond will contribute to improvement of water quality, climate resilience and quality of life.

Solving Multiple Problems at Once
DC Water solves problems of water quality with this initiative, but it also improves quality of life and offers economic opportunity by increasing the quality of recreational waters near outflows in economically disadvantaged areas of the Anacostia River.

Monitoring, evaluation, review/feedback
Evaluation of the monitoring and evaluation of the DC Water Green Bond will be fairly high due to its engagement of Vigeo to evaluate its process in both of its Green Bond issuances. The bond process is fundamentally a process that is monitored and evaluated, but DC Water’s engagement of Vigeo ensures that the process is evaluated in terms of “greenness” and environmental and social impacts by a neutral second party.

Quality of Life Impacts
The tunnels being funded by the bond will carry storm water and sewage to a water treatment plant where they will be treated before being released into regional waterways. Public health will be improved by reducing combined sewer overflow into the Anacostia River, which, besides improving water quality, also will improve recreational qualities of water near outflows. This also has the potential to increase economic opportunities in those areas.

Adaptive in Process
Green Bonds provide an opportunity for multiple stakeholders to collaborate. Green Bonds offer an arena for innovation as new kinds of bonds, such as DC Water 100 year bond, are creatively designed. Green Bonds have mobilized development of
methodologies of measuring and reporting impact of environmental solutions, such as the assessment tool used in this analysis current one which is being developed to assess integration and positive outcomes based on categories, or criteria, of integration.39

“We had extraordinary demand for our deal. We had initially structured it as a $300 million bond. We went to market and received over a billion in investor orders. We increased it to $350 million as a result and lowered the interest rate,” said Kim.

Innovation and creativity, and increased collaboration across silos were key elements in introduction and replication of this initiative at DC Water. Being creative and having strong leadership was important for the project’s mobilization –a) issuing the bond as a 100 year bond and b) issuing the bond as a taxable bond. Green Bonds have the potential to make green projects less expensive. i.e. High demand for the bond can create a lower interest rate for the borrower (issuer). This can reduce the cost of capital for the organization that is issuing the Green Bond. (i.e. DC Water reduced its interest rate in response to high demand for its Green Bond). DC Water solves problems of water quality with this initiative, but it also improves quality of life and offers economic opportunity by increasing the quality of recreational waters near outflows in economically disadvantaged areas of the Anacostia River.

Discussion & Analysis - Green Bonds

Several themes surfaced when interviews were reviewed for instances of repetition and similarity.40 Creativity, leadership, multiple benefits, untapped potential, and new collaborations were themes that emerged strongly. Creativity in the use of Green Bonds appears to be both its biggest obstacle and its biggest attraction.41 Due to the fact that the “Green” label of a Green Bond is a designation that can be made by the issuer, and is not under regulatory jurisdiction, upon closer scrutiny some Green Bonds may not fulfill the Environmental, Social and Governance goals of investors. Alternatively, without regulatory restrictions, the opportunity for creative problem solving exists and new ideas can be incubated, as in the innovative Century Green Bond issued by DC Water.

39 Appendix E
40 Ryan & Bernard
41 Reichelt, states that “innovative solutions are needed to blend government credit into activities in which mitigation or adaptation activities generate cash flow returns that, with appropriate credit-enhancement, can be moved from investors’ small allocations to alternative investments, to the mainstream fixed income allocation in the portfolios of the largest investors.”
"Flexibility is everything right now. The market is young. There are many beautiful things happening. In the absence of strict regulations… issuers are moving forward with new ideas…"

-Laurie Chesné, Sustainability Consultant, Vigeo.

Leadership is another important theme that emerged. In many cases, the issuers that were interviewed established their own precedents. They were all familiar with the process of bond issuance, having had experience in that arena, but they recognized two important concepts. First, that environmental problems needed to be addressed both administratively and financially and they took bold leadership steps to put that into action. Second, as in the case of the first labeled US Green Bond issued in Massachusetts, they understood that investors were motivated to mobilize funds in the direction of environmental solutions. They began new processes and forged ahead despite initial resistances.

Untapped potential is another theme that emerged. The fixed-income bond market is an enormous source of investment capital. Estimates reported range from $90 to $100 trillion. When issued in size and number, with certifications, second party opinions, and verifications, Green Bonds can become those kinds of investment products which appeal to investors from pension funds, endowments, sovereign wealth funds, and other managed assets. Shifting these assets into long-term projects that address environmental solutions offers the potential to make a large impact.

A bond is issued based on many factors, one of which is the length of the asset which it finances. As in the case of DC Water, a combined sewer overflow system was expected to last 100 years plus, so the concept of a hundred year bond was creatively implemented. Many other green infrastructure and greenhouse gas reduction initiatives are long term projects. Installation of electric vehicle charging stations, electric rail construction, flood mitigation and adaptation projects, low dam hydropower projects, green freight systems, are just a few. The connection among these larger themes of creativity, leadership, and untapped potential presents an exciting and synergistic possibility, optimism frequently absent in the current field of climate science.

A secondary, but no less important theme, is that of new collaborations. Green Bonds offer an opportunity for cooperation among groups that had previously been isolated in silos. These silos may be dynamic and effective, but can also miss opportunities to collaboratively address broader problems. When engaged to address a common problem the secondary theme that emerged in the initiative of Green Bond issuance was one of commonality and collaboration. When addressing the common theme of reducing environmental impacts and preparing for future impacts a collaborative theme emerged. This can be seen in the process of Green Bond development that includes a multidisciplinary approach.

43 Magaziner, Seth.
44 MacNaught, Colin
45 Kim, Mark
Looking ahead: Possibilities & Pitfalls

Bonds that address environmental problems are not a new concept. However, bonds that investors can choose that specifically address environmental solutions and greenhouse gas reduction, when labeled as Green Bonds, with certifications and second party opinions, offer opportunities for investors to respond to shareholder and stakeholder demands, as well as to meet their own Corporate Social Responsibility goals.

The hypothesis addressed in this case study is whether Green Bonds are a viable solution to climate damages, and if this is a solution with multiple or integrated benefits. In the analysis of interviews, preferable social, economic, and environmental outcomes were identified. Initiatives were connected to outcomes, systems approaches were used, initiatives were responsive and considered different perspectives, represented a diversity of interests, were contextualized and place-based to specific location and surroundings, and factored in “critical uncertainties” over time, building into the plan things that could change in the future. Outcomes were adaptive in process, resulting in public health or increased individual wellness benefits, succeeded or anticipate succeeding in their mitigation efforts, increased adaptation efforts towards resiliency or decreased vulnerability, improved economic development opportunities, have the potential to be economically viable and sustainable, and address socially equitable community resiliency while solving multiple problems.46

Green Bonds address environmental damage, finance environmental restoration, prevent more environmental damage, and connect with investors who want to shift funds into these areas.47 Benchmark size deals attract mainstream investors.48 A large bond, issued according to Green Principles, verified by a second party such as Vigeo, DNV GL, or certified by Climate Bonds Initiative, is more liquid - or easier for an investor to identify, and can reveal transparency of “greenwashing” attempts by an issuer. Verification of high numbers of smaller size bonds would be more time consuming and less desirable to mainstream investors, and could more easily be camouflaged into financing of undesirable projects falsely identified as “green.” Green Bonds can group many practical solutions to environmental problems and in doing so can provide economic opportunities as well as financing. When grouped, these larger denominations can be more attractive to investors and easier to mobilize on the financial bond platform.49

Green Bonds can group many solutions (think jobs) in order to reach this benchmark size: stormwater management, land acquisition/open space protection, river revitalization, LEED certified construction, energy efficiency retrofits, efficient transportation, EV charging stations, refinance of existing bonds, irrigation efficiencies, wetland redevelopment, hydropower, and greenscapes.

Green Bonds are in an early adopter phase. Standards are still being defined. A common framework is needed for investors, issuers, and underwriters. Use of a second party opinion provider, ESG, or certification may avoid charges of greenwashing. New

46 Appendix D
47 United Nations
48 GFOA
49 GFOA
projects vs refinancing are not always clearly defined and can create an “Emperor’s New Clothes” effect.

Investors’ benefits include the transparency of knowing where money from investments is being spent, that their investments in Green Bonds can meet Environmental, Social, Governance criteria goals, that there is no additional financial risk with comparably rated non-Green Bonds, that their investment meets Principles of Responsible Investment (PRI) commitment and they can receive reporting on climate impact of their fixed income investments if the bond is structured to provide this.

Issuers can benefit as cost of capital can be lower with lower interest rates which can save taxpayer dollars. Issuers can highlight their green assets or businesses, creating a positive marketing story. Investor bases can be increased by attracting ESG/PRI specialist investors. And of primary importance is the effect that the issuance of Green Bonds can have on increasing social awareness of management of environmental resources as diverse teams across silos increase collaboration and citizen engagement increases.

**Opportunity /Risk**

Opportunity lies in fact that the tool of bond finance already exists. Modified as a Green Bond, it can be used to meet greenhouse gas (GHG) reduction goals such as those identified in international and national GHG production goals. Green Bonds can be used to improve climate resilience, create new jobs through impact projects, improve public safety and health through cleaner water management, and can reduce infrastructure risks and vulnerabilities that may decrease FEMA flood insurance premiums.

Risks include the fact that standards are voluntary, as are many environmental standards. An important way to avoid “greenwashing” is through independent review of the structure of the Green Bond by a second party verification, as was completed by DC Water. In a recent request by investors to the SEC to increase stronger reporting of sustainability risks, Ann Simpson, Investment Director, CalPERS says, “Investors need robust, mandatory reporting to capture climate risks across their portfolios.”

> “So when we decided to do this project we looked at best practices, which were happening in Europe, and in their best practices were to come to market with a second party opinion. Makes total sense. Coming without one would be like coming to market with unaudited financials and saying, “Just trust us.” - Mark Kim, CFO, DC Water.

A qualitative approach has been used to measure criteria and outcomes in the two examples presented in this study, and further study will benefit from some of the quantitative tools that are being developed. The benefit of this kind of case study research is not so much in the metric that has been used, but in the identification of the

---

51 COP21, U.S. Clean Power Plan, if implemented
52 ISO 14000, Environmental Management
integrated aspects of these two examples and in the multiple benefits that are being observed. Social change is needed in order to address and potentially prevent damages from climate and the integrated aspects that contribute to the development of a Green Bond, both through its implementation and follow-up, illustrate expanded areas of social and administrative team interactions.

Areas of further research should include whether intended outcomes as identified by bond issuers for reduction of CO2 and other environmental impacts were met, as well as measurement of positive externalities such as economic and social welfare benefits. The challenge of these kinds of metrics that measure social, environmental, and economic impact over time (DC Water and Anacostia River) such as CO2 reduction and improved resiliency will provide an important link to learning about the long-term benefits, and integrated solutions from Green Bonds.
IES Reflection

We sometimes have opportunities to work with amazing teams and participating in the Climate Solutions New England Fellowship at the University of New Hampshire Sustainability Institute was one of those opportunities. What I have learned from the work of others as a Fellow is that not only are there dedicated, knowledgeable people who are truly passionate about efforts to address environmental issues, but there are many who take effective action. I saw this time and again, from everyone that I met at the Sustainability Institute.

I had the opportunity to step outside of my comfort zone in so many ways. It was the first time that I engaged in outreach, both with the Union of Concerned Scientists at the Seacoast Science Center Music by the Sea Concert, and in presenting support for the EPA Clean Power Plan and the Regional Greenhouse Gas Initiative at Senator Kelly Ayotte’s office (R-NH). I was so much more comfortable to participate in public outreach after those experiences.

The second step outside of my comfort zone was through my own case study research. I learned that finance can be a pretty intimidating subject, and those folks really do speak a different language – but by being consistently persistent, I began to see the value in learning that second language. I learned that I would like to be the translator who connects investors to impactful environmental projects. I am grateful to have knowledge about some of the technology and science that can fulfill the environmental solutions that I am passionate about, and I am excited to now know more about connecting them to the finance that can mobilize solutions. I am eager to share that information through outreach to potential Green Bond issuers.

There’s so much more research to be done in the area of impact investment and I’ve learned that it’s important for scientists to not only be able to communicate, but also to understand the financial interconnections that are available in order to marshal the knowledge that is discovered into applicable solutions. Overall, it is with humble appreciation I can say that my experience as a Climate Solutions Fellow at the University of New Hampshire Sustainability Institute exceeded my expectations!

And last but not least, I thank my practicum advisor Dr. Steven Elliott, and Committee Members Dr. David Prytherch and Dr. Sarah Dumyahn. Though it has been a challenging two years here at Miami University, with their excellent guidance and instruction I feel well prepared to face new challenges.
References

Chesné, Laurie, Sustainability Consultant, Vigeo. Interview by Irene Queen. August, 2015.


2015, Investing in a Greener, Greater Commonwealth”

“Moody's publishes methodology on Green Bonds Assessment,” by Global Credit
https://www.moodys.com/research/Moodys-publishes-methodology-on-Green-Bonds-Assessment--PR_346585

Reichelt, Heike. "Green bonds: a model to mobilise private capital to fund climate change
mitigation and adaptation projects." The EuroMoney Environmental Finance Handbook

Ryan, Gery W., and H. Russell Bernard. "Techniques to identify themes." Field methods

Sanders, Sarah. Assistant Treasurer of Debt Management, Office of the Treasurer, State

World Bank Green Bonds,

World Bank Green Bonds


http://www.climatebonds.net/resources/publications/how-to-issue-a-green-muni-bond

ICMA, International Capital Market Association http://www.icmagroup.org/Regulatory-
Policy-and-Market-Practice/green-bonds/green-bond-principles/


New Delhi, Sage


*World Bank.*  

http://www.wbjournal.com/article/20140923/NEWS01/140929987/investors-gobble-up-mass-green-bonds
Appendix A. Green Bonds Sustainability Briefing
Integrated Climate Solutions: Green Bonds

Over the past decade, Green Bonds have emerged as a viable—but underutilized—funding source for infrastructure improvements, coastal flood adaptation, habitat restoration, and more, while also offering portfolio diversification and reduced climate risk for investors. A Green Bond is a loan to finance or refinance a project. It is similar to a general bond—which has long been an attractive option for investors looking for fixed rates of return and high ratings for stability. However, Green Bonds incorporate added transparency, tracking, and impact reporting that General Obligation traditional bonds don’t have.

In 2008, the World Bank issued the first Green Bond as a response to concerns about pension fund assets’ exposure to climate risks. Since then, others have followed: In the Northeast, Massachusetts (in 2013), Connecticut (in 2014), and Rhode Island (in 2015) have all found a way to “ringfence” or isolate funds raised from the sale of bonds, and to track the spending and impact of these funds on environmentally beneficial projects. Since their introduction, demand for Green Bonds has far exceeded supply. This means that cities, utilities, campuses and states are missing out on a viable way to solve the perennial challenge of “not enough funding.” But the proof of concept, and a roadmap for others to follow based on the experiences of the other US organizations and agencies, is in place.

According to the Economist, “55% of pension fund assets are exposed to climate risks, including heavier regulation of dirty industries, and…buying Green Bonds helps offset such risks.”

HIGHLIGHTS

Green Bonds Outcomes
- More (and lower cost) available capital for climate and energy projects
- Environmental benefits
- Infrastructure renewal
- Community development
- Enhanced environmental/social justice
- Reduced climate risk for investors and thus a more stable global economy

Barriers
- Complexity of the system
- Lack of standardization

Sustainability Briefings are a collection of occasional essays, thought pieces, case studies and research briefings through which University of New Hampshire (UNH) faculty, staff and students can connect with larger audiences on the complex issues of sustainability. The collection is sponsored by the Sustainability Institute at UNH, a convener, cultivator and champion of sustainability on campus, in the state and region, and around the world. Learn more at www.sustainableunh.unh.edu.
MASSACHUSETTS LEADS THE WAY IN THE U.S.

In 2012, through conversations with investors in his personal and professional networks, former Massachusetts Assistant Treasurer of Debt Management Colin MacNaught realized that they were looking for financially transparent, socially responsible, environmentally-friendly projects in which to invest—and saw an opportunity to fund state projects while helping investors meet these goals. MacNaught reached out to the World Bank—which had piloted green bonds in 2008—and started the ball rolling to develop a Massachusetts Green Bond to connect these corporate and institutional investors to environmental and energy efficiency projects in Massachusetts.

The first step was to study the World Bank Green Bond process, and then to construct a framework to identify eligible project categories for investors. The Green Bonds were developed to fund projects, already in the state’s capital budget, which fell into one or more of four categories: clean drinking water, land acquisition/open space protection, river revitalization/habitat protection, and energy efficiency and conservation. These ranged from salt marsh restorations to state campus boiler upgrades to investments at water treatment plants.

The goals were to establish leadership in using an innovative financing tool in the US, and to attract new investors, which could potentially increase available capital for future projects. For the inaugural issuance of Green Bonds, the State Treasurer’s Office used a systems approach; along with the World Bank, they worked closely with the Massachusetts Executive Office for Administration & Finance and the Executive Office for Energy & Environmental Affairs to create, implement and track the performance of the Green Bonds they would issue.

When the market was opened for the sale of $350 million of Green Bonds in the Commonwealth in September, 2014, the Massachusetts Treasury was inundated with $1 billion in buy orders from investors who were excited about the opportunity to invest in transparent projects with local benefits.

“Green Bonds have the potential to increase states’ capital budgets from current 10-20% on environmental issues to 40-50%.”
- Colin MacNaught, Former Massachusetts Assistant Treasurer of Debt Management.
SHADES OF GREEN - DC WATER'S APPROACH TO THE FIRST EVER CENTURY GREEN BOND

The infrastructure of District of Columbia’s water utility, D.C. Water, was built in the 1800s and wasn’t designed to handle the growth, nor the increased frequency and severity of storms that accompanied climate change, to which it’s been subjected. This was the impetus for the DC Clean Rivers Project, a $2.6 billion deep tunnel system to transport and treat combined stormwater and sewage in order to reduce combined sewer overflows (CSOs). To help pay for it, DC Water looked to Green Bonds. Theirs was the first 100-year bond ever issued; the first in the US to carry a Second Party Opinion; and the first utility issuance to come to market.

The introduction of a 100-year bond term required some “selling,” as DC Water’s CFO Mark Kim noted: “When you say you want to issue a bond for 100 years, they wonder ‘Are you under financial stress? Are you unable to pay it off in a traditional time frame? We spent the better part of six months educating the rating agencies on multiple occasions,” said Kim.

Goldman Sachs and Barclay Capital served as joint underwriters, and as a middleman between DC Water and the investors. They were chosen based on their reputation as leaders in their fields; since no utility had ever issued a 100-year bond in the US, their credibility was also critical to the success of the project. Goldman Sachs and Barclay assisted DC Water in structuring the 100 Year Bond.

D.C. Water felt that it was important that—unlike the Massachusetts bonds—their bond should carry a Second Party Opinion. This decision was likewise made in order to cement the credibility of the offering, and to provide leadership and support a “best practices” approach to Green Bonds in the U.S. They worked with a European firm called Vigeo. “Coming without [a second-party opinion] would be like coming to market with unaudited financials and saying ‘Just trust us,’” said Kim. Vigeo helped to develop and structure the environmental outcomes and success.

From conception to execution, the deal took approximately 15 months, five times as long as would be typical for a traditional bond. However, investor demand was so high that what had initially been structured as a $300 million bond was raised to a $350 million bond with a lower interest rate. That capital is now being used to fund the Clean Rivers Project—which is slated to be finished in 2030.

“First, the challenge was the coordination between departments: engineering, finance, and accounting. We were remarkably successful in working across silos and have everyone understand what we were trying to accomplish with this project. The most important tool was common sense.”

- Mark Kim, CFO, D.C. Water

GREEN BONDS CONTRIBUTED TO FINANCING OF THE CLEAN RIVERS PROJECT, WHICH HAD EXPENSES SUCH AS PURCHASE OF THIS TUNNEL BORING MACHINE. THE COMPLETED TUNNEL WILL REDUCE COMBINED SEWER OVERFLOW INTO THE ANACOSTIA RIVER BY 98%
LESSONS LEARNED

For Potential Issuers - State/Local governments, campuses, utilities

From 2013 to 2015, demand for Green Bonds has exceeded supply by anywhere from 400 to 400%. It’s clear that many more local and state governments, campuses, utilities, businesses and others looking for ways to pay for needed capital investments to address energy and climate issues could look to Green Bonds as a viable option. The additional reporting requirements and the potential decision to work with an outside verifier to offer an opinion on the issuance does make issuing a Green Bond a bit more cumbersome than a traditional bond.

For Potential Investors

At the UN Climate Summit in New York in September 2014, the global insurance industry pledged to make climate smart investments of $420 billion by 2020, a tenfold increase over expected 2015 investments; Green Bonds are one key potential vehicle for that investment. One concern of would-be investors is the potential for “greenwashing” with Green Bonds. There are several ways to address this: careful review of the issuer’s Position of Statement; certification of the bond; investment in Green Bonds that meet certain benchmark size; or through review of professional environmental, social and governance (ESG) Opinion.

For Policy-Makers and Advocates

It is fair to ask whether the exponential growth of green bonds is due to new investment in sustainability, or from just a rebranding of existing investment. The answer seems to be a bit of both. Some Green Bonds have been for existing projects. However, refinancing at a lower rate with Green Bonds means that more capital is available for other green projects.

An important next step for Green Bonds is to maintain their market credibility. Future regulation may play a role, but for now, the voluntary “Green Bond Principles” guidelines offer an opportunity for creativity and development in this young market. Seth Magaziner, General Treasurer of the State of Rhode Island, has called for more regulation, but others feel that more fluidity may be a good thing in these early stages of development, allowing for more innovation. Ideally, new policies would be designed to spur, rather than slow, Green Bond issuances.

On another policy front, the National Infrastructure Protection Plan 2013: Partnering for Critical Infrastructure Security and Resilience, outlines ways to leverage partnerships and implement innovative risk management. Green Bonds can provide one such opportunity for public and private partnership in critical infrastructure investments. In that sense, Green Bonds represent an integrated climate solution for managing risks and increasing resilience on local, regional, and national levels.

ENDNOTES


“Flexibility is everything right now. The market is young. There are many beautiful things happening. In the absence of strict regulations... issuers are moving forward with new ideas and are not afraid...”

- Laurie Chesne, Sustainability Consultant, Vigeo
Primary Researcher & Author
Irene Queen
J2015 CSNE Climate Fellow

Primary Editor
Jennifer Andrews
Project Director, The Sustainability Institute

Additional Research Support and Review provided by the Climate Solutions New England core support team at UNH: Sarah Large, Professors Catherine Ashcraft, Cameron Wake, Paul Kirshen, and Dr. Tom Kelly.

The Climate Solutions New England “Integrated Climate Solutions” project aims to promote leadership and innovation by highlighting initiatives that provide opportunities for enhanced civic participation and democratic governance, economic development, public health, and social justice, while tackling climate change mitigation and/or adaptation. Full case studies on each of the solutions featured are in development, and will be available at climatesolutionsne.org.
Appendix B. Climate Solutions New England Core and Network Teams
Climate Solutions New England Core Team
Jennifer Andrews Climate Fellows Program Coordinator, jennifer.andrews@unh.edu
Dr. Cameron Wake, Research Professor, 603-862-0322, Cameron.wake@unh.edu
Dr. Tom Kelly, Director, UNH Sustainability Institute, 603-862-2003, tom.kelly@unh.edu
Dr. Catherine Ashcraft, Assistant Professor, 603-862-3925, catherine.ashcraft@unh.edu
Paul Kirshen, UNH Department of Civil Engineering
Matt Huber, UNH Professor in the Earth, Oceans, and Space Department

Case Study Network Team
Taylor Caswell, Executive Director of the NH Community Development and Finance Authority
Julia Dundorf, Executive Director of the New England Grassroots Environmental Fund
Cynthia Greene, Manager of the Energy and Climate Change Unit at US Environmental Protection Agency
Ellen Hawes, Senior energy systems, land use and carbon markets analysis for the Acadia Center
Nancy Hirshberg, Founder and Chief Catalyst of Hirshberg Strategic
Cynthia McHale, Director of Ceres Insurance Program
Ken Payne, Senior Policy Advisor to the Rhode Island State Senate
Michael Simpson, Chair of the Environmental Studies Department and Director of the Center for Climate Preparedness and Community Resilience at Antioch University New England
Roger Stephenson, representing Union of Concerned Scientists
Bob Varney, Senior Vice President of Normandeau Associates
Paul Costello, Executive Director of the VT Council on Rural Development
Ellen Mecray, National Oceanic and Atmospheric Administration’s Regional Climate Services Director for the Eastern Region
Lisa Rector, Senior Policy Analyst at the Northeast States for Coordination Air Use Management (NESCAUM)
Appendix C. Interview Questions
Semi-Structured Interview Protocol

1. Could you talk briefly about how you came to be involved in the initiative/project and efforts that address climate change, and your specific role?
2. Could you talk about the history of the initiative/project? How and why it came about? What were its original goals?
3. Have those goals changed over time?
4. Who have been significant participants or collaborators of the initiative/project, both in its creation and throughout its existence?
5. What are the aspects of the initiative/project that are most essential to its success?
6. What do you consider the most important advancement(s) the initiative/project has made either towards preparing for the impacts of climate change or reducing greenhouse gas emissions?
7. Are there any particular barriers or challenges the initiative/project has faced?
8. What has contributed to these challenges?
9. How were they overcome?
10. How do you evaluate the performance or progress of the initiative/project?
11. How do you view the initiative/project’s relationship with governments (local, state, regional), the private sector, and the community?
12. Is there anyone else you would recommend that would be well suited to contribute to this study?
13. Would you like to see the results of the study and if so, what form would you most prefer? (e.g. Report, PowerPoint)
Appendix D: Targeted Communication to Key Stakeholders & Professionals
Targeted Communication to Key Stakeholders & Professionals

- Sept 17th - Presentation and meeting with the University of New Hampshire Sustainability Institute Climate Solutions New England Core team
- Oct. 19th - Presentation to the Climate Solutions New England Network Design Team at EPA offices in Boston
- October 30 – Miami University Graduate Student Forum - Oral Presentation
- Dec. 4th – 29th Annual Miami Valley Planning & Zoning Workshop – Presentation to professional planners and architects, citizen members of planning and zoning commissions and boards of appeals, and elected officials representing both urban and rural jurisdictions in the Dayton metropolitan area.
- Jan. 6, 2016 - City of Grand Junction, Colorado Planning Department
Appendix E. Criteria for Integrated Solutions
Categories - Criteria defining integration\textsuperscript{55}

1. Connection to implementation
   - Planning was connected to outcome

2. Systems approach and complexity
   - Had intentional multiple benefits
   - Minimized/ eliminated externalities.
   - Goal addressed increase in ecological and human well being

3. Responsive
   - Multiple perspectives were considered and trade-offs identified
     - i.e. Consider winners and losers

4. Participatory
   - Diversity of interests was represented
     - i.e. members on the project from different initiatives with a range of participation

5. Contextualized/ Place based
   - Specific location/ surroundings were considered
   - Solution tailored to demographics, community, population density, geography, scale

6. Anticipatory:
   - “Critical uncertainties” were factored in
     - Built into the plan that things will change in the future (1, 5, 10 years down the line) (Matt Huber’s analogy: Is there a “fire wall behind the firewall?”)
     - Examples
       - prepare for disasters? possibility of a change in policy, investment climate, planning for future reviews?

Connections - Observed beneficial outcomes

1. Initiative was adaptive in process- adaptive management process, technology, governance
2. Initiative resulted in public health improvements/ increased individual wellness
3. Initiative addressed mitigation - changes in Earth’s energy balance
4. Initiative addressed adaptation- resilience, reduced vulnerability
5. Initiative addressed economic development/ opportunity
   a. jobs
6. Initiative addressed economic sustainability (cost effective, function without government money)
7. Initiative addressed equity:
   a. social justice
   b. social network/ community connection
   c. community resiliency
   d. improved quality of life
8. Initiative led to amplification: leads to additive value (multiplier effect)
9. Initiative solved multiple problems
10. Initiative was monitored, and evaluated with review and feedback

\textsuperscript{55} These criteria & outcomes were collaboratively developed by Network Core Team, author, and co-Fellow Researchers.
Appendix F. DC Water Interview (Full text)
DC Water Interview (Mark Kim, CFO, DC Water), July, 2015

1. Would you tell me about the history of the initiation of Century Green Bonds at DC Water? What was your interest in using this financial tool? What were the steps that led to its implementation?

The EPA mandates regulation of Combined Sewer Overflows (CSOs) through the Clean Water Act (CWA Long Term Control Plan). The Clean Rivers Project was financed by a Green Bond; it is the control plan to manage CSOs in the DC watershed. It’s a federal program under the Clean Water act. It is scheduled to be a $2.6 billion, 20-year (construction) program. This project is a deep tunnel system that is effectively going to double the capacity of our system so that when it overflows, instead of being diverted into the waterways it will be captured and diverted into the tunnel and sent to a water treatment plant. We’re in Year 10 of construction (of year 20). To date the project is on schedule and we’ve just completed the first major section of the tunnel. 4 ½ miles have been completed and we are on schedule.

So when we were getting ready to go to market and raise funds for our capital program, I talked with our chief engineer who is in charge of the project and asked him what he was spending all this money on -- $2.6 billion. (It’s DC Water’s largest capital program.) He said, “We’re building tunnels.” Which as an aside is a curious thing for a water utility to be doing. I said that’s a lot of money to be spending on a tunnel. He said, Mark, it’s a really big tunnel. He also said these tunnels are going to last 100 years. (Expected useful life). I said, oh, that’s interesting, so I went to our financial controller and asked him how we are planning to depreciate this asset once we finish construction? He said we’ll do it the way we always do it for our longest-lived capital assets: over 60 years. Then I went to our Finance Director and said how are you planning to finance it, and he said, the way we always do it, with a 30 year tax-exempt bond.

This didn’t make financial sense for DC Water. It was not fair to ratepayers. We’re supposed to balance our assets with our liabilities. So that was the genesis of the Century Bond – to allow DC Water to better match our assets and liabilities. When we started looking at what we were talking about, it was clear that taking 2 billion gallons of CSOs per year out of our waterways was a very environmentally friendly thing to do. (At the end of the project in 2025) By the time we’re done we’ll have 96% reduction (of CSO) from current levels. And this was the genesis of our Green Bond - to achieve water quality and other environmental outcomes.

2. Along with the need for updated infrastructure, was the project motivated by efforts to address climate changes?

Yes. The system was designed in the 1800s. It’s not designed to handle the growth in population, density, and certainly not designed for climate change impacts. It’s the
frequency and severity of the storms that are causing our systems to be overwhelmed. Our system can handle a lot, but not all at once. This project addresses water quality, climate resilience, and quality of life.

We have 53 outflows, the vast majority are along the Anacostia River (also Potomac River and Rock Creek), on SE and SW DC, which are the most economically depressed area of the City with the least development. Along the Potomac waterfront there is a tremendous amount of development, but that’s not the case for the Anacostia because that’s where the outflows are. So when we clean up the river there will be a huge increase in quality of life for local residents along with economic development opportunities. Also improved biodiversity, the (eventual) ability to eat the fish, the ability to swim or use them for recreational uses (which is currently not recommended by the EPA for some recreational uses, especially after a severe rain); “All of that’s going to change, with this project.”) So those benefits are what make it eligible to be a Century Green Bond.

3. **Who were the significant participants or collaborators in using Green Bonds at DC Water, both in its initiation and throughout its implementation? How are the funds managed and distributed? Who was involved?**

The usual cast of characters plus a few new ones on our finance team to get this deal executed:

DC Water Finance Team, DC Water Engineering – needed their tech expertise on design specs and environmental benefits that would accrue, DCW Board – especially chair of finance committee meeting with credit rating agencies. We had two investment banks: Goldman Sachs and Barclay Capital. They served as joint underwriters on this transaction. They were co-leading this deal for us. Their role was to serve as a middleman between us and the investors.

4. **Did you have to define it as Green Bond before going to Goldman Sachs and Barclay?**

Yes and no. We brought in Vigeo, a sustainability consultant. They were involved at the very beginning, along with Goldman Sachs & Barclay. When DC Water started this, we pulled together this team. Goldman Sachs and Barclay assisted us in structuring the 100 Year Bond. Vigeo helped us develop and structure the environmental outcomes and success. There’s a handful of GB certifiers. The vast majority of them are in Europe. There had only been six Green Bond deals in the US when we did our transaction: two municipal (MA and NY) and four corporate deals.

5. **What were the aspects of this collaboration that were most essential to its success?**

So when we decided to do this project we looked at best practices, which were happening in Europe, and in their best practices were to come to market with a second party opinion. Makes total sense. Coming without one would be like coming to market with unaudited financials and saying “just trust us.” We talked with the leading experts in Europe: DNV
GL, Vigeo and Cicero. Vigeo – we picked them because we liked their approach to the space, they had a very rigorous proposal...no one in the US had done a Green Bond opinion. We had to explain what a municipal credit was. None of these European issuers knew, were familiar with municipal bonds issuances. The vast majority in Europe have been supranational (e.g. World bank) or corporate. We picked Goldman Sachs and Barclay because they are really leaders in their fields. Issuing a 100-year bond is not an easy thing. No utility had ever done it in the US. Their expertise was critical to the success of this project as well.

6. Are there plans to fund additional projects besides the current CSO tunnel construction activities?

We’re planning to come to market with our second Green Bond deal; it will continue to support the Clean Rivers project. There are lots of other projects at DC Water that would qualify for Green Bond funding but we have made the decision to limit our Green Bond program to finance our Clean Rivers Project at the present time. We had extraordinary demand for our deal. We had initially structured it as a $300 million bond; we went to market and received over a billion in investor orders. We increased it to $350 million as a result and lowered the interest rate.

7. Would you tell me about barriers or challenges DC Water faced in the use of Green Bonds? What contributed to these challenges and how were they overcome?

It was challenge after challenge after challenge to get this deal done. Cultural challenges – Get people to think differently. First – the coordination between departments (e.g. engineering, finance, accounting). We were remarkably successful in working across silos and have everyone understand what we were trying to accomplish with this project. The most important tool was common sense. It became very clear to me that doing what we always did and using traditional thinking was going to yield a sub-optimum result for DC Water and our ratepayers.

The municipal market itself is not liquid in the 100-year space, so we didn’t issue it in the municipal space. We issued a taxable bond instead of a tax-exempt bond. Since the market we needed didn’t exist, we went to another market. We went to the corporate market.

Dealing with rating agencies that didn’t understand or questioned our motives. When you say you want to issue it for 100 years they wonder are you under financial stress, are you unable to pay it off in a traditional time frame; are you over-leveraging the organization? Are you over-leveraging the organization? We spent the better part of 6 months educating the rating agencies, on multiple occasions.

It was important to communicate the issue of equity and fairness to our ratepayers and board. The problem of CSOs is a 100-year problem; this solution will last another 100 years. It will benefit successive generations; didn’t make sense for this generation to finance it for future generations. Spreading the cost of the project provides
intergenerational equity, which was a compelling benefit to communicate to our board and our ratepayers. When you step back and put it in a broader context and appeal to people’s goals and values, it becomes much easier to break down the silos.

When I first suggested the idea that we issue a 100 year debt, the number of “No’s, that’s impossible, you can’t do that, it can’t be done” were like a broken record. From conception to execution it was probably 15 months (whereas for a traditional bond deal it would take 12 weeks.)

8. What did you consider to be the most important advancement(s) from the implementation of Green Bonds?
On the impact investing side, it was a benchmark transaction for the industry. It was the first Green Bond issue in the US to carry a second party opinion. First utility Green Bond issuance to come to market. I take a lot of pride in that. I like to think we’ve paved a path for others. I think it was a precedential transaction and think it set the bar. Globally, it was the first 100-year bond ever issued. Corporations typically issue 5-10 year bonds. What we were able to demonstrate with this deal is that there is a market for very long-dated Green Bonds.

DC Water Interview (Mark Kim, CFO, DC Water), July, 2015
Disclaimer

This presentation has been prepared for information purposes only, and no representation, warranty or assurance of any kind, express or implied, as to the accuracy or completeness of any of the information contained herein. Investors should consult their own financial and legal advisors for information about the risks and investment considerations arising from investment, the appropriate tools to analyze such investment, and the suitability of such investment to each investor's particular circumstances. The author does not warrant, guarantee or make any representation or warranties whatsoever express or implied, or assume any liability to investors regarding the financial results from information described herein.