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A Pioneering Environmental Impact Bond for DC Water (Updated)

In September, the DC Water utility repaid an Environmental Impact Bond in full with no penalty. When we first covered it in 2017, the bond was a novel approach that priced and sold the risk of green infrastructure performance to investors. If the utility's new green-infrastructure pilot project didn't reduce sewage in public waterways by a critical threshold, investors would send roughly \$3 million back to DC Water. And if it beat that threshold resoundingly, investors would earn a premium.

Abby Martin, who wrote the article heralding the bond, now works in fundraising consulting and has watched its success from afar. Catching up with CFN last week by Zoom, she reflected that the project became a "transferable" example for cities with risk-averse financial managers who wanted to support experimental conservation approaches. Indeed, Quantified Ventures, which helped structure the bond, now reports oversubscribed environmental-impact bond offerings in Buffalo, Atlanta, and elsewhere.

We also caught up with Quantified Ventures' president Eric Letsinger, who spoke of the project's promise in the article we're reposting here. Looking back, Letsinger sees "the number one overlooked benefit" of the bond's structure in its power to control the project's total cost of ownership. Bondholders paid for measurement and monitoring, he stressed, which freed engineers to observe and adjust to reach the systematic improvements they sought. "In municipal government, we pay for everything up front, don't invest in rigorous prediction and don't report out, and then when a project is over it becomes an advocacy effort for some to say hey, that was a wild success and somebody else to say it was not."

As more cities face annual weather catastrophes and changing climates, green infrastructure must prove effective to compete alongside gray infrastructure investments. DC Water's repayment of the Environmental Impact Bond is a proof point in predicting and pricing performance risk and measurement, and an important signal for utility engineers and investors alike.

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District of Columbia Water and Sewer Authority (DC Water) has created an innovative municipal bond that covers the downside risk of using green infrastructure to control stormwater runoff. Compared with conventional gray infrastructure, green options have a shorter performance record and are more difficult to model. However, they are often cheaper and offer visible community benefits.

If this bond package is successful, it could change the perception of green infrastructure as a risky, unproven option for managing stormwater. This might encourage water and sewer agencies to adopt green infrastructure techniques more widely.

Facing pressure from a federal consent decree to clean up its waterways, the city is looking for innovative ways to control urban runoff. But, like many government agencies, DC Water hopes to avoid bearing the full cost of any failed experiments.

DC Water's solution is the nation's first Environmental Impact Bond (EIB), which links financial payouts with environmental performance. The \$25 million tax-exempt EIB, which was sold privately to Goldman Sachs and the Calvert Foundation in September 2016, will fund a pilot green infrastructure project within DC Water's Clean Rivers Project. The \$2.6 billion, 25 year-old project is the city's effort to improve water quality to comply with its consent decree.

Why Is Infrastructure Being Created?

Like around 770 other communities in the United States, Washington, DC relies on a combined sewer system that mixes stormwater and sewage into the same pipes. Wet weather can overwhelm DC Water's one treatment plant, forcing discharges of raw sewage into local rivers. The Clean Rivers Project works to reduce these combined sewer overflows with massive underground tanks that will hold effluent until the plant has treatment capacity.

More recently, the city has also explored adding green infrastructure like rain gardens and permeable pavement as a first line of defense in preventing stormwater runoff from entering the system. Green infrastructure offers more visible community benefits at a lower cost than the concrete-intensive gray infrastructure of DC's planned holding tanks. However, green infrastructure is less proven compared to the gray alternative, said DC Water's CFO, Mark Kim.

In early 2016 the Environmental Protection Agency signed off on DC Water's modification of its original stormwater control plan, which relied solely on gray infrastructure. The change included more green infrastructure. The modification package allows DC Water to eliminate one of three massive tunnels and redesign another, Kim said, replacing gray infrastructure capacity with approximately 300 acres and over \$90 million of green infrastructure. The modification represents significant potential savings, as well as substantial risk.

How Is the Risk Being Quantified?

Although the performance of traditional gray infrastructure is straightforward to model and measure, green infrastructure is less predictable and measurable.

Performance of a green infrastructure installation depends on that site's particular climate, soils, vegetation, and a host of other factors, said Eric Letsinger, president of Quantified Ventures, the firm that helped analyze the risk of the EIB. And measuring water absorbed into soils across a city is much more challenging than gauging flow through sewer mains.

Successes in other cities, or even elsewhere in DC, would not guarantee that DC Water's large-scale green infrastructure will meet EPA-mandated performance goals, Kim said.

To help address these issues, the agency is building a pilot green infrastructure installation that channels all water from its site into a single, gauged outflow pipe to enable accurate performance measurement. The agency has conducted 12 months of baseline stormwater runoff measurements at the site. These will be compared with 12 months of runoff measurements after the green infrastructure is installed.

The EIB effectively insures DC Water against extreme underperformance. Kim said the operational risk of these natural systems is problematic. "The agency's performance depends on our green infrastructure success. We are planning to spend north of \$100 million on green infrastructure - and

we can't afford to make a \$100-million mistake."

The innovation within the EIB, Letsinger and Kim said, is DC Water's packaging and selling of the performance risk for its green infrastructure program.

Using water-modeling software, DC Water calculated that its green infrastructure installation would reduce stormwater runoff by about 30 percent. A Monte Carlo simulation, a modeling technique that calculates a range of possible outcomes and the probability that each outcome will occur, helped Quantified Ventures calculate the risks inherent in the project's performance.

Three tiers of performance help DC Water finance the most extreme project outcomes. The agency has conducted 12 months of baseline stormwater runoff measurements at the site. These will be compared with 12 months of runoff measurements after the green infrastructure is installed.

If the green infrastructure reduces runoff as expected in 95 out of 100 iterations, the EIB will function like a conventional 30-year municipal bond. Investors will receive the stated 3.43-percent coupon rate and the principal at maturity. This rate is comparable to the historic rate for DC Water's 30-year bonds, Kim said.

Any performance-based payments will occur at the five-year mark, when the project has been installed and post-construction performance has been measured. At that point, the bond will be refinanced into a conventional 25-year bond.

The Tier 1 and Tier 3 payments will cover the most extreme five percent of outcomes. Models suggest a 2.5-percent chance that the green infrastructure installations will reduce storm-water runoff by less than 18.6 percent, and a 2.5-percent chance that reductions will be greater than 41.3 percent. These numbers reflect a 95-percent confidence interval for the project's performance.

A Tier 1 underperformance, or runoff reductions of less than 18.6 percent from baseline, would trigger a contingency payment of \$3.3 million from investors to DC Water. This "Shared Risk Payment" covers almost the entire cost of DC Water's interest payments over the first five years, Kim said, insuring the agency against failure. In this scenario, DC Water would go back to the drawing board on its green infrastructure plan, likely replacing much of it with gray infrastructure.

Conversely, a Tier 3 overperformance, or runoff reductions of more than 41.3 percent from baseline, would trigger a \$3.3 million payment from DC Water to investors. This "Outcome Payment" would be in addition to the stated coupon and principal payments.

But this outcome would still represent significant savings for DC Water, Kim said, because the pilot green infrastructure would have proven to be extraordinarily efficient. The proven high performance would enable DC Water to handle the same volume of water with less green infrastructure – and possibly replace additional gray infrastructure with cheaper green alternatives.

"The EIB allows us to ask and answer the question 'does it work?' for these specific technologies for DC's climate," Kim said. Green infrastructure projects provide significant societal and environmental benefits beyond stormwater runoff reductions that are not valued in this offering. Kim said. "Green infrastructure has to work for managing stormwater to be worthwhile to DC Water. If it doesn't work for what we need, we shouldn't be doing it."

DC Water's goal has been to concentrate the performance risk for its entire green infrastructure plan into a single bond offering. With the success of this pilot project, Kim said, the agency will have satisfied itself that green infrastructure works. Then, it will be comfortable using conventional bond offerings to fund additional green infrastructure investments.

How Is the Project Scaling up?

The Environmental Impact Bond was sold in a private offering to Goldman Sachs and the Calvert Foundation. Eric Letsinger described the deal as a model for a wide variety of investors. "We wanted to demonstrate the attractiveness of this vehicle across a broad range of the investment field. We've created a financial structure that attracted institutional investors like Goldman alongside Calvert, a pure-play impact investor."

"The Calvert Foundation is greatly interested in green jobs and other co-benefits of green infrastructure," Kim said. "But they have not made a charitable investment with possibility of return; they have invested on the same terms as other investors."

DC Water and its partners believe the EIB will be more easily replicated than previously issued [social impact pay-for-performance bonds](#). In the past, these bonds have typically been issued as one-off private contracts between financiers and governments, often using philanthropic support to cover the risk of project failure.

As Kim said, "There is no philanthropic capital to take a write-off to get this deal done." It is the first true social impact bond, a debt instrument with a risk-adjusted market rate of return.

Other communities could replicate this performance-based payoff structure, adjusting to the needs of specific projects. Performance payouts (the Tier 1 and Tier 3 of the EIB) could cover different proportions of the bond's coupons. The thresholds triggering performance payouts (the 95 percent of outcomes covered in Tier 2 of the EIB) would be tied to local data. The range could be tightened for a project with higher confidence in a specific performance.

Future bond offerings might need higher returns to attract non-institutional investors, said Jacob Galardi, a senior analyst at investment firm Emerging Energy and Environment Investment Group, who studies the green bond market.

With a contingency payment of only 13 percent of the bond's \$25 million par value, this investment attracts conservative institutional investors, Galardi said. More sophisticated later offerings might test a wider range of performance values, narrower than the 95-percent confidence interval of the DC Water EIB.

From an environmental investment standpoint, "this is a very conservative offering because it is protecting against only five percent of outcomes," Galardi said. Future projects might use this risk-sharing model to protect against less extreme underperformance, or to fund more than a small pilot section of a project. "It is a tiny part of the overall capital issuance [of the \$2.6 billion Clean Rivers Project], but a good first step."

At that point, performance measurement might need to be more nuanced. Narrowing the range to a 50-60 percent confidence interval might require longer-term monitoring plans to control for seasonal extreme weather, Galardi said.

For example, 12-month flow data used for DC Water's EIB could be thrown off by a single unusually wet or dry season, but that the 95-percent confidence interval is wide enough that measurements are likely to fall within the Tier 2 range expected performance outcomes. As green infrastructure modeling and monitoring technology evolve, water authorities should be able to dial in a more precise performance range.

This vehicle was designed to be replicable for green infrastructure projects and beyond, despite different risk profiles across projects. DC Water was confident enough in its design and

implementation capabilities to manage that risk internally, Kim said, but other communities with less technical expertise might want to control risk elsewhere in the design process.

Meanwhile, Quantified Ventures is exploring the EIB's applications for protecting against performance risk in other new infrastructure investments like renewable energy, or the performance risk of water quality controls for agricultural runoff.

"We're a long way from cookie-cutter, but with more Environmental Impact Bonds, we'll get better, faster, cheaper, and more creative," Letsinger said, "I think the sky is the limit."

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