

New and Emerging Capital Providers for Infrastructure Funding

Project #4617



New and Emerging Capital Providers for Infrastructure Funding



About the Water Research Foundation

The Water Research Foundation (WRF) is a member-supported, international, 501(c)3 nonprofit organization that sponsors research that enables water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers.

WRF's mission is to advance the science of water to improve the quality of life. To achieve this mission, WRF sponsors studies on all aspects of drinking water, including resources, treatment, and distribution. Nearly 1,000 water utilities, consulting firms, and manufacturers in North America and abroad contribute subscription payments to support WRF's work. Additional funding comes from collaborative partnerships with other national and international organizations and the U.S. federal government, allowing for resources to be leveraged, expertise to be shared, and broad-based knowledge to be developed and disseminated.

From its headquarters in Denver, Colorado, WRF's staff directs and supports the efforts of more than 800 volunteers who serve on the board of directors and various committees. These volunteers represent many facets of the water industry, and contribute their expertise to select and monitor research studies that benefit the entire drinking water community.

Research results are disseminated through a number of channels, including reports, the Website, Webcasts, workshops, and periodicals.

WRF serves as a cooperative program providing subscribers the opportunity to pool their resources and build upon each other's expertise. By applying WRF research findings, subscribers can save substantial costs and stay on the leading edge of drinking water science and technology. Since its inception, WRF has supplied the water community with more than \$460 million in applied research value.

More information about WRF and how to become a subscriber is available at www.WaterRF.org.

New and Emerging Capital Providers for Infrastructure Funding

Prepared by:

John Mastracchio, CFA

Arcadis, U.S., Inc., 855 Route 146, Suite 2010, Clifton Park, NY 12065

Eric S. Petersen

Hawkins Delafield & Wood, LLP, 28 Liberty Street, New York, NY 10005

and

Tom Huestis

Public Resources Advisory Group, 117 Gayley Street, Suite 200, Media, PA 19063

Sponsored by:

Water Research Foundation

6666 West Quincy Avenue, Denver, CO 80235

Published by:



DISCLAIMER

This study was funded by the Water Research Foundation (WRF). WRF assumes no responsibility for the content of the research study reported in this publication or for the opinions or statements of fact expressed in the report. The mention of trade names for commercial products does not represent or imply the approval or endorsement of WRF. This report is presented solely for informational purposes.

Copyright © 2016
by Water Research Foundation

ALL RIGHTS RESERVED.
No part of this publication may be copied, reproduced
or otherwise utilized without permission.

ISBN 978-1-60573-277-0

Printed in the U.S.A.

CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	ix
FOREWORD	xi
ACKNOWLEDGMENTS	xiii
EXECUTIVE SUMMARY	xv
CHAPTER 1: INTRODUCTION	1
Purpose and Objectives.....	1
Scope of the Research.....	1
Existing Body of Knowledge.....	1
Report Organization.....	2
CHAPTER 2: METHODOLOGY	3
Overview.....	3
Project Approach	3
Literature Review.....	3
Interviews and Supplemental Research	3
Workshop.....	4
Tool Development	5
CHAPTER 3: FINDINGS.....	7
Introduction.....	7
Background.....	7
Partnerships.....	10
Public – Private Partnerships	10
Public-Public Partnerships.....	22
Direct Lending and Asset Backed Securities.....	23
Direct Lending through Private Placements	23
Securitization	26
Socially Responsible Investing.....	29
Green Bonds.....	29
Social and Environmental Impact Bonds.....	36
Crowdfunding	42
Mini or Micro Bonds	42
Crowdfunding Platforms.....	44
Other Non-Traditional Municipal Financing Options	44
Long-Duration Bonds	44
Catastrophe and Resilience Bonds.....	46
Federal and State Government Sponsored Funding.....	48
Water Infrastructure Finance and Innovation Act	49

Qualified Public Infrastructure Bonds	50
Guarantees through the SRF Program	51
Self-Financing.....	52
Tax Increment Financing	53
Internal Funding.....	56
Integrated Financing	57
Description.....	57
Prevalence in the U.S. Municipal Market.....	57
Advantages and Limitations	58
Example	59
Supporting Agencies and Organizations.....	60
EPA Water Infrastructure and Resiliency Finance Center	60
Project Financing Intermediaries	60
Preparing for Financing	62
CHAPTER 4: CAPITAL FINANCING TOOLS.....	65
Introduction.....	65
Case Studies.....	65
Interactive Decision Tool.....	67
CHAPTER 5: CONCLUSIONS AND FUTURE RESEARCH NEEDS.....	69
Conclusions.....	69
Future Research Needs	77
REFERENCES.....	79
ABBREVIATIONS.....	89

The following additional resources are posted on the #4617 project page on the WRF Website, under Case Studies and Web Tools, respectively:

CASE STUDIES

- City of Allentown and the Lehigh County Authority, Pennsylvania
- Bayonne Municipal Utilities Authority, New Jersey
- Metropolitan Water Reclamation District (MWRD) of Greater Chicago, Illinois
- District of Columbia Water and Sewer Authority (DC Water)
- City of Los Angeles, California
- City of Norfolk, Virginia
- Port of Miami, Florida
- Puerto Rico Aqueduct and Sewer Authority (PRASA)
- San Antonio Water System (SAWS), Texas
- San Diego County Water Authority, California

DECISION SUPPORT TOOL

LIST OF TABLES

3.1 Ranking of the world's largest infrastructure investors (2015)	18
4.1 Summary of case studies.....	65

LIST OF FIGURES

3.1 Demand-risk P3 model	12
3.2 Availability payment P3 model	13
3.3 States with P3 enabling legislation	14
3.4 Public-public partnership model	22
3.5 Private placement diagram.....	23
3.6 Trends in direct lending to municipal issuers by banks.....	25
3.7 Securitization model	27
3.8 Green bond financing model.....	30
3.9 Social impact bond model.....	37
3.10 Mini bond model.....	42
3.11 Resilience bond conceptual model.....	47
3.12 WIFIA financing model.....	49
3.13 SRF loan guarantee model	52
3.14 Example TIF model	53
4.1 Financing decision support tool dashboard.....	68

FOREWORD

The Water Research Foundation is a nonprofit corporation dedicated to the development and implementation of scientifically sound research designed to help drinking water utilities respond to regulatory requirements and address high-priority concerns. WRF's research agenda is developed through a process of consultation with WRF subscribers and other drinking water professionals. WRF's Board of Directors and other professional volunteers help prioritize and select research projects for funding based upon current and future industry needs, applicability, and past work. WRF sponsors research projects through the Focus Area, Emerging Opportunities, and Tailored Collaboration programs, as well as various joint research efforts with organizations such as the U.S. Environmental Protection Agency and the U.S. Bureau of Reclamation.

This publication is a result of a research project fully funded or funded in part by WRF subscribers. WRF's subscription program provides a cost-effective and collaborative method for funding research in the public interest. The research investment that underpins this report will intrinsically increase in value as the findings are applied in communities throughout the world. WRF research projects are managed closely from their inception to the final report by the staff and a large cadre of volunteers who willingly contribute their time and expertise. WRF provides planning, management, and technical oversight and awards contracts to other institutions such as water utilities, universities, and engineering firms to conduct the research.

A broad spectrum of water supply issues is addressed by WRF's research agenda, including resources, treatment and operations, distribution and storage, water quality and analysis, toxicology, economics, and management. The ultimate purpose of the coordinated effort is to assist water suppliers to provide a reliable supply of safe and affordable drinking water to consumers. The true benefits of WRF's research are realized when the results are implemented at the utility level. WRF's staff and Board of Directors are pleased to offer this publication as a contribution toward that end.

Charles M. Murray
Chair, Board of Directors
Water Research Foundation

Robert C. Renner, P.E.
Chief Executive Officer
Water Research Foundation

ACKNOWLEDGMENTS

The authors of this report would like to thank the many organizations and individuals that have contributed to this research and for their cooperation and participation in this project. The following list includes those that participated in the project workshops and interviews, provided materials for the research report, or provided a review of the interim and final reports:

- Buncombe County Metropolitan Sewer District: Mr. Scott Powell
- Denver Water: Ms. Usha Sharma
- City of Laramie, WY: Mr. Carl Van Zee
- Miami-Dade Water and Sewer Department: Mr. Douglas Yoder
- City of Minneapolis, MN: Ms. Danette McCulley
- Metropolitan Water Reclamation District of Greater Chicago: Ms. Mary Ann Boyle
- San Diego County Water Authority: Mr. David Shank
- Water District No. 1 of Johnson County, KS: Mr. Darin Kamradt
- City of Winnipeg: Ms. Lucy Szkwarek
- United States Environmental Protection Agency: Mr. Peter Shanaghan
- S&P Global Ratings: Mr. Ted Chapman

The authors would also like to thank the WRF Project Officer, Mr. Jonathan Cuppett, and members of the Project Advisory Committee: Mr. Ron Lovan from the Northern Kentucky Water District, Mr. Bret Weingart from the City of Oklahoma City, Mr. Mike Matichich from CH2M, and Mr. Andrew Rheem from Raftelis Financial Consultants.

EXECUTIVE SUMMARY

BACKGROUND

There is an ongoing challenge in the United States water industry stemming from the need for continued financial investment in water infrastructure to address aging infrastructure, secure the necessary water resources for the future, and meet pertinent regulatory requirements. The current and future needs for infrastructure investment are much greater than the current level of spending, which creates an infrastructure gap. In fact, current estimates of resources needed for water and wastewater infrastructure upgrades and renewal over the next 20 years are estimated at more than \$650 billion. With federal appropriations and programs reducing funding, and with customer affordability levels being of concern, the water industry needs to find ways to fund and finance this much needed infrastructure investment.

Why does this infrastructure funding gap exist? On the supply side, there is plenty of money, especially in the private sector, to finance needed capital improvements; currently, there is an oversupply of private capital. Institutional investors, such as pension funds that are particularly suited for infrastructure assets with their long-term liabilities, have steadily increased their allocations in infrastructure investments in recent years. Furthermore, the municipal bond market is the largest and most diverse in the world, providing access to low cost, tax-exempt financing. The real problem is not the lack of traditional or innovative financing alternatives, but rather the limited amount of sufficient and sustained revenue funding sources that can pay for the financing since, ultimately, utility service rates are the primary means to fund the capital investments in water utilities.

Water utilities (both water and wastewater) have two primary approaches to financing system improvements – cash funding or debt financing. Cash funding is limited to the revenues at hand or that accrued over time, which are usually from water rates, service fees, connection fees from new accounts, or taxes. Both public and investor-owned water utilities in the United States have also relied upon capital markets to finance water infrastructure. However, traditional financing alternatives, such as revenue bonds, general obligation bonds, and state revolving fund (SRF) loans, can pose certain challenges for utilities, namely the need to manage relatively high debt service costs over the life of the debt, and the need to raise utility service rates to fund debt obligations. The extraordinary capital funding needs, and the demands and expectations of water utility stakeholders, create a challenging capital financing environment for water utilities, leading policymakers to look for innovative ways of lowering borrowing costs and achieving other benefits, such as risk mitigation, greater public awareness, and value capture. New and emerging financing alternatives may be able to help utilities obtain these benefits while helping to close the infrastructure funding gap.

OBJECTIVE

The primary objective of this research project was to identify and assess the applicability and potential of new and emerging capital financing alternatives that may be suitable to water utilities in the United States.

APPROACH

The research began with a review of pertinent literature to document the current state of financing alternatives in the water industry, identify and evaluate new and emerging capital financing alternatives, describe their advantages and disadvantages, and discuss benefits and limitations of each identified alternative. Based on the results of the literature review, the research team facilitated a number of interviews and correspondences with utility managers, investors, investor advisors, and other organizations involved in municipal capital financing to get their perspectives on why various alternatives were used, how the process worked, what benefits were realized, and what lessons were learned. The research also aimed to obtain perspectives on the current level of investor interest and participation in these financing alternatives, and opportunities to increase said interest and participation. A project workshop was then held with the project team, utilities participating in this research, the Water Research Foundation, and the Project Advisory Committee members for this project to discuss the preliminary findings; case studies were also prepared as part of this research. The workshop helped to refine the merits, challenges, opportunities, and applicability of each of the capital financing alternatives and capital financing program approaches that were discussed. Several ready-to-use tools were then developed to assist utility managers in assessing the suitability of the alternative financing approaches.

RESULTS AND CONCLUSIONS

Research findings suggest that there are several new and emerging capital financing alternatives that are gaining momentum in the United States (U.S.) water sector that may be suitable for water utilities in the future. These include the following:

- Alternatives focused on public and private partnerships
 - Public-private partnerships (P3s)
 - Public-public partnerships
- Alternatives focused on direct lending and asset backed securities
 - Direct lending through private placements
 - Securitization
- Alternatives focused on socially responsible investing
 - Green bonds
 - Social and environmental impact bonds
- Alternatives focused on crowdfunding
 - Mini or micro bonds
 - Crowdfunding platforms
- Alternatives focused on other non-traditional municipal bond variations
 - Long-duration bonds
 - Catastrophe/resilience bonds
- Alternatives sponsored by federal and state governments
 - Water Infrastructure Finance and Innovation Act (WIFIA)
 - Qualified public infrastructure bonds (QPIBs)
 - Guarantees through the SRF program
- Alternatives involving self-financing
 - Tax increment financing (TIF)

- Internal funding
- Integrated financing

Table ES.1 summarizes the applicability, advantages, limitations, lessons learned, and future market opportunities associated with each alternative.

Table ES.1
Summary of new and emerging capital financing alternatives

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Partnerships: Public-Private Partnerships					
Contractual arrangements where resources, risks, and rewards of both the public agency and private company are combined to provide greater efficiency, better access to capital, and improved compliance with regulations.	Utilities looking to transfer project risk to private sector or obtain guarantees, achieve a shorter implementation timeline, monetize the value of their assets, or obtain more certainty regarding capital funding and user charges. Applicable for projects >\$100 million. May be applicable for financially stressed utilities.	• Risk transfer to the private sector. • Potential for shorter capital project implementation timeline. • Access and incentive for private sector innovation. • Potentially lower life-cycle costs.	• Higher transaction costs limit P3s to larger sized projects. • Private sector financing typically higher in cost than tax-exempt municipal debt. • Political discomfort with transfer or loss of control.	Investors in P3s look for: • Projects that have legislative approval to move forward. • Clear description of the project, P3 arrangement, and balance of responsibilities. • Quality P3 contract.	• Fragmented nature of U.S. water and wastewater utilities significantly reduces the potential number of P3 projects. • Aggregation of a number of projects with similar capital needs in a region or state could expand the market for P3 in the future.
Partnerships: Public-Public Partnerships					
Collaborations between two or more public utilities to improve the quality and efficiency of water and wastewater services, share risks, and provide a source of capital financing.	Utilities looking for the collaborative advantages of public-private partnerships while providing a source of financing that does not involve the private sector. May be applicable for financially stressed utilities.	• Risk transfer. • Access to tax-exempt financing from public-sector partner. • Potential for shorter capital project implementation timeline. • Potentially lower life-cycle cost.	• Does not provide access and incentive for private sector innovation. • High transaction costs limit applicability to larger sized projects. • Political discomfort with transfer or loss of control.	• Stakeholder outreach and citizen education are crucial. • Requires a strong political leader to carry the message. • Workforce protection can be an important issue.	• Could expand as an option if public-private partnerships gain more traction in the future.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Direct Lending and Asset-Backed Securities: Direct Lending through Private Placements					
Bank loans and direct purchase bonds where the issuer sells directly to a small number of sophisticated investors who have the ability to perform their own assessments on the issuer's credit.	Utilities looking for debt diversification, a new source of capital, issuance of debt in a short time period, or an alternative to publicly offered variable rate debt.	• Typically, a shorter financing timeline and process than publicly offered debt. • Typically, a reduction in issuance cost as compared to publicly offered debt. • Simpler execution process. • Structuring flexibility. • Direct interaction with the lender instead of multiple bondholders.	• Limited access to public market and competition. • Shorter financing term, requiring replacement facility every few years. • Potentially higher debt interest costs than public offering. • Potential for arduous or non-uniform covenants that may create liquidity issues if covenants are breached. • Transparency concerns.	• Higher disclosure standards than historically required are being developed by various states and rating agencies to address transparency concerns.	• Banks of all sizes are now offering private bank loan products providing municipal issuers with multiple options for direct lending.
Direct Lending and Asset-Backed Securities: Securitization					
Financial model where a separate special purpose entity is formed that finances a utility's capital needs on behalf of the utility by pledging revenues from utility user charges that are separate from the utility's other user charges.	Utilities with limited access to the bond market or that desire to lower borrowing costs. Utilities in states with enabling legislation, such as New York, Louisiana, Texas, and Florida.	• Access to financing when otherwise cost prohibitive. • Lower financing costs. • Lower debt service coverage requirements. • Does not dilute debt capacity of the municipality. • May broaden potential investor base.	• Requires enabling legislation. • Complex documentation and high upfront issuance cost. • May require unlimited ability to "true-up" user charges to meet debt service requirements. • Political concerns.	• Could broaden the potential investor base by bringing in investors that have not purchased bonds of the underlying issuer because of credit concerns, or who have reached their exposure limits to the utility.	• Expanding, as Florida recently passed securitization legislation and Puerto Rico is considering similar legislation. If legislation expands further, it could provide other utilities with access to this financing model.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Socially Responsible Investing: Green Bonds					
Fixed income, financial instruments used to finance projects that generate significant identifiable climate or environmental benefits, and whose use is pre-defined and made transparent to the investor.	Projects that will have a positive effect on the environment or climate change.	• Investor demand and diversification. • Branding and public relations benefits. • Slight to negligible potential interest rate savings.	• Cost of ongoing disclosure, including additional tracking, monitoring, and reporting. • Current lack of rules, regulations, and concrete definitions of "green."	• No official green bond standards/guidelines. • Independent certifications are generally not required. • Demand is a real grassroots-driven demand. • Issuers can make green bonds more attractive to investors by focusing on transparency. • Investors are interested in green bonds with a range of credit quality.	• There is a need for more diversified range green bond offerings in the market, expanding the range of size, terms (taxable vs. tax-exempt), and credit quality. • Demand could increase if retail investors create the demand and results in money managers seeking out green investments.
Socially Responsible Investing: Social Impact Bonds					
Pay-for-success contracts that are loans provided by private investors intended to provide funding to achieve specific social outcomes by encouraging collaboration between government agencies and nongovernment investors.	Utilities looking to access and transfer performance risk to environmental, social, and governance-focused investors. Historically, applicable to funding programs to address social problems (e.g., education, homelessness, health, criminal justice). Considered as a way to fund green infrastructure projects.	• Transfers a portion of the risk of success or failure of the desired outcome to the capital investor. • Access to socially-responsible investors. • Provides motivation to implement projects to achieve intended benefits or cost savings.	• Relatively new concept with limited examples. • Has not been applied to water, wastewater, or stormwater infrastructure projects yet. • Potentially higher transaction and financing costs.	• Investors desire more of a smooth curve regarding threshold between success and failure. • Investors prefer projects that have demonstrated early signs of success prior to investment.	• Potential for funding green stormwater infrastructure. • Transaction costs need to be reduced if this financing model is to become more common.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Crowdfunding: Mini Bonds					
A form of crowdfunding where capital is raised by a municipality for a project from individual, often local, investors, and the bonds are of small denomination.	Smaller projects with high interest from the local community.	• Provides direct access to local citizens interested in investing in their community. • Can help to build community engagement and support education regarding the infrastructure. • Can be used to help build political will for a capital project.	• Generally applicable only to smaller capital improvement projects. • Relatively high up-front and ongoing costs of establishing and maintaining a mini bond program.	• Important to implement a comprehensive engagement plan with the community in parallel with the bond offering.	• Practice of issuing mini bonds for municipal utility projects is rare, but the City of Denver example indicates that this type of approach can be successful in attracting local community investors.
Other Municipal Financing Options: Long-Duration Bonds					
Municipal bonds with a duration of more than 30 years, such as Century Bonds with an amortization period of 100 years.	Projects with long useful lives.	• Reduction in annual debt service payments. • Improved asset-liability matching and intergenerational equity (i.e., better matching of the payment of assets with the use of the assets).	• Bond market conditions need to be right (i.e., a relatively flat yield curve) to make this option viable for most issuers.	• Potentially attractive to pension fund and life insurance investors due to the matching of the long bond duration with long-term liabilities.	• Current market activity for long-duration bonds is very low, particularly in the water sector; however, the market has the potential to expand given infrastructure needs and their long useful lives.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Other Municipal Financing Options: Catastrophe and Resiliency Bonds					
Catastrophe bonds are debt instruments primarily used by insurance companies to reinsure or mitigate the risk of natural disasters. Resilience bonds are bonds intended to provide a municipality with reduced insurance costs if they implement projects that reduce the risk of loss.	Municipalities with stormwater and flooding issues resulting in high insurance costs.	• Provides a way to incentivize and capture the value and benefit of a resilience project through reduced insurance costs that can be captured as an insurance rebate. • Potential to be part of an integrated financing approach to address stormwater capital needs. • Investor diversification since these bonds are not generally affected by market trends like traditional bonds.	• In the concept stage only; no resiliency bonds have been issued yet. • Limited applicability to water and wastewater utility capital financing for utilities with disaster resiliency issues.	• Provides an innovative way for value capture and incentives for resiliency projects.	• Potential market attractiveness due to the current high cost of disaster insurance.
Government Sponsored Programs: Water Infrastructure Finance and Innovation Act					
Federal program that makes available low-interest rate federal loans to fund up to 49% of drinking water, wastewater, and reuse projects.	Individual projects costing \$20 million or more, or \$5 million for communities of less than 25,000.	• Low interest rate loans. • Payments start 5 years after project completion. • Maximum amortization term of 35 years.	• Pilot stage, no project funding as of yet. • Projects must comply with Buy America provisions and prevailing wage requirements of the Davis-Bacon Act, which can add to the underlying project cost.	• Limited as a P3 enabler in its current form since private activity bonds would be needed to secure tax-exempt debt for remaining portion of project funding under a P3, and these are limited to a volume cap.	• Could evolve into a program that promotes investment in water infrastructure in a similar manner to what has occurred under the Transportation Infrastructure Finance and Innovation Act (TIFIA), and help leverage substantial private co-investment for water and wastewater projects.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Government Sponsored Programs: Qualified Public Infrastructure Bonds					
A new type of municipal bond proposed as part of a federal infrastructure tax proposal that possesses many of the characteristics of exempt facility private activity bonds.	Applicable for funding of capital projects involving the private sector.	• Ability to issue tax-exempt debt for infrastructure involving the private sector. • No issuance volume caps. • Ability to access the benefits of private activity bonds without competition from other infrastructure sectors.	• Currently a tax proposal that has not been enacted by Congress.	• N/A	• If QPIBs are approved by Congress and the President, P3s in the water sector could emerge as a significant source of new infrastructure funding.
Government Sponsored Programs: Guarantees using State Revolving Loan Funds					
Use of the SRF program to guarantee the repayment of a loan.	The SRF program can be used for loan guarantees for purchase insurance for local obligations where such debt obligations occurred after March 7, 1985.	• Potentially results in lower financing costs for issuers. • Allows mitigation of risk in lending for utilities and private lenders.	Not all state laws governing SRF administration have enabling legislation similar to the Federal authority to allow SRF fund to be used as loan guarantees.	• SRF debt guarantees have remained largely untapped.	• Could expand existing capacity of current project funding levels.

(continued)

Table ES.1 (Continued)

Description	Applicability	Advantages	Drawbacks / Limitations	Lessons Learned	Future Market Opportunities
Self-Financing: Tax Increment Financing					
A public financing model where the increased tax revenues generated by a project pay for the project financing.	Development and redevelopment projects anticipated to generate incremental tax revenues. Enabling legislation exists in all U.S. states except Arizona.	• Repayment of the cost of the project from the additional value created. • No impact on existing tax base or customer base. • Enabling legislation is widespread.	• Risk associated with a failed development and insufficient revenue to fund the debt. • Potential inequities created with tax incentives located inside and outside the TIF district.	• Tax increment financing can be part of an integrated financing approach that helps to capture the benefit and value of a capital investment program with dispersed benefits.	• With the recent focus on resiliency expected to continue in the future, this financing model has the potential to be used on a more widespread basis to support city stormwater and resiliency projects that spur development or redevelopment.
Self-Financing: Internal Funding					
Optimizing current business and operational practices to uncover ways to reduce costs or avoid expenses by increasing efficiencies, which can unlock capacity to fund and finance additional capital projects.	Applicable to most utilities.	• Positive effect on financial condition over time. • Could help to alleviate affordability issues. • Reduce need for more significant rate increases. • Could help to maintain or improve credit rating, lowering overall borrowing cost.	• Capital outlay may be needed to achieve cost savings. • Complexity of working in the public sector could make efficiency savings difficult to realize.	• Water utilities have begun to incorporate "lean" techniques to focus on operational excellence by targeting root causes of inefficiencies and waste, and to design and implement more sustainable practices.	• Variable; some utilities have focused on operational efficiencies for years and have relatively limited opportunities for savings, while for others, there may be significant opportunities for savings that could unlock financing or funding capacity.

In addition to these new and emerging financing alternatives, other topics were explored as part of this research, such as integrated financing, the role of financing intermediaries, and preparing a utility for financing. These are summarized below.

Integrated Financing

Integrated financing is the coordination and planning by multiple departments within a municipality, or multiple municipal agencies, working together to finance a capital program with disperse benefits using multiple financing and funding sources. Government challenges and existing regulations have driven utilities to consider innovative approaches to integrated financing. These approaches integrate multiple regulatory requirements (such as wastewater and stormwater) and have leveraged limited funding from different programs. A number of cities across the country, such as Norfolk, Virginia and Hoboken, New Jersey, are exploring integrated financing approaches that are centered around building more integrated and resilient infrastructure. The Rockefeller Foundation and re:focus partners are two organizations that are helping to lead the development of integrated financing approaches through collaboration with forward thinking cities around the country. As a result, financing strategies that combine multiple funding sources and financing alternatives are on the rise and could become more prevalent in the future to help solve resiliency, sustainability, and environmental challenges.

Financing Intermediaries

In recent years, intermediaries have emerged to support the adoption of new and emerging capital financing alternatives. These have included the West Coast Infrastructure Exchange, which is focused on connecting municipal capital projects to private capital and providing advice, best practices, and technical assistance to public sector decision makers; Social Finance and Third Sector Capital Partners, which were created to assist the government and private sectors in assessing, evaluating, preparing for, and pursuing pay-for-success financing; and foundations, such as the Rockefeller Foundation and Ford Foundation, which provide funding to support the development of various new and emerging capital financing alternatives.

One intriguing concept that intermediaries, such as the West Coast Infrastructure Exchange, are exploring is the concept of aggregating (bundling) smaller projects into a larger offering to increase the attractiveness and feasibility of financing using a P3 approach. According to the West Coast Infrastructure Exchange, in order for this concept to work, there must be a common plan and structure of the transaction and strong political backing to foster the public's understanding of the potential benefits of aggregated projects. Aggregation efforts may be most likely to garner support in jurisdictions facing a cluster of similar needs. These regional drivers can potentially align political leadership and other key stakeholders around a common issue. However, such aggregation efforts are anticipated to be very challenging to form at the local level due to political and control factors.

Preparing for Financing

Regardless of the mix of financing alternatives that a utility decides to pursue, whether traditional or new and emerging financing alternatives, it is important that utilities implement practices and take steps to be as enticing to investors and credit rating agencies from a credit

perspective as possible. Effective financial management practices can help mitigate operational and financial risks and lower a utility's overall risk profile, which can translate into lower borrowing costs. Utilities can follow several financial management practices to help improve their ability to secure low cost financing. These include:

- Establishing and meeting formalized fiscal targets and policies recognized as prudent in the industry;
- Developing and maintaining a long-range business plan and financial projections;
- Establishing a track record of the willingness and ability to raise rates, and implementing timely and sufficient rate increases to maintain strong fiscal condition;
- Maintaining a rate structure that generates stable revenues;
- Controlling costs through efficiency savings and continuous improvement to mitigate the cost of service and help address affordability issues;
- Minimizing the dependence on non-recurring revenues, such as system development charges;
- Limiting non-utility transfers to the general fund;
- Planning for uncertainty by having contingency plans; and
- Maintaining fiscal transparency and accountability through voluntary internal and external reporting.

APPLICATIONS

Case Studies

A total of 10 case studies were prepared as part of this research project covering financing alternatives including green bonds, century bonds, public-private partnerships, public-public partnerships, private placements, WIFIA, and integrated financing. A summary of these case studies is provided in [Table ES.2](#). These case studies accompany this research report, and are provided separately.

Table ES.2
Summary of case studies

Municipality	Case Study Topic	Overview
City of Allentown and the Lehigh County Authority, Pennsylvania	Public-Public Partnership	Public-public partnership concession for the operation and financing of an existing water and wastewater system in poor financial condition.
Bayonne Municipal Utilities Authority, New Jersey	Public-Private Partnership	P3 concession agreement for management, operation, and maintenance of existing water distribution, wastewater collection, stormwater, and combined sewer systems.
Metropolitan Water Reclamation District (MWRD) of Greater Chicago, Illinois	Green Bonds	Green bonds used to finance a portion of MWRD's wastewater capital program without the use of an independent third party green certification.
District of Columbia Water and Sewer Authority (DC Water)	Green Century Bonds	Green bonds and long-duration bonds to finance a portion of DC Water's wet weather Clean Rivers project using an independent party that provided a green opinion.
City of Los Angeles, California	Private Placement Bank Lending	Private placement bank lending to finance a portion of the City's capital improvement needs.
City of Norfolk, Virginia	Integrated Financing and Resilience Bond	Integrated financing and catastrophe/resilience bonds and how Norfolk is proceeding to assess the suitability of this financing approach to improve its storm resiliency.
Port of Miami, Florida	WIFIA	How TIFIA was leveraged to help finance the Port of Miami Tunnel project to provide the reader with an example of how WIFIA could be leveraged to finance water projects in the future.
Puerto Rico Aqueduct and Sewer Authority (PRASA)	Public-Private Partnership	P3 involving a private energy services company to provide turnkey services for energy projects at PRASA's facilities.
San Antonio Water System (SAWS), Texas	Public-Private Partnership	P3 agreement for the design, construction, operation, and financing of a new water supply for SAWS involving significant transfer of risk to the private sector.
San Diego County Water Authority, California	Public-Private Partnership	P3 arrangement for the design, construction, operation, and financing of a seawater desalination plant.

MULTIMEDIA

Decision Support Tool

An interactive decision support tool was created to assist utility finance managers in assessing the potential applicability of the various new and emerging capital financing alternatives highlighted in this research report. This tool was constructed in Microsoft Excel and is available on the WRF Website on the #4617 project page. A screen image of the financing decision support tool dashboard is provided in [Figure ES.1](#). This tool is not a specific endorsement or recommendation for any specific capital financing approach. Neither the Water Research Foundation nor Arcadis is a municipal advisor registered with the Securities and Exchange Commission, and they are not subject to the statutory fiduciary duty applicable to municipal advisors under Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act. Users of this tool should discuss capital financing alternatives with any and all internal or external registered municipal advisors that they deem appropriate before making any capital financing decisions.

**NEW AND EMERGING CAPITAL PROVIDERS FOR INFRASTRUCTURE FUNDING (PROJECT #4617)**

NEW AND EMERGING FINANCING DECISION SUPPORT TOOL[How does the tool work?](#)

The financing options tool can be used to help determine financing options that may be most appropriate for your utility. This tool focuses on new and emerging financing options, rather than more traditional financing options, such as revenue bonds, general obligation bonds, and state revolving fund (SRF) loans. Traditional financing methods may also be appropriate for consideration when determining the optimal financing strategy for your entity. Determine financing options that may best fit your circumstances by answering the questions below.

Questions		
Project Type:		
What Is the size of the project(s) to be financed?	Greater than \$100M	
Are the projects being financed considered "green" projects?	☐ Yes	
Will the project have a useful life longer than 30 years?	☐ Yes	
Will the project spur additional economic development?	☐ Yes	
Issuer Characteristics:		
Strong financial condition and capacity to take on new debt	☐ Yes	
Weak financial condition and limited ability to access the public debt market	☐ No	
Do you pay flood insurance premiums for existing utility assets?	☐ Yes	
Has your state passed PPP enabling legislation?	☐ Yes	
Financing Objective:		
Do you want to gain access to Environment, Social, and Governance (ESG) investors?	☐ Yes	
Is one of your primary drivers to minimize transaction or issuance costs?	☐ No	
Is one of your primary interests to complete the financing in the shortest time possible?	☐ No	
Is one of your primary interests to minimize ongoing administration or disclosure efforts?	☐ No	
Do you desire to spread debt service payments over the entire life of a long lived asset?	☐ No	
Do you desire to make investing in the project directly accessible to the local community?	☐ No	
Are you looking to transfer project risk to the private sector?	☐ No	

Options to consider:
[Traditional Financing](#)
[Green Bonds](#)
[Long-Duration Bonds](#)
[Mini / Micro Bonds](#)
[Private Placement](#)
[Public-Private Partnership](#)
[Public-Public Partnership](#)
[Resiliency Bonds](#)
[Securitization](#)
[Social Impact Bonds](#)
[Tax Increment Financing](#)
[WIFIA Loan](#)

Developed by:
 Develop & Consultancy
for water and
built assets

Disclaimer:
This tool is intended to increase awareness of new and emerging capital financing alternatives and the situations in which the alternatives may be most applicable. The tool may be used as a preliminary step in the identification of possible new and emerging capital financing alternatives that may be applicable to a utility. After answering the questions, the highlighted alternatives may be ones that the utility may want to explore further. However, the utility may also want to explore some of the other non-highlighted alternatives as well, since answering a limited number of questions may not fully capture the utility's specific circumstances. Furthermore, this tool is not intended to replace the complex capital financing decision process that a utility goes through to develop a financing strategy. This tool is not a specific endorsement or recommendation for any specific capital financing approach. Neither the Water Research Foundation nor Arcadis is a municipal advisor registered with the Securities and Exchange Commission and are not subject to the statutory fiduciary duty applicable to municipal advisors under Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act. Users of this tool should discuss capital financing alternatives with any and all internal or external registered municipal advisors that it deems appropriate before making any capital financing decisions.

This study was funded by the Water Research Foundation (WRF). WRF assumes no responsibility for the content of the research study reported in this publication or for the opinions or statements of fact expressed in the report. The mention of trade names for commercial products does not represent or imply the approval or endorsement of WRF. This report is presented solely for informational purposes.

Copyright © 2016.

Figure ES.1 Financing decision support tool dashboard

CHAPTER 1

INTRODUCTION

PURPOSE AND OBJECTIVES

The primary objective of this research project was to build a body of knowledge on the applicability and potential of new and emerging capital financing alternatives that may be suitable to water utilities in the United States, and to explore novel and creative approaches to capital financing in the water industry.

SCOPE OF THE RESEARCH

The scope of this research included:

- Completing a literature review to document the current state of financing alternatives in the water industry, identify and evaluate new and emerging capital financing alternatives, describe the advantages and disadvantages, and discuss benefits and limitations of each identified alternative.
- Facilitating interviews with utilities, investment advisors, investors, and other organizations involved in the utility financing process to get their perspectives on why various alternative are utilized, how the process worked, what benefits were realized, what lessons were learned, and to obtain perspectives on current level of investor interest and participation in these financing alternatives, and opportunities to increase interest and participation.
- Facilitating a project workshop to bring together experts representing water utilities, financial advisors, industry practitioners, associations, and other relevant stakeholders to refine the merits, discuss challenges, opportunities, and applicability of each of the capital financing alternatives.
- Developing capital financing evaluation tools to help identify and evaluate viable capital financing options. These tools include a series of case studies and an interactive decision support tool.

EXISTING BODY OF KNOWLEDGE

Several national organizations have provided guidance on the most common water capital financing alternatives, including the American Water Works Association (AWWA) and the Water Environment Federation (WEF). For example, in 2014, AWWA published the Fourth Edition of Water Utility Capital Financing, Manual of Water Supply Practices, M29 (AWWA 2014), which was published to assist utility managers and stakeholders address the capital financing needs of water systems. In 2005, WEF published Financing and Charges for Wastewater Systems, Manual of Practice No. 27 (WEF 2004) to provide a general overview of the practices and procedures that should be considered for financing and establishing rates and charges for wastewater collection and treatment systems. In addition, various Water Research Foundation (WRF) research projects have addressed relevant topics regarding capital financing including *Capital Funding Imperatives: Best Practices in Identifying, Prioritizing, Funding, and Resourcing Capital Improvement*

Programs (Matichich et al. 2016), *Improving Water Utility Capital Efficiency* (Olstein et al. 2009), *Rates Handbook: Case Studies on Utility Rates and Financing Challenges* (WRF 2014), and *Research and Innovation Within Water Utilities* (Carter et al. forthcoming). The research that was completed and is highlighted in this report took into account, and was intended to build on, these prior research efforts.

REPORT ORGANIZATION

The report is organized into five main chapters:

- Chapter 1: Introduction – briefly discusses the purpose and objectives of this research project and the scope of the research.
- Chapter 2: Methodology – discusses the approach used to achieve the main objectives of the research and prepare this report.
- Chapter 3: Findings – presents the findings from the literature review, interviews with capital providers, utilities, and financing practitioners, summarizes case studies prepared to highlight capital financing examples, and summarizes the findings from the project workshop held to further the body of knowledge of new and emerging capital financing alternatives.
- Chapter 4: Capital Financing Tools – describes the capital financing tools prepared to assist utility managers in evaluating the applicability of new and emerging capital financing alternatives.
- Chapter 5: Conclusions and Future Research Needs – highlights significant findings resulting from the research and identifies specific topics that should be the focus of future research efforts regarding capital financing.

CHAPTER 2 METHODOLOGY

OVERVIEW

This research focused on exploring novel and creative approaches to capital financing to achieve the goal of documenting and furthering the research and body of knowledge associated with emerging capital financing alternatives. The primary project activities included completing a detailed literature review, supplementing the literature review with interviews with capital providers and utility managers, and facilitating a workshop and focus group. This information was used to develop case studies of the use of new and emerging capital financing alternatives, a decision support tool that can be used by utility finance managers to assess the potential applicability of new and emerging financing alternatives, and conclusions regarding the applicability of these capital financing alternatives.

PROJECT APPROACH

Literature Review

The research began with a review of pertinent literature to ensure the project was based on current research related to water utility capital financing alternatives. The literature review focused on peer-reviewed journal articles, white papers, trade journals, manuals of practice, web articles, and other sources of information. The focal points of the literature review included identification of new and emerging capital financing alternatives and capital providers that may be useful to both municipally-owned and investor-owned utilities in the United States, with a focus on how they work, advantages and disadvantages, structural and institutional issues and challenges, strategic management considerations, and opportunities and limitations. The literature review also included the identification of applicable approaches and programs used to fund infrastructure investments in other industries (such as transportation and social infrastructure), and other geographies (such as Europe and Canada).

Interviews and Supplemental Research

Based on the results of the literature review, the research team contacted and facilitated a number of interviews and correspondences with utility managers, investors, investor advisors, and other organizations involved in municipal capital financing. The following organizations were contacted to provide input into this research project:

Utility Organizations

- Denver Water, Colorado
- District of Columbia Water and Sewer Authority (DC Water)
- City of Laramie, Wyoming
- Lehigh County Authority, Pennsylvania
- City of Los Angeles, California

- Metropolitan Sewerage District of Buncombe County, North Carolina
- Metropolitan Water Reclamation District (MWRD) of Greater Chicago, Illinois
- Miami-Dade Water and Sewer Department, Florida
- Minneapolis Public Works, Minnesota
- City of Norfolk, Virginia
- City of Oklahoma City, Oklahoma
- Puerto Rico Aqueduct and Sewer Authority (PRASA)
- San Antonio Water System (SAWS), Texas
- San Diego County Water Authority, California
- WaterOne of Johnson County, Kansas
- Winnipeg Water and Waste Department, Canada

Investors and Investor Advisors

- Macquarie Capital Advisors
- Morgan Stanley
- Citigroup
- Whitehelm Capital
- Blackstone
- Stonepeak Infrastructure Partners, LP
- Franklin Templeton Investments
- Federated Investors
- California State Teachers Retirement System (CalSTRS)
- California Public Employees Retirement System (CalPERS)

Other Organizations

- West Coast Infrastructure Exchange
- Harvard Government Performance Laboratory
- re:focus partners
- Ceres
- Standard & Poor's (S&P) Global Ratings
- Rockefeller Foundation
- Honeywell International, Inc.
- U.S. Environmental Protection Agency (EPA)

Workshop

A project workshop was then held with the project team, utility participants in this research, the Water Research Foundation, and the Project Advisory Committee members assigned to this project to discuss the preliminary findings and case studies prepared as part of this research. The outcome of this workshop helped to refine the merits, challenges, opportunities, and applicability of each of the capital financing alternatives and capital financing program approaches that were discussed.

Tool Development

Several ready-to-use tools were developed to assist utility managers in assessing the suitability of the alternative financing approaches. One of these tools included a series of case study examples that highlight the relevance of new and emerging capital financing alternatives for different utility situations. In addition, based on the research findings, an interactive decision support tool was prepared to help utilities identify the potential applicability of the new and emerging capital financing alternatives to their specific situation.

CHAPTER 3

FINDINGS

INTRODUCTION

This chapter summarizes the findings of the research that focused on new and emerging capital providers for infrastructure funding. The discussion of findings begins with a short overview of capital financing for water utilities followed by a description of new and emerging capital financing alternatives, a discussion of supporting programs and agencies, and a summary of utility best practices for preparing for financing. Sources of information gathered for this chapter included peer-reviewed journal articles, white papers, trade journals, manuals of practice, web articles, interviews and correspondences with utility managers, investment firms, investors, and other organizations involved in the capital financing process, and other sources of information. The research findings provide a description of new and emerging infrastructure funding alternatives, a discussion of their applicability, merits and downsides, a number of examples, lessons learned, and a discussion of potential future market opportunities.

BACKGROUND

The U.S. water infrastructure funding gap is well document in the literature. There is an ongoing need for continued financial investment in water infrastructure in order to address aging infrastructure, secure future water resources, and address regulatory requirements (AWWA 2014). This gap is defined as the difference between the current level of spending on water infrastructure and the future need for additional infrastructure investment. For example, the American Society of Civil Engineers (ASCE) provided a comprehensive analysis of U.S. infrastructure in 2013 and the report card issued a grade of “D” to drinking water (ASCE 2013). The report card attributes this grade to aging infrastructure and water main breaks of approximately 240,000 a year. “Capital spending has not kept pace with needs for water infrastructure” (ASCE 2013). Similarly, EPA estimates that the resources needed for capital investment in infrastructure upgrades and renewal are about \$384 billion over 20 years between 2011 and 2030 for drinking water infrastructure needs (EPA 2013), and \$271 billion for wastewater and stormwater management needs from 2011 to 2021 (EPA 2016a). The U.S. Conference of Mayors estimated the “all-in” capital and operation and maintenance investment needs over the 20-year horizon from 2008 to 2028 within the range of \$2.8 to \$4.8 trillion (Anderson 2010).

Why does this infrastructure funding gap exist? On the supply side, there is plenty of money, especially in the private sector, to finance needed capital improvements, and there is currently an oversupply of private capital. Due to the prevalence of private investment, some industry experts believe that there is no infrastructure funding gap, but rather a gap in investable infrastructure projects, as many of these projects are not attractive to investors. They highlight that the world is not short on capital (e.g., \$43 trillion of assets is currently under management in the United States alone) (Macomber 2016). Furthermore, the municipal bond market in the United States is the largest and most diverse in the world, with over one million different municipal bonds outstanding and total aggregate principal amount of more than \$3.7 trillion (U.S. Securities and Exchange Commission 2012). There is also an unprecedented appetite for infrastructure assets from the private investment community. Institutional investors, such as pension funds that are

particularly suited for infrastructure assets with their long-term liabilities have steadily increased their allocations in infrastructure investments in recent years. The issue at hand is not a lack of money, but rather insufficient projects in the pipeline to keep up with the money supply (Kim 2016). The lack of attractiveness is due to factors ranging from uncertain revenues to disagreements over guarantees to concerns about political risk (Macomber 2016). The real problem is not the availability of traditional and innovative financing alternatives, but rather the sufficient and sustained revenue funding sources that can pay for the financing. Ultimately water rates are the primary means to fund the capital investments in water utilities, as the majority of operating revenues typically comes from the sale of water through rates. As such, adequate revenues are needed to maintain quality of service and the construction and maintenance of infrastructure (AWWA 2012a).

Water systems have two primary approaches to financing system improvements- – cash funding or debt financing. Cash funding is limited to the revenues at hand that accrue over time, which is usually from water rates, service fees, connection fees from new accounts, or taxes (in some locations). When existing revenues are not enough to cover the cost of capital investment, utilities have traditionally looked to fund capital costs by raising customer rates and fees, and financing the capital costs through municipal bonds, SRF loans, notes, and bank loans, with the terms of bonds and loans typically not exceeding 30 years. Debt financing is the typical way that utilities raise upfront capital to invest in their systems. For systems large enough to issue debt in the capital markets, municipal bonds are the debt instrument of choice (The Johnson Foundation at Wingspread 2012). Water utilities can issue revenue bonds that are backed by the cash flows of the water utility, or general obligation bonds that are backed by the taxing authority of the local government (AWWA 2014). For small or rural water utilities, cash or federal and state loans, and to a lesser extent, grants, are the predominant means of financing system improvements (The Johnson Foundation at Wingspread 2012). Often times, a combination of these methods are used to address funding capital projects.

Both public and investor-owned water utilities in the United States have relied upon capital markets to finance water infrastructure. Publicly owned water systems have traditionally financed capital needs through the municipal bond market. However, traditional financing alternatives, such as revenue bonds, general obligation bonds, and SRF loans, can pose certain challenges for utilities, such as managing relatively high debt service costs over the life of the debt, which is often shorter than the useful life of the underlying asset, and raising utility rates to fund debt obligations given the limited willingness and ability to raise rates due to customer affordability concerns. The demands and expectations of water utility stakeholders (e.g., customers, regulators, and policymakers) create a challenging capital financing environment for water utilities (Fedder et al. 2014). The extraordinary needs of many systems are leading policymakers and utility directors to look beyond the bond market for much needed capital, as well as innovative ways of lowering borrowing costs and achieving other benefits, such as risk mitigation, public awareness, and value capture (The Johnson Foundation at Wingspread 2012). For example, together the mounting mandates and other cost drivers are leading clean water agencies to explore creative solutions to address wet weather issues, such as green infrastructure, century bonds and public-private partnerships (NACWA 2015). New and emerging financing alternatives may be able to help utilities obtain these benefits, while serving to close the infrastructure funding gap.

In the 2013 report card, ASCE highlights five solutions to raise the infrastructure grade of “D.” These solutions are:

- Raise awareness for the true cost of water. Current water rates largely are not truly reflective of the actual cost of supplying clean, reliable drinking water.
- Reinvigorate the SRF loan program under the Safe Drinking Water Act by reauthorizing minimum federal funding of \$7.5 billion over 5 years.
- Eliminate the state cap on private activity bonds for water infrastructure projects to bring in up to an estimated \$7 billion annually in new private financing.
- Explore the potential for a Water Infrastructure Finance and Innovation Authority that would access funds from the U.S. Treasury at Treasury rates and use those funds to support loans and other credit mechanisms for water projects.
- Establish a federal Water Infrastructure Trust Fund under the Clean Water Act and Safe Drinking Water Act to finance the national shortfall in the funding of infrastructure systems (ASCE 2013).

Most academic and water industry professionals acknowledge that one method of financing will not universally work for all utilities or all projects within a single utility. Some innovative solutions have seen early success, while for others, it is too soon to measure their success or failure. There are also examples where investors suffered a loss using innovative financing in the public sector (see the discussion of social impact bonds contained in this research report). These and other challenges offer a multitude of lessons learned. Not everyone is convinced that alternative financing in the public sector is the right approach, and some of those who recognize the benefits of alternative financing are still cautious about the long-term success and applicability to water utilities. Major concerns include:

- Standards / Regulations: Some alternative financing models are still relatively new for the water industry and subsequently do not have official standards, best practices, or regulatory framework to guide them.
- Unfamiliarity: Due to the complexity and unfamiliarity of new and emerging capital financing alternatives, there has been slow adoption of these alternatives. This highlights the need for additional knowledge, education, and training to improve awareness and mitigate discomfort and misunderstandings that may exist (Kim 2016).
- Complexity: Many of the alternative financing tools are complex, may be difficult to understand and explain to the general public, and take more time in the early planning stages than more traditional approaches.
- Transaction Cost and Scale: Some of the alternative financing tools require greater effort to initiate and result in more significant upfront costs diminishing their feasibility for financing smaller scale capital projects.
- Transparency: Of particular concern is the frequent absence of disclosure of the use of these alternatives and their terms. While new and innovative ways of financing capital infrastructure present some benefits, the risks associated with these new financing products must be highlighted and well understood (Bodek et al. 2014).

The remaining portions of this chapter summarize several new and emerging capital financing alternatives in the water industry, provides information on supporting programs and

agencies, project financing intermediaries, and summarizes best practices for preparing for financing. The following new and emerging capital financing alternatives are discussed:

- Alternatives focused on public and private partnerships
 - Public-private partnerships (P3s)
 - Public-public partnerships
- Alternatives focused on direct lending and asset backed securities
 - Direct lending through private placements
 - Securitization
- Alternatives focused on socially responsible investing
 - Green bonds
 - Social and environmental impact bonds
- Alternatives focused on crowdfunding
 - Mini or micro bonds
 - Crowdfunding platforms
- Alternatives focused on other non-traditional municipal bond variations
 - Long-duration bonds
 - Catastrophe / resilience bonds
- Alternatives sponsored by federal and state governments
 - Water Infrastructure Financing and Innovation Act (WIFIA)
 - Qualified public infrastructure bonds
 - Guarantees through the SRF program
- Alternatives involving self-financing
 - Tax increment financing (TIF)
 - Internal funding
- Integrated financing

PARTNERSHIPS

Public – Private Partnerships

Description

P3s are contractual arrangements whereby the resources, risks, and rewards of both the public agency and private company are combined to provide greater efficiency, better access to capital, and improved compliance with government regulations (NCPPP 2016). The public's interests are generally assured through provisions in the contracts that provide on-going monitoring and oversight of the operation of a service or development of a facility. PPP Canada, an independent element of the Canadian government, defines a P3 as a “long-term, performance based approach to procuring public infrastructure where the private sector assumes a major share of the risks in terms of financing and construction and ensuring effective performance” (P3 Canada 2016).

The key distinctions of P3s from other forms of alternative project delivery are: 1) the extended duration of the partnership; and 2) the nature of the financing and the sources of revenues (World Bank 2014). In a P3, the duration of the partnership is a long-term one, lasting 10 to 20 years or more. While private financing is not a pre-requisite for an alternative delivery project, it

is commonly accepted that private financing is a key distinguishing feature of a P3 arrangement. In considering public infrastructure assets, it is important to distinguish between private sector financing and private capital. Private capital can be used whether an infrastructure project is publicly or privately financed. For example, a municipal bond is a financing instrument used by water utilities for publicly financed infrastructure projects, but private capital from bond buyers is involved in the financing (Kim 2016).

The following contractual arrangements are typical forms of alternative project delivery, and because of private financing, the Design-Build-Finance-Operate and Maintain (DBFOM) and concession approaches may be considered P3s (Wharton 2015a):

- Design-Build Operate (DBO) or Operate and Maintain (O&M). The basic concept behind DBO is the aggregation of traditionally separate services – design, construction, operations and maintenance – under a single contract to provide a single point of responsibility for overall project performance. The aggregation of these services allows for “operator-driven” design and permits a full level of cooperation between the designer, builder, and operator. A municipality may choose to handle the design-build part of a project itself or hire a contractor to complete a turnkey-ready project. In either case, a private partner assumes responsibility for operating and maintaining the system. Such O&M arrangements are typically long-term, often lasting decades. However, some of the advantages offered under a DBO approach may not be realized if the design-build and O&M components are split between different private partners in such a manner.
- DBFOM. This is an equity-driven and a far more inclusive deal than other forms of alternative project delivery, in which a private consortium takes responsibility for every phase of a project, including the financing. While one company takes the lead (typically the primary equity investor), many private firms may be involved (including additional equity investors, a design-builder and an operating services provider). DBFOM is similar to DBO in that it permits a full level of cooperation between the designer, builder and operator. The requirement for the DBFOM contractor to obtain the necessary financing results in additional protections to the governmental owner. For instance, since service fee payments are not made until completion of construction and commencement of operations, the DBFOM contractor bears the risk of proper completion of the project. This is because debt payments are not paid by the governmental-owner until the construction is complete and it is demonstrated that the project functions as intended.
- Concession agreement. What distinguishes a concession agreement from other contractual arrangements is that the private sector partner collects revenue directly from those who use the system, usually in the form of fees paid by customers. These revenues are used by the private sector partner to make debt payments, provide return on equity, and fund ongoing operation and maintenance requirements for the asset.

In general, there are at least two types of P3 models – 1) demand risk model; and 2) availability payment model. The demand risk model represents the case where P3 financing is secured with the future revenue streams from user charges, and where the private concessionaire takes on the overall financial risks associated with potential fluctuations in future user demand.

This model is typically used where there are sufficient revenue streams from user charges to fund the capital investment. A schematic diagram of the demand risk model is provided on [Figure 3.1](#).

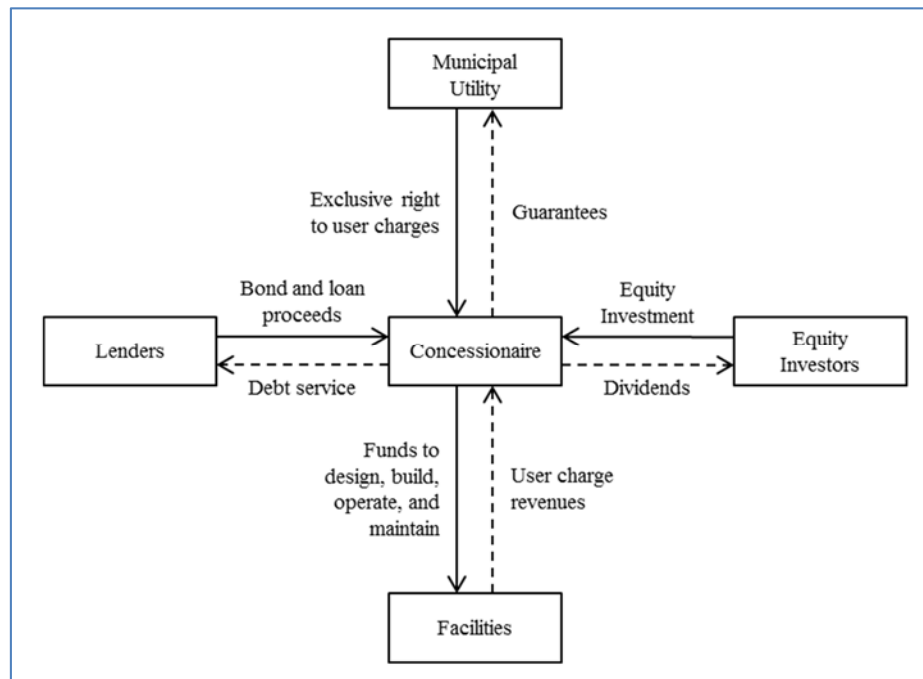


Figure 3.1 Demand-risk P3 model

Under the availability payment model, the private concessionaire provides the P3 financing, but it is secured with annual payment commitments from the public sector over the concession term. Deductions from the availability payment may be available in the event the asset is not meeting performance guarantees specified in the P3 project agreement. A schematic diagram of the availability payment model is presented on [Figure 3.2](#). In several U.S. states, such as Florida and North Carolina, the availability payment liabilities count against the municipality's bonding capacity and are treated no different than direct public debt. As such, this model may provide less of an advantage to municipalities with debt capacity limitations than the demand risk model, but is less risky to the private concessionaire, and overall, the private financing costs are generally lower under this model because the public sector essentially takes on the long-term financing liability (Kim 2016).

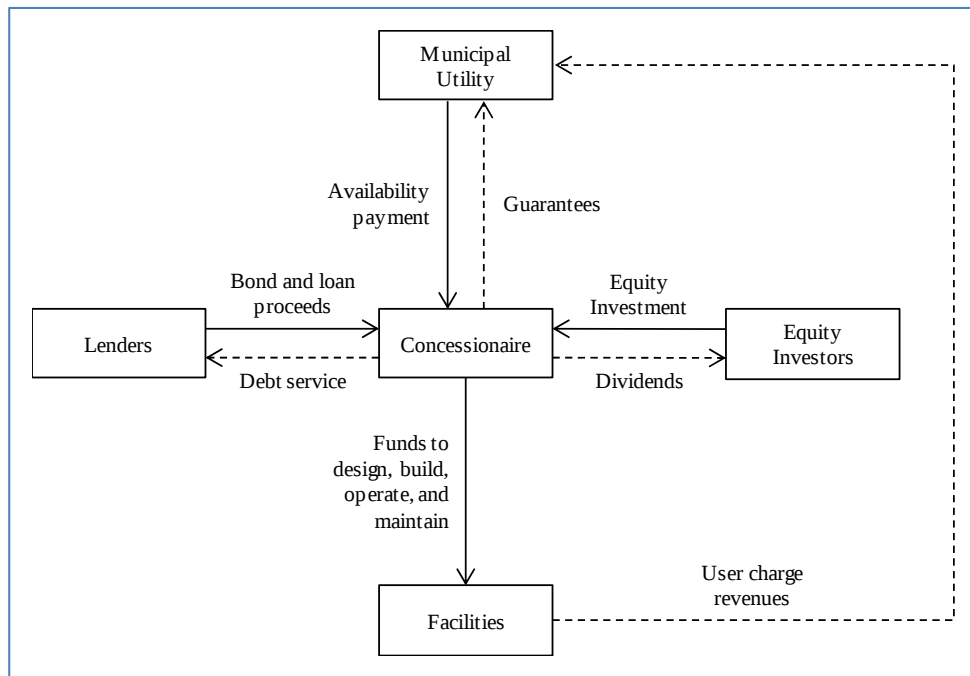


Figure 3.2 Availability payment P3 model

Prevalence in the U.S. Municipal Market

P3s are prevalent in the U.S. transportation sector, and less so in the U.S. water sector even though other forms of alternative project delivery are common in the U.S. water sector. However, in some countries outside of the United States, such as Canada, P3s in the water sector are also common (Wharton 2015a). While P3s in the U.S. water sector are less prevalent, they are a growing concept given the vast funding gap for water infrastructure, the desire to limit or defer utility rate increases, and the ability for the governmental owner to shift risk to the private sector (Ernst & Young 2013). Furthermore, municipalities under financial stress in the United States may be more inclined to monetize the value of the water system in view of their limited ability to increase overall municipal revenue. Private sector participation in the U.S. municipal water sector is expected to gain further momentum as legislative changes allow or expand opportunities for P3s (Ernst & Young 2013). To date, P3 enabling state legislation has been enacted in approximately 32 states and Puerto Rico (see [Figure 3.3](#), below).

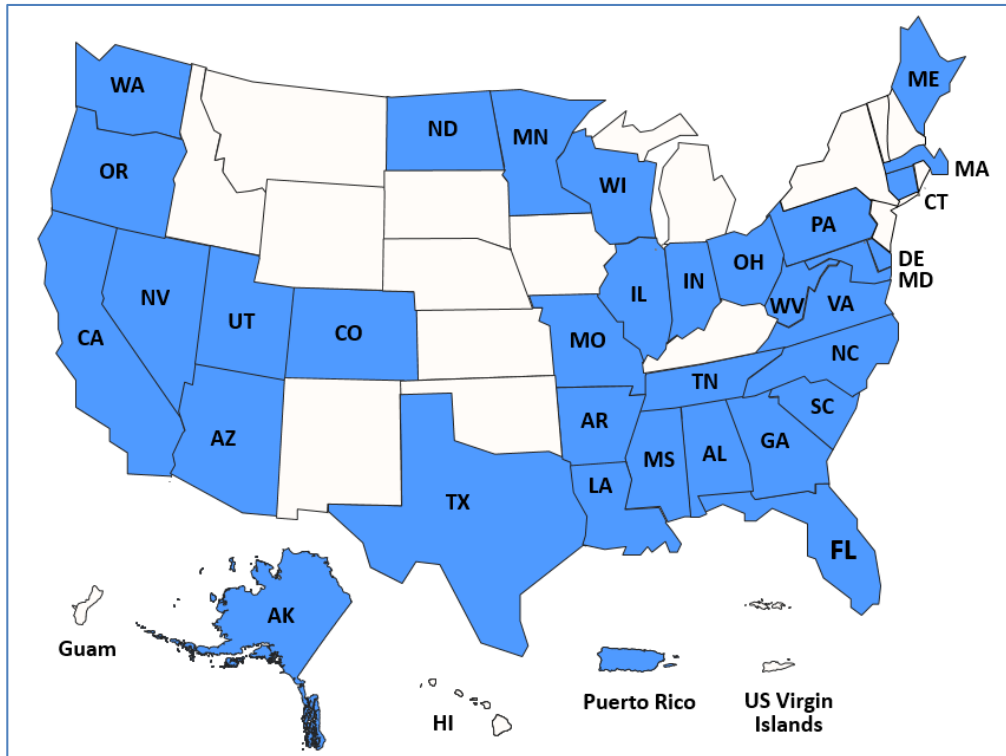


Figure 3.3 States with P3 enabling legislation

Advantages and Limitations

There are several reasons for the growing interest in P3s in the U.S. water sector. The first is the ballooning debt burden many cities are facing. With more than \$1.7 trillion in long-term debt, and significant pension liabilities, some municipalities are hard pressed to finance needed capital improvements for water systems, even when these water systems are managed as an enterprise fund of the municipal government. For financially stressed municipalities, private equity could help fund these projects and move them forward, and could even help take existing debt off of the municipality's balance sheet, thereby strengthening the municipality's credit rating and lowering its cost of capital for other vital services (Wharton 2015b). Regulatory compliance is the second driver. A private company or consortium could help a municipality complete the work demanded by a consent decree within the time specified, and it could also assume the risks involved by guaranteeing that the work will be successfully completed for a fixed price. One example of this is the Prince George's County P3 Stormwater program (see description below). The guarantee could also include a cap on increases to utility rates (under a concession-type arrangement) providing utility rate certainty for the municipality and its customers. Ultimately, the terms of the project agreement governing the P3 project would be heavily negotiated by the private consortium and the government entity, and could include some or all of these components.

Therefore, some of the advantages of P3 arrangements include:

- Provide opportunities for incentivizing private sector innovations and for achieving cost and operational efficiencies over the entire project lifecycle;
- Enable accelerated implementation of infrastructure projects;
- Allow for risk sharing between the public and the private sectors;

- Provide a degree of certainty regarding future rate increases and funding of infrastructure; and
- May allow for the monetization of the value of the assets.

In a September 2014 report, Moody's Investors Service stated that, "The United States has the potential to become the largest P3 market in the world, given the sheer size of its infrastructure" (Moody's Investors Service 2014). Given that the infrastructure gap is in the hundreds of billions, the water sector P3 market could easily be in the billions if not the tens of billions of dollars per year. According to Moody's, "two inter-related trends are at work that could cause P3 activity to expand: the need to upgrade, replace or build out essential infrastructure assets and the inability of governments to finance these current and future infrastructure investments entirely on their balance sheets" (Moody's Investors Service 2014).

The extent to which the U.S. P3 water market expands depends on at least two factors: 1) the federal government's continued ability to offer loans and other forms of financial assistance in P3 transactions; and 2) the extent to which other funding sources grow, thereby lessening the demand for private financing of public works (Deye 2015). The Transportation Infrastructure Finance and Innovation Act (TIFIA) program, originally enacted in 1998, plays an essential role in the U.S. transportation P3 market by providing "credit assistance for qualified projects of regional and national significance" (Deye 2015). Particularly since the financial crisis, TIFIA has been instrumental in facilitating transportation P3 activity (Deye 2015). Thus, the extent to which TIFIA assistance remains readily available going forward will directly affect the level of transportation P3 activity. In the water and wastewater sector, the recently established 5-year WIFIA program provides a new project delivery model (modeled after TIFIA) that could encourage P3s in the water sector to grow significantly if WIFIA is eventually expanded beyond its current pilot scale and modified to address its limitations (see further discussion of WIFIA below).

One of the hurdles that P3s in the U.S. water sector face is the public versus private cost of money. For most water utilities in good financial condition, the cost of municipal debt is significantly less than private debt and equity because municipal debt is typically issued on a tax exempt basis. The difference between tax-exempt and taxable debt has historically been in the range of 100 to 200 basis points (1% to 2%) (AWWA 2009), and private equity returns can be 4% to 8% more than tax-exempt debt due to added risk to equity investors. Therefore, in order for P3s involving private financing to be economically attractive to the municipality, efficiency savings and the transfer of risk need to be significant enough to offset the higher cost of money (Price Waterhouse Coopers 2010). This high hurdle causes many P3s to be eliminated from consideration in the early planning stages (Petersen and Howard 2014).

Several of the more notable P3s in the U.S. water sector (e.g., the Carlsbad Seawater Desalination project in California and the Bayonne P3 project in New Jersey) received special tax treatment through their use of exempt facility private activity bonds (PABs), which helped to reduce the cost difference between public and private financing. However, these PABs are competitive, limited, difficult to secure, and generally the exception, rather than the rule, for municipal water infrastructure projects. Exempt facility PABs, in general, are subject to annual volume cap limits, and each state has a limit of \$100 per capita, subject to certain total annual minimum amounts for smaller states (Petersen and Howard 2014). Municipal water utilities must compete within each state for an allocation of the general exempt facility PAB volume cap, and water utilities compete with housing, airport, solid waste, and industrial development project

applicants. The uncertainty as to whether exempt facility bonds will be available is a major impediment to procuring municipal water on a P3 basis (Petersen and Howard 2014).

Ultimately, the source of revenue to pay for a project under a P3 arrangement or a traditional arrangement is the utility's customer base. As such, the viability of projects to be implemented as a P3 will in part be determined by a comparison of the total life-cycle costs under a traditional approach versus a P3 approach – a Value for Money analysis (Price Waterhouse Coopers 2010). As such, P3 projects may not be the right choice for every large water utility project.

Another significant hurdle that P3s in the U.S. water sector face is the political risks associated with private sector participation. Many aspects of the unique political culture in the United States have contributed to the perception of high political risks. These include (Kim 2014a):

- The U.S. public's discomfort of placing infrastructure assets into private hands;
- The bottom-up and decentralized approach to planning and decision-making in infrastructure development;
- Political fragmentation across the 50 states regarding political culture and rules of engagement; and
- A legacy of strong collaborative relationships between municipalities and local contractors motivated, in part, by the lengthy and costly infrastructure development process.

The discomfort of placing infrastructure assets into private hands relates to a loss of control, lack of transparency, accountability issues, and a general mistrust regarding the profit motivation of the private sector.

These political risks can potentially be mitigated with efforts and frameworks that can be adopted by municipalities. First, having a clearly delineated P3 strategy, legislation, established approval protocol, and consensus before procurement can help to mitigate political controversy. Having this structure in place before proceeding with P3 procurements can help reduce the risk associated with lack of consensus among key stakeholders, improve transparency, and can help to safeguard environmental standards and labor contracts. Second, enhancing transparency throughout the P3 project planning process can combat political risk. By involving the stakeholders early on in the process, it is possible to gain insights into the political feasibility of P3 projects before costlier planning phases commence. Providing public access to pertinent project and financial information, as well as having formal project audits and performance evaluations can enhance transparency. The concern over loss of control and the balancing act between the two parties regarding the risk and rewards that they assume can be addressed through the P3 contract. The establishment of effective regulations or contracts that balance the public need for quality infrastructure and the private need for sustained business can address the loss of control issue (Kim 2014a).

The mistrust of the private sector that is prevalent among some stakeholders stems from the concerns about windfall profits and high risk premiums that are perceived to be passed on to the users of the system. These are largely controllable through contract negotiations and competition in the procurement process. Lessons learned from the United Kingdom's experience in P3s include constructing the P3 contract such that it allows for the ability to tighten the project economics and minimize non-productive transaction costs. Examples include (Kim 2014a):

- Allowing more flexibility in contract adjustments (e.g., when project scope changes exceed a given level);
- Minimizing financing costs through alternative mechanisms, such as credit guarantee financing that retain the difference in cost of capital between public and private sector;
- Sharing the upside of post-construction financing when the financing terms become more favorable with reduced risk;
- Transferring the early termination financing penalties to the private sector in case of voluntary termination; and
- Introducing debt and equity funding competition after the selection of the preferred concessionaire to reduce cost of capital.

Attracting private and public parties to P3s requires a clear delineation of objectives, requirements, and responsibilities, and an understanding of the benefits to both the public and the private sector. Investors and private firms with the necessary expertise to complete the project must be certain of a reliable, long-term revenue stream, whether provided by fees or government payments over time. The public partner must in return benefit from receiving services and expertise that it would otherwise struggle to obtain, often combined with a completion date far shorter than it could envision accomplishing on its own. Each partner also must understand the environment in which the other operates (NCPPP 2015).

Another challenge to the applicability of P3s for utilities that desire to use this approach for existing water infrastructure assets relates to the defeasance of debt. Where existing water infrastructure that was constructed using tax-exempt debt will come under private management for a period of more than 20 years, defeasance of that existing debt must occur. Defeasance can be a significant impediment to utilizing a DBFOM model to rehabilitate existing infrastructure because it drives up costs. When a jurisdiction defeases a bond, it has to maintain the stream of expected interest payments in addition to paying off the outstanding principal. To comply with this requirement, it has to buy Treasuries that generate interest payments equal to those that would have been paid out under the original bond indenture. At today's low interest rates, this requires the upfront investment of significant capital in low-yield Treasuries to achieve the required stream of payments, placing significant financial stress on potential DBFOM water infrastructure projects. The challenges presented by defeasance could be eliminated by simple clarifications from the Internal Revenue Service (IRS) about how it interprets the phrase "alternative use of disposition proceeds" in Section 1.141-12 of the U.S. Treasury Regulations (WCX 2015a).

Investors and Investor Perspectives

Infrastructure Investor, a publication by Private Equity International (PEI), ranks the 30 largest infrastructure fund managers globally by size. This ranking can provide insight into the current and potential future investors in water sector P3s in the United States. A summary of the 2015 ranking is provided in [Table 3.1](#), below.

Table 3.1
Ranking of the world's largest infrastructure investors (2015)

Rank	Company	Country	Region	Fundraising (\$M)
1	Macquarie Infrastructure and Real Assets	Australia	Asia-Pacific	28,846
2	Brookfield Asset Management	Canada	North America	15,791
3	Energy Capital Partners	United States	North America	10,436
4	ArcLight Capital Partners	United States	North America	9,592
5	IFM Investors	Australia	Asia-Pacific	8,436
6	Global Infrastructure Partners	United States	North America	8,250
7	Borealis Infrastructure	Canada	North America	7,247
8	The Blackstone Group	United States	North America	7,080
9	Kohlberg Kravis Roberts (KKR)	United States	North America	6,485
10	Colonial First State Global Asset Management	Australia	Asia-Pacific	5,783
11	Ardian	France	Western Europe	5,269
12	Goldman Sachs Infrastructure Investment Group	United States	North America	4,994
13	InfraRed Capital Partners	UK	Western Europe	4,989
14	KDB Infrastructure Investments	South Korea	Asia-Pacific	4,699
15	JP Morgan Asset Management	United States	North America	4,428
16	Antin Infrastructure Partners	France	Western Europe	4,164
17	Alinda Capital Partners	United States	North America	4,100
18	EnerVest	United States	North America	4,093
19	First Reserve Corporation	United States	North America	3,769
20	BTG Pactual	Brazil	Latin America	3,605
21	Hastings	Australia	Asia-Pacific	3,349
22	Equis Funds Group	Singapore	Asia-Pacific	3,229
23	I Squared Capital	United States	North America	3,200
24	Copenhagen Infrastructure Partners	Denmark	Western Europe	3,123
25	Ridgewood Energy Corp	United States	North America	3,000
26	Partners Group	Switzerland	Western Europe	2,728
27	Meridiam Infrastructure	France	Western Europe	2,665
28	Equitix	UK	Western Europe	2,480
29	DIF	Netherlands	Western Europe	2,471
30	Highstar Capital	United States	North America	2,434

Source: PEI 2015

Certain U.S. public pension funds, such as the CalPERS and the CalSTRS, have shown a heightened interest in direct investment in infrastructure through P3 arrangements. Pension funds are typically interested in infrastructure assets because they have long-term, inflation-adjusted obligations, and infrastructure assets potentially could offer long-term, inflation-adjusted cash flows (Williams and Nesbit 2009). As an example of the interest in infrastructure assets by pension funds, in 2015, CalPERS announced a \$1 billion deal with an Australian pension fund, Queensland Investment Corp., to invest in Australian and Asian Pacific Infrastructure (Eicher 2015). This deal is an example of a trend among pension funds around the world to directly invest in infrastructure, rather than investment in infrastructure funds through intermediaries, and could help pave the way for more direct investment by pension funds in U.S. public infrastructure in the future. However, even the most sophisticated pension-fund investors struggle with the competition from low-cost capital that can be accessed by municipalities through the municipal bond market (Eicher 2015). These pension funds hope to capitalize on the value that could be realized from investors willing to finance the total lifecycle costs of U.S. public infrastructure, rather than just the upfront capital costs.

Based on a survey of approximately 114 public and corporate pension plans, fund of funds managers, family offices, endowments, foundations, consultants, insurance companies and other agencies that was conducted by Probitas Partners in 2007, over 52% of the investors that responded

to the survey were either actively considering infrastructure investing or would opportunistically do so in the future. The survey respondents were biased toward global infrastructure funds, but with funds focused on U.S. preferred by 36% of the respondents (Probitas Partners 2007).

Institutional investors have also become more knowledgeable and sophisticated when it comes to P3s resulting in direct investment and co-investment in infrastructure projects. Large institutional investors are anticipated to focus much of their infrastructure asset allocation on brownfield and greenfield equity investment opportunities in developed and emerging markets (Drexler et al. 2014). In addition, increases in institutional investment in infrastructure debt are expected, both for liability-matching purposes and to fill the gap left by banks that restrict direct placement lending based on tight balance sheets (Drexler et al. 2014). Co-investing is expected to remain the most popular form of direct investing, particularly with regard to private equity. Under the co-investing model, an institution invests in a fund run by an asset manager and then may have the opportunity to make direct investments alongside that fund's manager. This is attractive to institutional investors because fees are generally not charged on the co-investment and the investor can leverage the skills of the asset manager while paying lower fees in aggregate (Drexler et al. 2014). Institutional investors pursue direct investments for three main reasons: to improve returns while managing risks, strengthen control over the life of the investment, and to improve the value and alignment with the institution's interest.

The following additional comments were provided by investment advisors, managers, and investors through interviews and correspondences regarding P3s that highlight their current level of interest and participation, and identify opportunities to increase their interest and participation:

- Private investors are generally very interested in pursuing additional investment opportunities in the P3 water sector, and there has been a greater interest from institutional investors in participating in P3s recently.
- One of the most important things that investors look for in a viable P3 project is whether or not it has legislative approval to move forward. This relates to political risk and legislative approval, and demonstrates that there is political commitment for the project.
- Municipalities should provide a clear understanding of the project to potential investors and should not change the procurement in the middle of the process. The public should be very clear on what they are asking for in a P3 arrangement.
- The lack of private investment in P3 projects is not due to the lack of capital. Rather there are a limited number of viable P3 project opportunities in the U.S. water sector.
- The P3 water market in the United States is distorted because of the difference between taxable and tax-exempt debt. This results in an indirect subsidy for publicly financed projects and a misallocation of capital.
- The U.S. market is attractive to P3 investors because of the predictability of the legal system, and efficient model. However, it is unattractive because of tax-exempt financing that distorts the market and puts P3 projects at a disadvantage.
- The quality (readability and traceability) of P3 contracts was another factor that was cited as important to a viable P3 deal.
- Due to the transaction costs and the need to realize value through economies of scale, the typical size of a P3 project that would attract investors is in the range of \$500 million or more.

- The private sector is generally able to accept and price various levels of risk. However, in completing value for money assessments, the public sector needs to do a better job of identifying and quantifying the risk on their side.
- Some investors suggest that project site risk should be borne by the government, and demand, construction, and operations risk should be borne by the private sector in a P3.
- The amount of private equity included in a P3 deal is very small. Some report that 3% to 5% of the capital structure will be equity. Others report that 10% equity is the typical amount.
- Workers in the United States and Canada want to see more of their pension funds put safely to work at home, helping to rebuild our domestic infrastructure, expand our economy, and rebuild the middle class by creating new and lasting jobs. To keep the promise of retirement security for a new generation of workers, our pension funds need strong and reliable long-term returns that investable infrastructure can deliver, but until now, institutional investors have had a hard time finding attractive infrastructure investment opportunities in the United States (WCX 2016).

Examples

Several large water projects in the United States have been procured using a P3 approach, most notably the Carlsbad Seawater Desalination project, the Bayonne Concession, the San Antonio Water System, Vista Ridge Transmission Project, and the Prince George's County Stormwater P3 project. These are discussed briefly below, along with a project in the United Kingdom that is using an innovative P3 approach that could have relevance in the United States in the future. Additional case study descriptions are provided in Chapter 4, and several case studies accompany this report.

Carlsbad Seawater Desalination Project. The Carlsbad Seawater Desalination project in San Diego County, California is the largest desalination plant in the western hemisphere. The \$922 million DBFOM project consists of a 50-million-gallon-per-day seawater desalination facility and a 10-mile, 54-inch-diameter conveyance pipeline project that was procured by the San Diego County Water Authority (SDCWA). Poseidon Resources, LLC., the developer, constructed and financed the project in exchange for a 30-year Water Purchase Agreement with the SDCWA for the entire output of the plant. In 2010, the project was allocated \$530 million in exempt facility PABs to finance a portion of the project costs (Kable 2016). A P3 approach for this project was determined to be the best option for SDCWA due to the risk mitigation such partnership offers (Prall 2014). See Chapter 4 and the case study accompanying this report for more information.

Bayonne Concession. The Bayonne Concession involved a P3 concession for the operation, maintenance, and management of water distribution, wastewater collection, stormwater, and combined sewer infrastructure in Bayonne, New Jersey. A major impetus for proceeding under a P3 concession approach was the poor financial condition of the Bayonne Municipal Utilities Authority (BMUA), which was significantly in debt and facing double-digit rate increases to keep its system running. The concession was a \$175 million, 40-year concession with Kohlberg Kravis Roberts & Co (KKR) and United Water that solved the city's failing credit problem and resulted in holding rates near where they would have been in a public solution (Lloyd 2013). Under the concession, KKR took responsibility of the operation and management of the system in return for the user fee revenues of the system. The BMUA continues to exist and is funded with \$500,000

per year, indexed, for its cost to administer the concession agreement (MS&B 2012). See Chapter 4 and the case study accompanying this report for more information.

Vista Ridge Regional Supply Project. In July 2014, the SAWS and the City of San Antonio entered into a P3 arrangement with Abengoa, a Spanish multi-national corporation, to deliver 50,000 acre feet of water beginning in 2020 for a 30-year period. Since then, in 2016, Abengoa's parent company declared bankruptcy, and Abengoa sold 80% of its stake in the project to Garney Construction (Collier 2016). Abengoa and Garney Construction, under a DBFOM agreement, will deliver new production wells, pumping stations, raw water collection, storage tanks and a new water supply 142-mile transmission pipeline. The \$3.4 billion SAWS Vista Ridge Regional Supply Project has an engineering, procurement, and construction (EPC) value of \$850 million. Under the water transmission and purchase agreement, Abengoa and Garney Construction agreed to assume delivery risk, including all components of regulatory, technical, and financial risk, at a fixed price for the 30-year duration of the project (Rockcliffe Ltd 2015). The project sets strong precedent in the U.S. water sector for the emergence of the P3 model and is historical for the City of San Antonio. See Chapter 4 and the case study accompanying this report for more information.

Prince George's County Stormwater P3 Project. In November 2014, Prince George's County approved a P3 agreement with Corvias Solutions for a 30-year stormwater management project. The County is expected to invest \$100 million in an initial 3-year retrofit of the stormwater system. Corvias will undertake the design, construction, and long-term maintenance of the County's stormwater infrastructure, covering up to 4,000 impervious acres, to meet Municipal Separate Storm Sewer System permit compliance requirements. The project will initially be funded by stormwater management fees collected by the County, but private financing options are also being explored (Gabriel and Devlin 2015).

Thames Tideway Tunnel P3 Project. The western European water market is very different from the U.S. market, particularly since in western Europe, water utilities are frequently privately owned. However, the Thames Tideway Tunnel project is a large water project in the United Kingdom that is being funded with an innovative P3 approach that has the potential to be expanded beyond the United Kingdom. Thames Water is a privately owned water utility that provides water and wastewater services across London and the Thames Valley in the country (Thames Water 2016). The project is funded with a combination of bank debt and equity from pension and infrastructure funds.

The Thames Tideway Tunnel project is a sewer tunnel project that is 15 miles in length and 65 meters below ground that will connect 34 sewer overflows, capture sewage and transfer it to a wastewater treatment plant to be treated (Tideway 2016). Instead of funding the project on its own balance sheet, Thames Water selected a separate company to design, build, and own the tunnel through a competitive procurement process. The new owner will design and build the asset, own it in perpetuity, and formally become a new economically regulated utility.

The new project company is made up of Allianz, Dalmore Capital, Amber Infrastructure, Swiss Life Asset Managers, and International Public Partnerships. About one-third of the £4.2 billion cost of the project will still be funded by Thames Water (mostly for early works), with the remaining £2.8 billion raised by the project company with £1.6 billion of debt and £1.2 billion of equity. What is unique about the financing of this project is that the Thames Tideway financing model involves private financing with U.K. government protection against certain risks including insurance, significant cost overruns, incidents during construction, and termination compensation (Grant and Pooler 2015). This combination of regulatory and specific protections by the U.K. government resulted in low cost of capital financing (i.e., weighted average cost of capital of

approximately 2.5% per annum), the benefits of which will be felt by water consumers (Pinsent Masons 2015). Customers of Thames Water will face extra charges of £20-25 a year to fund the project, rather than the additional £80-90 initially forecast under a more conventional financing approach.

This approach is part of the U.K.'s National Infrastructure Plan, the U.K. Guarantee Scheme for infrastructure, and a new model for private sector delivery of public service. The U.K. Guarantee Scheme was launched in 2012 to support investment in U.K. infrastructure, and has since provided £40 billion worth of guarantees to provide certainty to investors by using the strength of its credit rating (HM Treasury 2014). This government backing or guarantee provided for public infrastructure projects lowers the cost of capital for project funding and can encourage private investment, an approach that is somewhat similar to what WIFIA and SRF loan guarantees are aimed at doing in the United States (see discussion of WIFIA and SRF loan guarantees below).

Public-Public Partnerships

Description

Public-public partnerships are collaborations between two or more public utilities to improve the quality and efficiency of water or wastewater services, share risks, and provide a source of capital financing. These partnerships can take many forms in different areas and for different governmental organizations. A schematic diagram of a typical public-public partnership model is provided on [Figure 3.4](#).

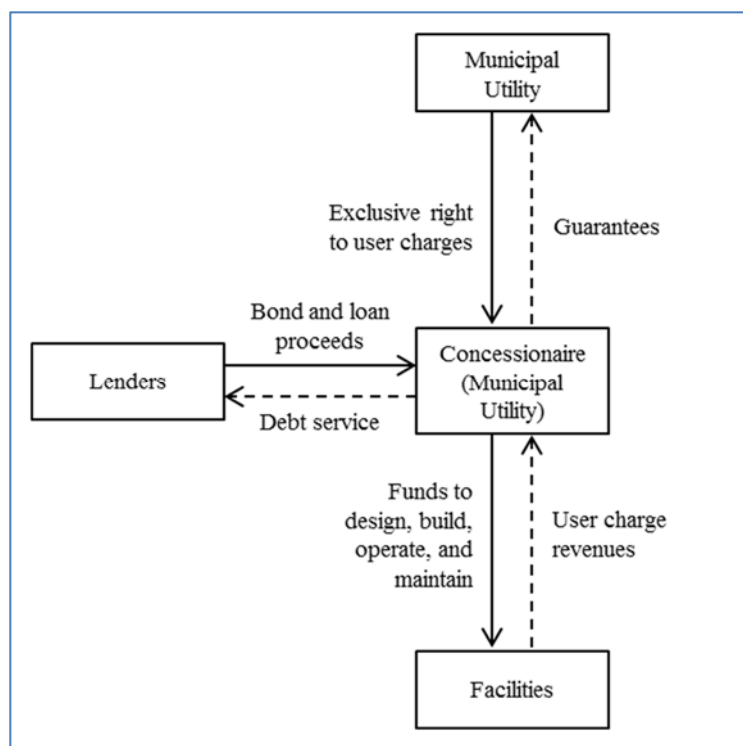


Figure 3.4 Public-public partnership model

Advantages and Limitations

Public-public partnerships may offer the collaborative advantages of public-private partnerships, such as the transfer of risk and cost or rate certainty, while providing a source for capital funding that does not involve the private sector (Food and Water Watch 2012).

Example

One of the most notable recent public-public partnerships is the water and wastewater concession agreement between the City of Allentown and the Lehigh County Authority (LCA) in Pennsylvania. In 2012, the City of Allentown's efforts to boost revenue and cut costs were not enough to cover growing pension fund payments, and the City needed a creative solution to raise revenue. Following a competitive bidding process, the City finalized a 50-year, \$211.3 million lease of its drinking water and sewer systems in August 2013 to LCA, a public water and wastewater utility. The upfront payment from the lease, as well as a \$500,000 annual royalty payment, was used to pay off water and sewer bonds, reduce the City's debt, and eliminate unfunded pension liability. In return, the LCA receives the water and wastewater user charges of the system. (EPA 2016b; Metro Planning Council 2013). See Chapter 4 and the case study accompanying this report for more information.

DIRECT LENDING AND ASSET BACKED SECURITIES

Direct Lending through Private Placements

Description

Private placements include bank loans and direct purchase bonds. In a private placement, the issuer sells bonds directly to a small number of sophisticated investors who have the ability to perform their own assessments of the issuer's credit. This approach is often considered if the issuer's credit is deemed to be less than investment grade by rating agencies (AWWA 2014). A schematic diagram of a typical private placement transaction is provided on [Figure 3.5](#).

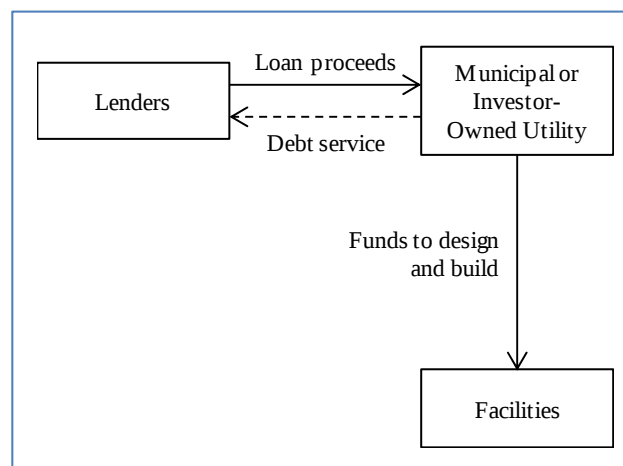


Figure 3.5 Private placement diagram

Advantages and Limitations

The emergence of private placement lending provides benefits to issuers by offering diversification and, often times, new sources of capital. But issuers should recognize that the structural character of these loans may differ from the more traditional forms of borrowing. Specifically, many of these loans contain covenants that lead to acceleration, create demands on liquidity, or contain cross-default provisions for other outstanding debt of the borrower (CDIAC 2015).

Private placements could result in higher effective interest costs to the issuer because bonds sold through private placements are often not liquid to the investor. However, private placements can benefit municipal bond issuers by saving them time and issuance expense compared to competitive or negotiated sales (Kamins 2014). For example, these debt issuances typically do not require the following:

- Published notice of sale in the bond buyer;
- Underwriter;
- Preliminary or final official statement;
- Bond rating;
- Continuing disclosure;
- Sometimes no bond trustee; rather, a local official may be the transfer agent;
- Sometimes no bond purchase agreement; rather, a bank term sheet or commitment letter; and
- No book-entry-only registration; rather, the registered bondholder is the bond buyer.

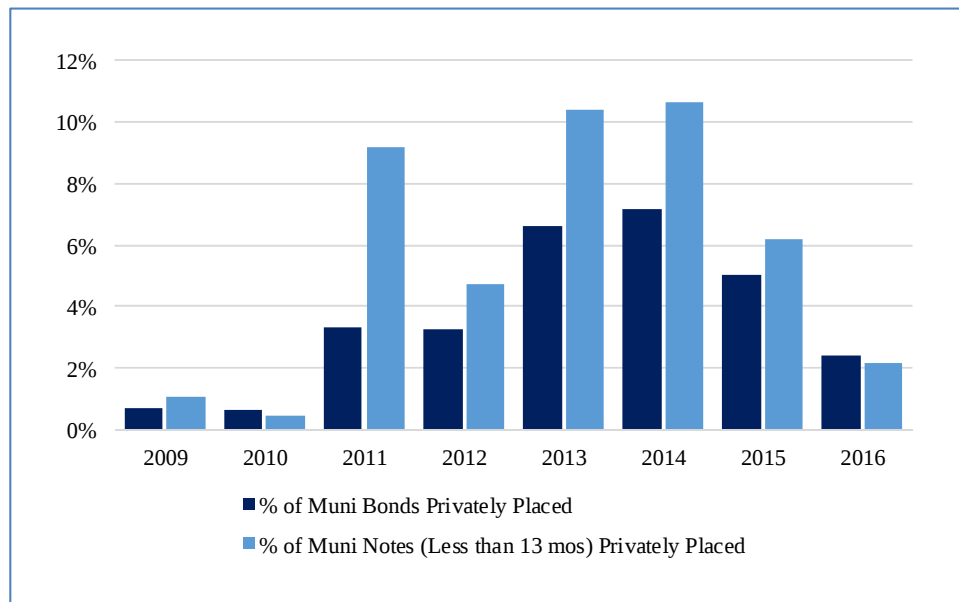
Typically, the process for executing a bank loan is more streamlined than a traditional, publicly marketed bond issue, with fewer costs of issuance and ongoing compliance requirements. In particular, bank loans often do not require an offering document or credit ratings. Additionally, bank loans are often structured in a more flexible manner than a traditional municipal bond issue, to conform to a specific project schedule or particular cash flow considerations. However, because bank loans are not typically executed in an environment that is as transparent as the municipal securities market, an issuer may have limited ability to assess information about whether the proposed interest rate, fees, and terms of a particular loan are consistent with bank loan market practices (GFOA 2016).

Another concern is that breached covenants and default events, combined with cross-default provisions, could accelerate not only the privately placed obligations, but also capital market debt, which could create a liquidity crisis for the issuer and potentially have negative rating implications. S&P Global Ratings stresses the importance of disclosure of privately placed debt so that an evaluation of the likelihood of the issuer triggering acceleration, termination payment, or collateral posting requirements can be undertaken (Bodek et al. 2014).

In addition to rating agency concerns, California, for example, is requiring higher standards for disclosing these types of direct loans with a law that speeds up the deadline to file loan disclosures to 21 days. In addition, the Municipal Securities Rulemaking Board, the body that sets rules for the municipal market and its users, does not require governments to disclose bank deals, but it has published guidance on doing so (Farmer 2014a).

Prevalence in the U.S. Municipal Market

Historically, only a small percentage of the total dollar amount of tax-exempt bonds each year is privately placed. However, this approach has become more prevalent in recent years. S&P estimates that direct loans might account for as much as 20% of municipal issuances (Bodek et al. 2014). Privately placed loans comprise a larger share of primary market issuance today than they did 5 or more years ago (see [Figure 3.6](#)), and the proportion of municipal bonds and notes held by domestic banks has risen steadily over this period.



Source: Data from The Bond Buyer 2016.

Figure 3.6 Trends in direct lending to municipal issuers by banks

The greater interest by municipal issuers in private placements is due to several factors. First, issuer demand for variable-rate debt continues to exist, and bank loans can be structured to mimic many of the features of traditional variable-rate bonds and serve as a substitute. Second, the cost of issuing direct debt is often lower than publicly offered debt. Third, the regulatory burdens associated with issuing public bonds are growing and bank loans can avoid certain annual reporting requirements (Breckinridge Capital Advisors 2014).

The use of direct-purchase bonds was initially generally limited to replacements of expiring letters of credit and standby bond purchase agreements in support of variable-rate demand obligations, typically placed with large national banks. However, variable- and fixed-rate direct-purchase bonds are being used not just for variable rate structures, but for new money needs, as well as the refunding of existing fixed-rate debt. Banks of all sizes are providing this product, and the terms and covenants within the agreements are less clearly defined and less uniform, creating the potential for considerable credit risk exposure (Bodek et al. 2014).

Example

Since 1985, the City of Los Angeles Wastewater System (LAWW) has undergone an extensive multi-billion, multi-decade capital improvement program (CIP) that has improved its infrastructure including providing a blend of primary and secondary treatment to advanced tertiary treatment, increasing capacity to serve an exploding population, and reclaiming water for a historically arid landscape. To finance the massive CIP, LAWW has employed a diverse suite of financing structures and products, including senior and subordinate lien bonds, fixed and variable rate bonds, commercial paper, and interest rate swaps, among others.

The use of direct purchase fixed rate notes benefited LAWW in multiple ways, including lowering the effective cost of funds versus alternative products, limiting LAWW's exposure to the creditworthiness of its bank facility providers, reducing budgetary risk, eliminating potential market-to-market risk, and reducing the financing process timeline and issuance expense as compared to a public market transaction. The structure has proven to be very effective, and upon the expiration of the initial direct purchase term of the fixed rate notes in 2015, LAWW opted to renew financing arrangement for another three years. See Chapter 4 and the case studies accompanying this report for more information.

Securitization

Description

Securitization, or a “cost containment,” “stranded cost,” or “rate reduction” bond structure is a financing model by which a separate special purpose entity is formed, such as a debt financing authority, that finances a utility's capital needs on behalf of the utility by pledging revenues from utility customer charges separate from the utility's other user charges. In addition, a lien is placed on the utility property to secure the payment of the securitized bonds. Under securitization, the utility applies to the special purpose entity to finance the costs of an eligible project. The special purpose entity adopts a financing resolution, setting forth certain requirements for issuance of bonds, and the bonds are issued. The proceeds from the securitization bonds are made available to the utility. The bond is serviced from the revenues of user charges that are separate from the utility's other user charges. The right to receive the charge is “sold” to the special purpose entity and remains in effect until the bonds are retired. The revenues from the charge are transferred to the special purpose entity for servicing the debt. A schematic diagram of a typical securitization model is provided on [Figure 3.7](#).

Municipal securitization is similar to revenue bond financing in that the bonds are secured by a pledged revenue stream. The various municipal revenue bond structures available today create a continuum of municipal securitization with the basic municipal revenue bond at one end of the spectrum, and full “rate reduction bonds” at the other end of the spectrum with dedicated tax bonds and highly structured revenue bonds in the middle (Mauro 2014).

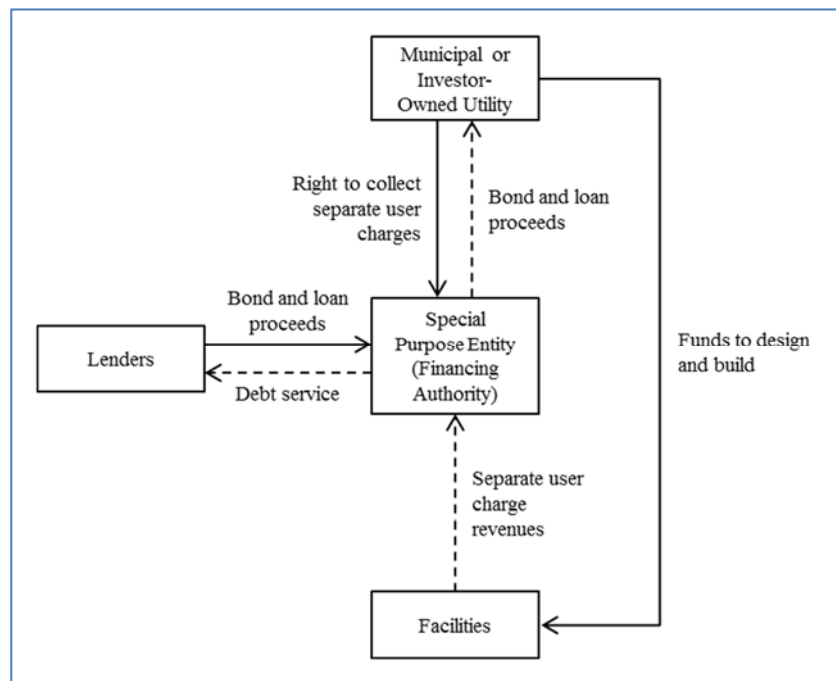


Figure 3.7 Securitization model

Advantages and Limitations

One advantage of securitization bonds is the potential to produce significantly lower financing costs than if the issuer sold debt under its own credit, which is a benefit particularly for lower rated issuers. Securitization bonds can allow a utility that might otherwise not be able to issue debt on favorable terms to finance capital projects with lower interest rates and debt service costs. In addition, securitizations are structured with debt service coverage only slightly greater than one times, and a securitized financing is not governed by traditional revenue bond covenants. As such, a utility with a strong credit rating may be able to use securitization to finance capital projects without having to generate the excess cash flow required by a typical revenue bond covenant. In addition, securitization will not dilute the debt service coverage of the utility's existing municipal revenue bonds. Finally, since securitization bonds are issued by a separate entity, it may broaden the potential investor base available to the utility by bringing in investors who have either not purchased the bonds of the underlying issuer because of credit concerns, or who have reached their exposure limits to the utility (Mauro 2014).

One disadvantage of securitization is that it requires special enabling legislation, and so it may not be a viable option for utilities in many states. Also, since securitization bond repayment is shown as a separate line-item on customer bills, securitization may not be applicable for all types of utility capital projects for political reasons. It may be more applicable to specific types of projects, such as consent orders, unfunded mandates, and sustainability-related projects, rather than more customary capital projects, because these projects may be less politically sensitive to the use of securitization financing. In addition, the use of municipal securitization is still limited for municipal utility financing due to the lack of enabling legislation in many states. However, debt securitization is becoming a more proven approach to reduce debt financing costs and experts believe it will be used on a more widespread basis in the water industry where there is a need for

capital or debt restructuring. It may also help smaller issuers improve their credit (higher ratings) for bank lending structures as the banks will not need to be as concerned with the operation risk of small water and wastewater systems (Howard 2016).

Three financing elements are required for the viability of securitization bonds: a financing act, a financing order, and a special purpose financing entity. First, to issue municipal securitization bonds, there must be state enabling legislation authorizing securitization financing to recover the identified costs. The legislation establishes a property right to collect a future stream of rates, fees, or charges that will be used to retire the securitization bonds, and authorizes the transfer of the property right to a special purpose entity. A financing order needs to be issued by the legislation that imposes an irrevocable charge on customer bills. This charge remains in effect until the securitization bonds are retired. The financing order may also include a true-up mechanism by which the securitization charge is periodically adjusted to assure the full payment of the securitization bonds. Finally, a special purpose entity issuing the securitization bonds is structured such that it is unable to declare bankruptcy and its ability to collect the securitization surcharge is not contingent on the credit quality of the underlying utility. If such financing framework is constructed, the bonds will likely be awarded the highest rating from bond rating agencies, which will result in lower financing costs than those associated with non-securitization utility financing, in most cases (Mauro 2014).

Prevalence in the U.S. Municipal Market

Securitization bond structures have been in existence since electric utility deregulation in the early 1990s. California was the first state to authorize the issuance of “stranded cost” bonds, followed by Illinois and Pennsylvania. While the vast majority of securitization bonds in the past were issued to finance the cost recovery of stranded assets due to deregulation, some of the securitization bonds issued in the last decade have funded other capital needs. For example, special purpose financing entities in Louisiana, Texas, Florida, and other states have issued storm recovery securitization bonds. Additionally, a limited number of states have used securitization financing to fund environmentally beneficial programs, such as several series of pollution control bonds that were issued by a West Virginia financing entity in 2007 and 2009 (Mauro 2014).

Examples

Securitization was first used in the municipal bond market in 2013 with the securitization transaction that was completed by the Long Island Power Authority (LIPA) in New York. In the summer of 2013, New York State enacted the LIPA Reform Act that authorized the use of the stranded cost recovery financing techniques to restructure the debt of LIPA. In December 2013, LIPA completed an approximate \$2 billion debt securitization. The securitization bonds, which are scheduled to mature in 2039, were issued at an AAA rating through a special purpose vehicle, the Utility Debt Securitization Authority, and were used to refund higher cost LIPA debt with similar maturities. Under this transaction, LIPA ratepayers will pay for the securitized debt via a special non-by-passable charge included in their rates, and LIPA must set rates in a manner that assures recovery of all of costs, including debt service on the securitization bonds (LIPA 2015).

Other similar enabling securitization legislation exists (such as in California and Florida) or has been proposed for funding water infrastructure (such as in Puerto Rico). For example, the Los Angeles Department of Water and Power announced in 2015 that it is in the process of a debt

securitization deal estimated at \$750 million, and in March 2016, the Puerto Rico House of Representatives passed a bill that would create a new corporation through which the Puerto Rico Aqueduct & Sewer Authority (PRASA) could access the capital markets to finance needed capital improvements to its water and sewer infrastructure through securitization given its lack of access to the traditional tax-exempt municipal bond market. The legislation would create a new corporation that would issue new debt on behalf of PRASA (Velez 2016). The bill was finally approved by Puerto Rico's legislative assembly on July 2016 and was in process of being signed into law at the writing of this report.

SOCIALLY RESPONSIBLE INVESTING

SRI is an investment approach that considers environmental, social, and corporate governance (ESG) criteria as part of an investment strategy. SRI is growing in the United States and globally. Public pension plans and nonprofits are most likely to incorporate ESG factors into their investment strategy because of pressure from donors, students, tax payers, and other constituents (Funds Europe 2015). Conventional investment firms are increasingly active in creating and marketing targeted products for sustainable investors. SRI investing is found across all asset classes and includes Green Bonds and alternative investments such as social impact bonds (US SIF 2014).

Green Bonds

Description

Green bonds are fixed income, financial instruments used to finance projects that generate significant identifiable climate or environmental benefits, such as mitigation of climate change, or improvement of water quality, and whose use is pre-defined and made transparent to the investor (Ceres 2014). The key difference between a green bond and a regular bond is that the issuer publicly states it is raising capital to fund green projects, assets or business activities with an environmental benefit (KPMG International Cooperative 2015). In the beginning, green bonds focused primarily on major initiatives for climate change mitigation, but have now expanded into other categories, including water infrastructure projects (Gale 2015). In 2014, there were approximately \$36.6 billion in green bonds issued across the globe, with 11 U.S. states issuing green municipal bonds, bringing the total amount of outstanding green bonds to \$53.2 billion (Field 2015). A schematic diagram of the green bond financing model is provided on [Figure 3.8](#).

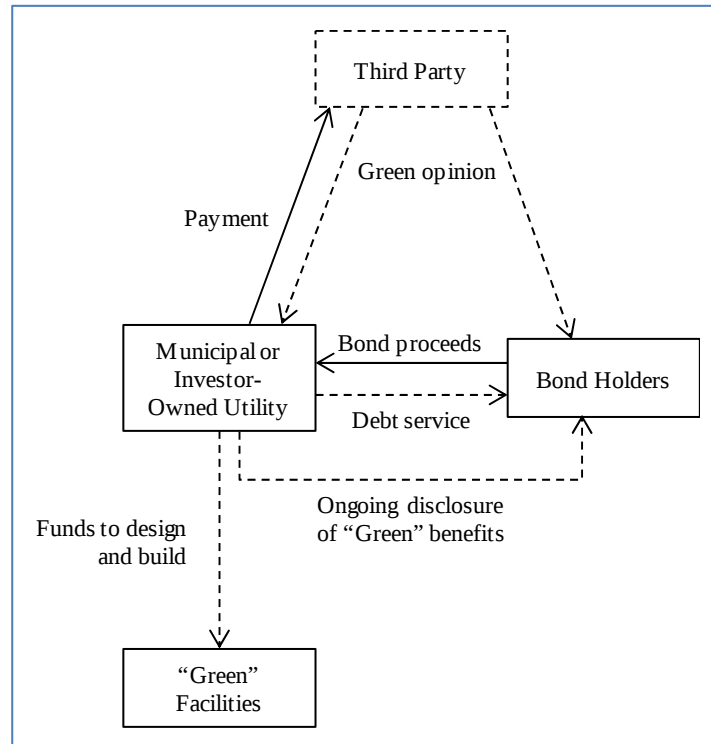


Figure 3.8 Green bond financing model

Advantages and Limitations

The advantages to an issuer of green bonds are investor demand and diversification, press coverage, and brand value. Green bonds can give issuers access to a broader range of investors than regular bonds or other asset classes (KPMG International Cooperative 2015). While retail investors demand sustainable investments from their brokers and fund managers, institutional investors are using green bonds to address ESG mandates, something that, before green bonds, was a struggle to address with fixed income tools (KPMG International Cooperative 2015). These mandates are imposed by institutional investors, and are gaining in popularity. In a recent survey, more than 50% of asset managers stated that they had received institutional client requests for ESG mandates (Funds Europe 2015). The demand for green municipal bonds in the United States is driven more by retail investors than institutional investors (such as endowments and pension funds) because many of the green municipal bonds that are offered are tax-exempt and such institutional investors cannot take advantage of the tax-exempt feature of these bonds.

The advantages of enhanced investor demand of green bonds have been documented in the literature. For example, the State of Massachusetts issued both a regular corporate bond and a green bond in 2013. Both issues were priced identically; yet, the green bond was 30% oversubscribed while the regular bond was undersubscribed (Kidney 2014). Green bonds can also enhance an issuer's reputation. Issuing a green bond can show commitment to the environment and improve awareness within the organization of the issuer's sustainability goals. A study by Barclay's concluded in 2015 that investors were paying approximately a 20 basis point premium to acquire green bonds in the secondary market as compared to their comparable plain vanilla counterparts, attributable to opportunistic pricing based on strong demand for environmentally focused funds (Preclaw and Bakshi 2015). However, due to the multiple factors that impact the

pricing of municipal bonds, it is difficult to definitively make a direct link between the green bond feature of a municipal bond and the original pricing of the bond in the market (GFOA 2015a).

The drawbacks of green bonds include ongoing costs to the issuer associated with tracking, monitoring, and reporting, as well as upfront investment needed to define the bond's green criteria and sustainability objectives. Additionally, investors may seek penalties for a "green default," whereby a bond is paid in full but the issuer breaks the agreed upon green clause (KPMG International Cooperative 2015). In "Green Bonds or Greenwash?" the authors acknowledge that strict rules and regulations regarding green bonds may not make green bonds the right alternative for some issuers. Strict regulations could increase the cost of issuing green bonds, making them less advantageous (Serap et al. 2015). However, currently there are no consistent expectations among investors, or requirements for issuers, regarding the additional reporting obligations for green bonds (GFOA 2015a).

A major concern of green bonds is the lack of rules, regulations, and concrete definitions of "green" (Serap et al. 2015). Currently, no official guidelines exist as to what can be considered as a green project eligible for green bond funding. With the green bond market still being relatively new, there are accountability concerns. However, standards are in the works to support investing in these financial instruments and to also hold municipalities accountable to ensure that the projects funded with green bonds have a measurable environmental impact.

Evolving Standards for Green Bonds

There are several evolving standards and guidelines on green bonds; however, they are all currently voluntary. These include the Green Bond Principles, which broadly define expectations for reporting and transparency in use of proceeds of green bonds, and the Climate Bonds Standard, which provides sector-specific eligibility criteria for assets and projects that can be used for Climate Bonds and green bonds. A green bond standard specific to water-related projects is being developed by Ceres, World Resources Institute, Carbon Disclosure Project, and the Climate Bonds Initiative. The goal of creating standards is to get rid of some of the ambiguity and help define what kinds of projects should be including in a green bond offering and what criteria investors and issuers can use to assess those projects. Industry-developed standards also aim to preserve the integrity of the name "green bonds" (Gale 2015). Also, green bond indices have been launched by investment banks and credit rating agencies that are designed to benchmark green bond performance (KPMG International Cooperative 2015).

Green Bond Principles. In January 2014, a group of banks, with the help of the investor group Ceres, formulated and launched the Green Bond Principles aimed at standardizing practices for issuers and investors and improving transparency. The principles specify sectors in which green bond proceeds can be invested, including renewable energy, energy efficiency, sustainable waste management, sustainable land use, biodiversity conservation, clean transportation, and clean water sectors. Specifically, the Green Bond Principles are a set of principles that outline good practices for the process of issuing a green bond, including (Ceres 2014):

- Defining and disclosing the criteria used by the issuer to determine what projects, assets, or activities are considered green;
- Describing the process that will be used to apply the green criteria to selected specific projects or activities;

- Identifying what processes and controls are in place to ensure that funds are used only for specified green projects; and
- Describing how projects will be evaluated and reported against environmental and financing criteria.

The principles were developed with the support of the investor group Ceres and in consultation with investors and issuers such as the World Bank and the International Finance Corporation (World Bank 2015a). These principles have the support of 55 of the largest investors, bond issuers and intermediaries including Bank of America Merrill Lynch, Citibank, Credit Agricole, JP Morgan Chase, Goldman Sachs, HSBC and SEB. The International Capital Markets Association (ICMA) is serving as the secretariat for the Green Bond Principles (World Bank 2015b). The Green Bond Principles provide a broad guideline that is intentionally less prescriptive, making this guideline more inclusive for many different types of green projects.

Furthermore, in February 2015, Ceres' Investor Network on Climate Risk (INCR), a network of major institutional investors, released a Statement of Investor Expectations to support the development of a consistent and durable framework for the green bonds market, endorse the Green Bond Principles, and identify four key areas that would benefit from further definition and structure (Ceres 2014). These key areas include:

- Eligibility, including general criteria for green projects;
- Disclosure in the Bond Offering Statement, including intended use of proceeds and other actions consistent with investor expectations;
- Reporting on the use of proceeds and project impacts and benefits; and
- Independent assurance.

The Statement of Investor Expectations was endorsed by numerous major institutional investors and banks including, Addenda Capital, Allianz SE, AXA Investment Management, BlackRock Inc., Boston Common Asset Management, Breckinridge Capital Advisors, CalSTRS, Colonial First State, Community Capital Management, Connecticut Retirement Plans and Trust Funds, Employees' Retirement System of the State of Rhode Island, Everence, Mirova, New York State Comptroller, Thomas P. DiNapoli, Pax World Investments, PIMCO, RBC Global Asset Management, Standish Mellon Asset Management, Treasure, State of California, Trillium Asset Management, University of California, Walden Asset Management, and Zurich Insurance Group.

Climate Bonds Standard. The Climate Bonds Standard is a tool that was developed by the Climate Bonds Initiative, an international investor-focused not-for-profit organization that allows investors and intermediaries to assess the environmental integrity of bonds claiming to be green bonds. The standard is a multi-sector standard that is certified by a third party verifier, and is backed by the Climate Bond Standards Board comprised of various institutional investors, including the CalSTRS, the California State Treasurer, the International Cooperative and Mutual Insurance Federation (ICMIF), and the Natural Resources Defense Council, among others (Climate Bond Standard 2015). The standards define what is considered green and the technology specifications for certain types of climate-related projects. It includes certification process rules, pre-issuance requirements, and periodic certification and assurance. Standards are currently available for wind and solar energy generation, and low carbon buildings projects, but standards for water and other projects are still being developed. To date, five bonds have been certified using this standard (Climate Bond Standard 2015).

Investors and Investor Perspectives

According to a recent green bond investor study, there are six broad categories of investor groups that were found to be particularly active green bond buyers; asset managers and investment consultants, foundations and endowments, faith-based investors, investment banks, corporations and insurers, and public pensions (Humphreys and Sanders 2014). Each of these investor groups has its own concerns and focus when it comes to investment in green bonds. For example, SRI asset management firms are far more concerned with the actual use of proceeds than their green labeling, and they have expressed a willingness to consider a bond used to finance environmental projects regardless of how it might be marketed. The research also revealed that foundations and higher education endowments are increasingly receiving pressure from stakeholders to consider the climate impacts of their investment portfolios. The faith-based investors reported that environmental issues are important to them, and that they view green bonds as a piece of environmentally-themed investing.

Investment banks also play a critical role on the demand side as underwriters of green bonds and clean energy bonds. According to Humphreys and Sanders (2014), banks that are active in the green bond space are in a good position to have some of the most comprehensive and influential views of the green bond market because they see both buyers and sellers that would otherwise remain hidden from view. Banks are also bond buyers, with a de facto right of first refusal to determine whether to keep a debt opportunity for their own portfolio needs, often on highly favorable terms, or to sell it as bonds in public markets or as private placements. The underwriting investment banks most highly engaged in green bonds, such as Bank of America Merrill Lynch, Citigroup, and JPMorgan Chase, played a leading role in formulating the Green Bond Principles (Humphreys and Sanders 2014).

Overall, however, insurers have expressed heterogeneous interest in the green bond market, with some acknowledging the attractiveness of green bond offerings, while others having tempered enthusiasm due to the potential for “green washing.” Furthermore, some U.S. public pensions are becoming more active in the green bond market (Humphreys and Sanders 2014). However, U.S. endowments and pension funds may be less interested in tax-exempt municipal funds than taxable green bonds because these investors typically do not benefit from the tax exemptions that municipal funds offer. The demand for municipal green bonds in the United States is more of a grass roots driven demand, as retail investors request green investments, and money managers seek green products to meet this request.

According to the research, the following six characteristics impacting the demand for green and clean energy bonds were commonly mentioned by green bond investors (Humphreys and Sanders 2014):

- **Liquidity** – Many institutional investors require a high degree of liquidity in clean energy and green bonds. To fulfill expectations for higher liquidity, most institutional bond buyers pursue larger deals.
- **Credit quality** – A diversified range of credit quality of green bonds was found to be important, since some investors require high credit bonds, whereas others prefer lower quality, higher yielding bonds. In addition to diversifying the quality of the bond offerings, the research indicated that bonds should be diversified across type as well. Currently, the market consists largely of taxable corporate and supranational bonds, and tax-exempt municipal bonds. Because many investors, such as faith-based

- investors, cannot take advantage of the tax benefits of exempt bonds, there is demand for increasing the offerings of taxable municipal bonds (Humphreys and Sanders 2014).
- Size – Due to the nature of projects underlying green bonds, these bonds tended to be smaller in size than traditional bond issues. While size was shown to be important for banks with specific underwriting criteria and bond buyers with specific liquidity needs, the limited availability of “index-eligible” bonds was repeatedly cited as an issue of concern. The research suggested that a reliable pipeline of replicable, well-structured bonds from issuers could help mitigate the negative aspect of smaller sized bonds for some participants. Similarly, a consortium of issuers using standardized underwriting and structuring could ease the transactional burdens perceived by banks and buyers (Humphreys and Sanders 2014).
 - Terms – Although many municipal bonds are tax-exempt, many of the investors interested in green municipal bonds cannot take advantage of their tax exemption, as they are already tax-exempt. This includes some of the faith-based investors, the public pensions, foundations, and others. The researchers found a lack of taxable municipal clean energy and green bonds available to these tax-exempt investors, and concluded that this is a major opportunity moving forward (Humphreys and Sanders 2014).
 - Use of Proceeds – Transparency of the use of proceeds is important to many investors, as confirmed with disclosure, third-party audits, and continued reporting. However, other investors are less concerned with the use of the proceeds if the credit and yields are favorable (Humphreys and Sanders 2014).
 - Labeling – SRI investors may overlook a bond if it is not labeled as a green bond. In general, most investors thought favorably of the development of principles for labeling green bonds to help allow for the sustainability attributes of the issuer to be taken fully into consideration (Humphreys and Sanders 2014).

Finally, the research found that as a general rule, green bonds do not appear to benefit from price premiums over more traditional bonds, and investors conveyed that they were unwilling to sacrifice investment yield when considering green and clean energy bonds. However, the researchers acknowledged that, in some sectors, because green bonds are oversubscribed, there may be some discount to the yield for the issuer (Humphreys and Sanders 2014).

The following additional comments were provided by investment advisors, managers and investors regarding green bonds that highlight their level of interest and participation and identify opportunities to increase their interest and participation:

- The point of having a certification or an independent opinion for a green bond is transparency to the investor.
- Most municipal green bonds have not had a certification because there is an implicit level of trust and transparency regarding the use of the proceeds, and institutional investors requesting such certifications have not been a significant portion of the municipal market.
- U.S. endowments and pension funds are less interested in tax-exempt municipal funds than taxable green bonds because they do not benefit from the tax exemptions that muni funds offer.

- The demand for municipal green bonds in the United States is more of a grass roots driven demand, as retail investors request green investments, and money managers seek green products to meet this request.
- Two independent green opinion providers have led the market in the United States – Sustainalytics, and Cicero – which are both European firms that have a presence in the United States.
- Issuers can make their green bonds more attractive to the market by focusing on transparency, including enhancing internal and external reporting of the use of green bond proceeds, and reporting the benefits of the investments over time through various performance metrics.
- Green Bond Principles provides a broad guideline that makes this standard very inclusive to various types of green projects. Climate Bond Standards are more focused on adaption and mitigation of climate change and thus is more specific to certain types of projects.
- It is very difficult to say definitively that the green bond aspect of a bond issue is responsible for a reduction in interest rates for the issuer. However, in the future, a pricing benefit could be generated if retail investors in the United States continue to create demand for green bonds, and if in general, municipal bond demands outweigh the supply of municipal bonds, then bonds with a green feature could receive a pricing advantage.
- The current size of the municipal green bond market is currently around \$10 billion (cumulative). Investors believe that a global green bond market size of \$100 billion per year is feasible with municipal bonds comprising about 7 to 10% of the global supply.
- Most municipal green bonds have been issued by municipalities with very strong credit. Investors are interested in green bonds for higher yield green bonds that are issued by issuers with lower credit.

Examples

Several agencies in the water sector have successfully issued green bonds. These include District of Columbia Water and Sewer Authority (DC Water), Massachusetts Clean Water Trust (MCWT), Metropolitan Water Reclamation District (MWRD) of Greater Chicago, City of Spokane, and New York State Environmental Facilities Corporation. A brief summary of these green bond offerings is provided below. See Chapter 4 and the case studies accompanying this report for more information.

DC Water Green Bond. In July 2014, DC Water issued \$350 million in green century bonds, making history as the first water/wastewater utility to issue century bonds and green bonds backed by a third party in the U.S. The initial offering was increased from \$300 million to \$350 million, due to the amount of interest in the initial bond offering. The bonds were over-subscribed within a few hours on the first day of sale, with over \$1.1 billion in buy orders, and with \$116 million from socially responsible funds that only invest in green initiatives. The level of interest also allowed them to lower the interest rate by 15 basis points (0.15%), saving rate payers \$9 million (Gale 2015).

The investors in DC Water's green bonds included insurance companies (41.6%), bond funds (26.9%), money managers (21.4%), and pension funds (9.1%). Among the investors, approximately 8.6% were considered SRI Investors (GFOA 2015b). SRI investors are those that

consider ESG criteria to generate long-term competitive financial returns and positive societal impact. They are comprised of individuals and institutions, such as universities, foundations, pension funds, nonprofit organizations and religious institutions (US SIF 2016).

In October 2015, DC Water issued an additional \$100 million in green bonds, and reported that market reception for these was strong, with nearly all maturities being oversold. This allowed DC Water to lower yields by 2 to 6 basis points (0.02% to 0.06%) (DC Water 2015a).

Massachusetts Clean Water Trust Green Bond. MCWT issued \$230 million in green bonds in December 2014 to fund clean water initiatives that included new and innovative ways to “improve efficiency, reduce waste, and improve water quality.” The MCWT administers loan programs that provide funding to cities, towns, other governmental units in Massachusetts, and private entities for the purpose of financing improvements to drinking water and wastewater infrastructure. Included in the offering documents were a list of project descriptions to provide assurance to investors that their dollars are going towards green projects (Gale 2015). The MCWT received purchase orders for the bonds in excess of \$1 billion, which resulted in the bonds being more than four times oversubscribed. JP Morgan was the underwriter in the MCWT green bond offering. The head of J.P. Morgan’s public finance group, Paul Palmeri, said, “The green bond label helped us open our marketing to a new group” (Gale 2015).

Metropolitan Water Reclamation District of Greater Chicago Green Bond. In December 2014, MWRD issued \$297 million in green bonds to fund a variety of sustainability focused projects, including stream bank stabilization efforts, construction of a phosphorous recovery facility, and a capital improvements project to improve energy efficiency and eliminate air pollution at various facilities. Similar to MCWT, this organization provided project descriptions in the offering documents, quantifying the environmental impact of projects once they are completed (Gale 2015). These bonds were issued as green bonds to differentiate their offering, expand their investor base, and increase competition for their bonds. The green bond offering doubled the number of investors interested in buying MWRD bonds compared to their previous 2011 offering, and one-third of those investors were new to MWRD (Gale 2015).

City of Spokane Green Bonds. In November 2014, the City of Spokane, Washington sold \$200 million in water / wastewater utility revenue bonds designated as green bonds. The bonds will be used to implement the City’s Integrated Clean Water Plan that is intended to manage combined sewer overflows and stormwater management elements.

New York State Environmental Facilities Corporation Green Bond. In 2015, the New York State Environmental Facilities Corporation, which administers New York State’s SRF loan program, issued \$475 million in green bonds for clean water and drinking water projects throughout New York State (Coen 2015). This bond deal was reported to be approximately three times oversubscribed.

Social and Environmental Impact Bonds

Description

Social impact bonds (sometimes called pay-for-success contracts) are an example of what is known as Socially Responsible Investing, Pay for Success models, or impact investing. Social impact bonds are not publicly offered bonds, but rather loans provided by private investors intended to provide funding to achieve specific social outcomes by encouraging collaboration between government agencies and nongovernmental investors (Costa and Tomasko 2014).

Typically, investors pay upfront for the program through an external organization or intermediary with a chance to receive a return on investment if the social outcomes are realized. A third-party independent evaluator determines whether the desired outcome has been achieved, and the government agency only pays for the program after the outcome is achieved and verified. If the outcome is not achieved, the government does not pay (Costa and Tomasko 2014). In this way, social impact bonds are not fixed income debt like a regular bond because they do not offer a fixed rate of return. Because the repayment to investors is “at risk”, contingent upon specific outcomes being achieved, they work more as an equity instrument (Kim 2016). A schematic diagram of the typical social impact bond model is provided on [Figure 3.9](#).

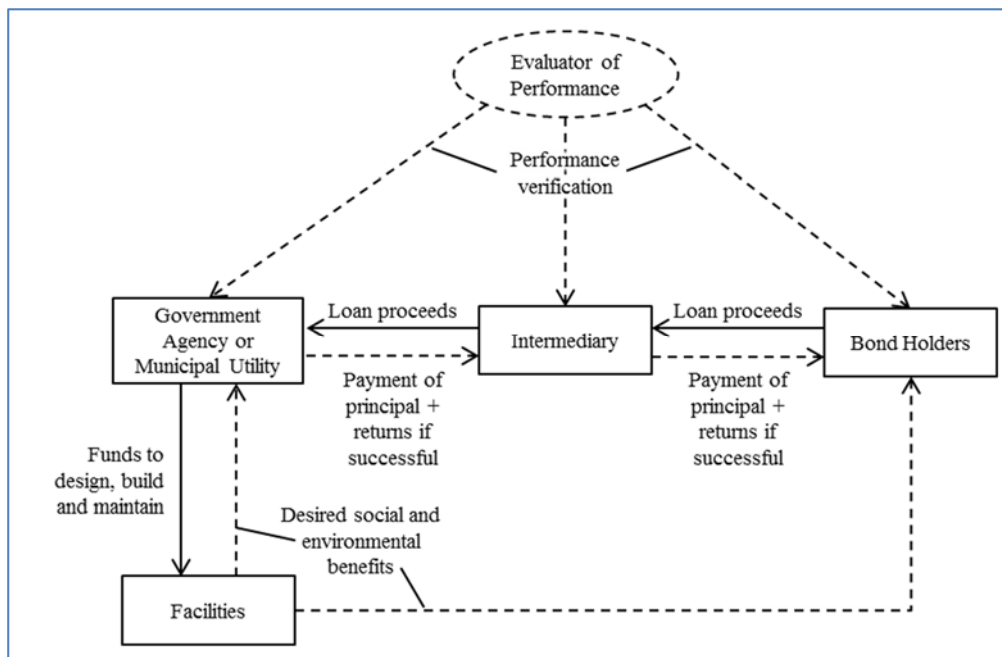


Figure 3.9 Social impact bond model

Whereas philanthropic capital is usually provided in the form of a donation or grant, with no expectations of any financial return, impact investing seeks high impact on targeted social issues and is targeted toward solving a specific social problem while also generating returns. The willingness to take risk is a critical component of impact investing. This risk includes both the business risk of deploying an innovative business model or new technology, as well as the segmented risk of targeting underserved populations. A key to impact investing is to enable the forces of capitalism and innovation to tackle social issues that require financial innovation (Harvard Business School 2014).

The continuum of sustainable investment approaches range from simply value alignment, which is a strategy of investment that avoids investing in companies whose core business activities do not meet the investor’s social or environmental standards; to ESG focused investing, which is the specific inclusion of environmental, social, and governance factors into financial analysis and investments, to impact investing, focusing on investments in business models that specifically seek to solve social or environmental problems (Choi 2014). Social impact bonds and green bonds are forms of impact investing that are beginning to have relevance in the water sector, as described further below.

Prevalence in the U.S. Municipal Market

The first social impact bond agreement in the world was launched in the United Kingdom in 2010. It was a project intended to reduce recidivism among nonviolent offenders at a prison in Peterborough. To date, investment in social impact bonds has been relatively small – less than \$20 million (Costa 2014). In 2012, New York City (NYC) implemented the first social impact bond program in the United States working with Goldman Sachs and MDRC, a nonprofit, nonpartisan education and social policy research organization dedicated to learning what works to improve programs and policies that affect the poor. The social impact bond program was centered around reducing recidivism at a jail on Rikers Island. MDRC implemented a four-year education and counseling program at the jail, with a goal to reduce recidivism by 10% or more. If the goal was met, the NYC government would pay the non-profit \$9.6 million, which, in turn, would pay back Goldman Sachs for its investment in the program. A preliminary report released following several years of efforts showed that the 10% goal was not going to be met. “Goldman Sachs moved swiftly and took a contract option to cancel the program one year early,” (Farmer 2015). Since the program was cancelled, the loan was reduced from \$9.6 million to \$7.2 million. Goldman Sachs secured the investment with insurance from Bloomberg Philanthropies, who guaranteed \$6 million dollars of the \$7.2 million loan, leaving Goldman Sachs with a loss of \$1.2 million (Burton 2015). As a result of not meeting the goal, NYC did not pay the nonprofit organization. If the program was successful and exceeded its target Goldman Sachs could have received close to \$12 million, and NYC would have seen an estimated net savings of up to \$20.5 million (Farmer 2015).

Today, social impact bond deals are being used to address all sorts of social problems, including early childhood education, homelessness, health, and criminal justice (Farmer 2015). Each specific project must draw up its own contract with service providers and with the project evaluators who track the outcomes. None of the new projects can be modeled after an existing one; each is its own social experiment and must be built from the ground up (Farmer 2015). For example, a Massachusetts juvenile justice bond program is financed with \$18 million from six organizations, including nonprofits. The state is setting aside money every year for a separate fund to pay back investors if the seven-year project meets its goals. The Rikers Island project, on the other hand, was financed entirely by Goldman Sachs, with Bloomberg Philanthropies insuring three-quarters of the money (Farmer 2015). Still, the task of attracting investors is tricky. Even the philanthropically minded investors drawn to social impact bond projects are not going to put up money for a program that has not been fully developed and vetted (Farmer 2015).

More recently in 2014, Harvard University awarded DC Water a grant to further develop the social impact bond model for green infrastructure projects in the water sector. DC Water worked with the Harvard’s Social Impact Bond Technical Assistance Lab at the Harvard Kennedy School of Government to examine how to use the Pay for Success models to develop green infrastructure stormwater solutions to reduce stormwater runoff in the Rock Creek and Potomac River sewer sheds. This environmental impact bond solution is aimed to improve water quality, mitigate climate change impacts, and “promote environmental, socio-economic and health benefits,” (DC Water 2015b). DC Water is enthusiastic that further developing the model will not only be beneficial to DC Water, but across the entire public service industry. DC Water CEO and General Manager George S. Hawkins stated that “the SIB model is measurable, so that our investors and public stakeholders can objectively quantify results, which promotes accountability and smart programming,” (DC Water 2015b). The ability to have measurable results is essential

for long-term impact investing success. DC Water's social impact bond was issued in September of 2016 (DC Water 2016).

Additionally, in 2015, 100 Resilient Cities (100RC), The Rockefeller Foundation, and Social Finance announced a strategic partnership to launch a Resilience Pay for Success Initiative. This partnership is aimed at providing guidance and support to 100RC members in the United States to pay for resiliency through social impact bonds or Pay for Success financing. The partnership provided a \$100 million commitment to build urban resilience. Almost 400 cities applied to the challenge and an initial 32 cities were selected (100RC 2015).

Several intermediaries have emerged to support and growth the pay for success financing model. One such intermediary is Social Finance, a non-profit organization that serves in a catalytic role in creating pay for success financing opportunities in the market (Social Finance 2016). Another is Third Sector Capital Partners, a non-profit organization that provides a variety of advisory services for government, service providers preparing for or pursuing pay for success projects (Third Sector Capital Partners 2016).

In addition, based on the success of impact investing in the United Kingdom and elsewhere, the United States, and the Group of Eight (G8) have established a Social Impact Investment Taskforce (<http://www.socialimpactinvestment.org/>). The areas of focus of this taskforce include creating a standard and accepted definition of impact investing, defining a set of rules for impact investing, determining ways to measure impact, and developing an impact accounting system.

Advantages and Limitations

The advantages to the issuer of social impact bonds include risk transfer, access to socially responsible capital investors that may be new to the issuer, and often the degree of savings that are associated with underlying projects associated with them (North 2016). Other advantages of social impact bonds are that they provide investors social and economic gains. However, one significant disadvantage is that the social impact bond concept is still very new, and there are a limited number of actual arrangements to learn from. It is also difficult to identify all of the characteristics that will define social impact bonds. However, several notable characteristics of social impact bonds have already been defined (Rudd et al. 2013), including the following:

- Committed government partners. High level support from central, influential governmental partners.
- Agreement on the metrics for success. Service providers, investors, and government entities must support a single metric to be used to measure success.
- Payment based on impact. Payments made based on the difference between the outcomes of the program versus a similar population that did not receive the program.
- Withheld repayment. Payments spread over a period long enough that the government entity can make its final payment after a program demonstrates success.
- Large-scale programs. Allows programs to be implemented at a scale that is not possible without private capital.
- Outside investment. Provides the initial funding to expand a program that shows promise.
- Presence of an intermediary. Intermediary organizations, such as government agencies, social service providers, impact investors, and external organizations, identify funding

- partners, assist with the deal structuring, and may play a role in monitoring implementation.
- Robust independent evaluation. Can offer proof that the program led to the desired difference.

Investors and Investor Perspectives

Based on an interview with a representative from the Harvard Government Performance Laboratory at the Harvard Kennedy School of Government, most social impact bonds have been funded by a combination of investors, such as large investment banks, foundations, and local investors, and there has been a growing interest by socially responsible investors in this model. Furthermore, major financial institutions are entering the market of environmentally conscious investing and envision large opportunities for collaboration between the public and private sectors (North 2016). For example, Audrey Choi, the CEO for Morgan Stanley Institute for Sustainable Investing, recognizes that there are ever increasing demands on vital infrastructure across the world, and sees an opportunity for private-sector innovation and investment in areas such as energy, water, agriculture, and health as “the global demand for food, water and energy is projected to increase by 35, 40, and 50 percent, respectively, as soon as 2030” (Choi 2014). In the United States, professionally managed assets invested in sustainability-oriented strategies increased more than fivefold from 1995 to 2012, reaching \$3.74 trillion, or 11% of the U.S. assets under management. Globally, more than one-fifth of all assets under management incorporated ESG criteria as of 2012 (Choi 2014). Due to the limited number of social impact bond deals, there is an enormous amount of money sitting on the sidelines (Cohen and Sahlman 2013).

Millennials may drive the prevalence of social impact investing in the future. According to one study, they are willing to accept a higher risk profile or receive lower returns to invest in companies that create positive social or environmental impact. Furthermore, Millennials are the largest generation in American history, approximately 20 million larger than the Baby Boomer generation, and it is anticipated that a transfer of wealth from Baby Boomers to the Millennials in the range of \$30 to \$40 trillion will occur over the next few decades. This transfer of wealth may drive the market for social impact investments (Emerson and Norcott 2014). However, for sustainable investing to become mainstream, there must be a sufficiently broad range of financial products and strategies to support investment along the continuum of sustainable investing approaches (Choi 2014).

In 2014, the Center for American Progress organized a series of discussions with potential social impact bond investors to identify what incentivizes each investor type to consider participation in a social impact bond. The investors involved in this research included foundations, Community Development Financial Institutions (CDFIs), investment firms, wealth management advisors, and large investment banks. This research underscored two basic issues that will be critical to the ultimate success or failure of the social impact bond as a financial mechanism in the United States. First, due to the complexity of these transactions, each of the different participants must clearly communicate their motivations, limitations, and abilities and understand the same of others. Second, peer networks have a powerful role to play in both spreading knowledge about social impact bonds and facilitating potential co-investment in individual agreements (Costa and Tomasko 2014). Given the complex structure of social impact bonds, potential investors can greatly benefit from understanding one another and from calling on the expertise within their networks. Cultivating a network that extends beyond an individual’s or an organization’s area of

expertise increases an investor's ability to conduct solid due diligence to determine how or whether to enter an investment collaboration. In addition, the investors that were interviewed had concerns that under the typical structure of social impact bonds, the government was "free riding," reaping most of the savings and benefits while shouldering none of the risk, and stated that it would be worth investigating appropriate ways for government to have more "skin in the game" in future social impact bond transactions (Costa 2014).

While there seems to be increased interest from investors in social impact bonds, there are also some common misconceptions of impact investing. One misconception is that the approach needs to take an all-or-nothing approach to philanthropic capital and mainstream capital. Clark et al. argue that the approach should leverage a combination that creates important opportunities to deliver more impact (Clark et al. 2013). It is also argued that the industry should move away from the idea that there are only two types of investors in the marketplace when it comes to impact investing. The common myth is that "impact-first" investors focus on the impact criteria first, and financial returns come secondary with investment, while "financial-first" investors focus on non-negotiable financial returns first, with impact concerns coming secondary. Impact investors actually "find ways to blend these motivations in ways that bring a cohesive and aligned set of capital and impact expectations" to the project, and "establishing an embedded strategy and structure for achieving impact prior to investment is at the core of successful impact investing" (Clark et al. 2013). Cohen and Sahlman argue that social impact investing will be the new venture capital (Cohen and Sahlman 2013). The more success stories that arise over the next 5 to 10 years the more accessible money will be through social impact investing.

Based on the results of the NYC social impact bond deal three primary lessons were learned that could help attract investors to future social impact bond deals (Rudd et al. 2013). These are:

- Sharp drop-offs in repayment increase investor risk. To attract investment, it may be necessary to eliminate sharp distinctions between program success and failure. From an investor's point of view, this sharp distinction can result in the difference between repayment and a total loss. It may be necessary to "smooth the curve" for more traditional investors (Rudd et al. 2013).
- Early performance indicators increase investor confidence. It is more appealing to invest in a social impact bond if the program it funds offers early indicators of success or failure. However, it may be a challenge to identify short-term measures that reliably predict long-term outcomes, as was the case with recidivism in the NYC deal (Rudd et al. 2013).
- Transaction costs must come down dramatically if social impact bonds are to become more common. The transaction costs, including set-up, evaluation, and intermediary costs, will likely need to decrease (Rudd et al. 2013).

As social impact investing becomes more mainstream, this may provide a new source of capital providers for water infrastructure, particularly infrastructure related to improvement of water quality, such as stormwater and wet weather-related infrastructure. This approach could be a powerful way to mobilize capital toward multisector thinking working towards a common good that encourages collaboration (Macomber 2016).

CROWDFUNDING

Crowdfunding is a cross between microfinance and crowdsourcing. Microfinance involves using a strategy for financing small initiatives, and crowdsourcing involves leveraging a distributed network of individuals through what amounts to an open call for proposals (Gasparro 2015). Crowdfunding has evolved to refer to the act of raising capital for a project from individual investors (the crowd) through an intermediary online platform (Kim 2016). The research suggest that crowdfunding has the potential to be used for municipal infrastructure projects. (Gasparro 2015). Mini or micro bonds are an example of crowdfunding.

Mini or Micro Bonds

Description

Municipal mini bonds are small denomination bonds that are underwritten and directly issued by municipalities, and are dedicated to specific local projects or for financing small initiatives (Gasparro 2015). Generally, mini bonds act like municipal bonds in that they are sold on a local basis and only offer tax benefits to residents where the non-profit is located. Since a government agency or a government underwrites the bonds, they are backed by the full faith and credit of the taxing authority who issues them. Bonds issued in minimum denominations of less than \$5,000 and often with minimum denominations of less than \$1,000 (MSRB). A schematic diagram of a typical mini bond model is provided on [Figure 3.10](#).

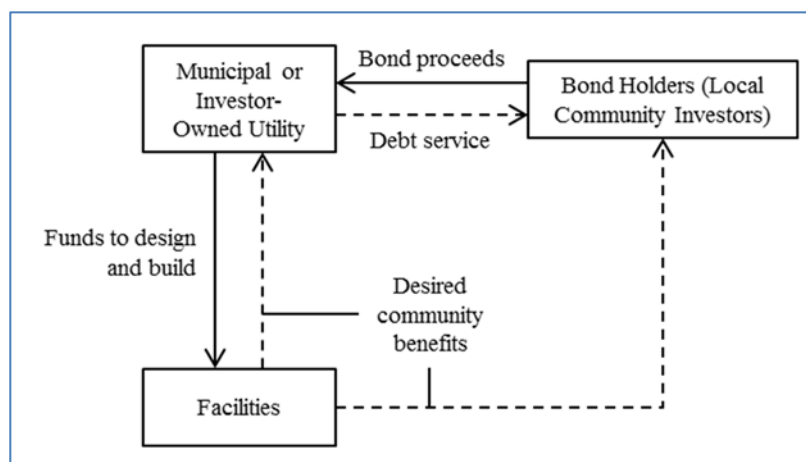


Figure 3.10 Mini bond model

Advantages and Limitations

High minimum denominations of traditional municipal bonds can prevent residents and ordinary citizens from investing in their own communities because of the relatively high cost of bonds. However, the small denomination of mini bonds could make investment possible for more community members. Further, the research indicates that the benefits of mini bonds may not outweigh the cost of administering such a program, but the social and long-term benefits have the potential to increase the return on investment in a number of ways (Gasparro 2015). These benefits include the following:

- Direct access to local investors – The bonds provide direct access to individual, local investors. Individuals who provide funding are showing support for the project by voting with their investment, and because many of the funders are located within close vicinity to the project, they have a vested interest in the project as future users.
- Increasing political will – Crowdfunding approaches, such as mini bonds, have the potential to increase the political will to support infrastructure investment because success is dependent upon community engagement, participation, and support during the early stages of infrastructure development.
- Building community engagement – Issuing mini bonds can be used as a way to engage and educate constituents throughout the development of the infrastructure.

Success of this type of funding depends upon the extent of citizen participation and timing. To ensure that this type of financing is successful, a comprehensive engagement plan should be developed to encourage communities to participate, and there should be a strong project sponsor or champion. The project sponsor or champion needs to engage and educate the public in order to attract potential investors (Gasparro 2015).

The drawbacks of mini bonds include upfront investment needed to establish the program, ongoing costs to the issuer associated with tracking, monitoring, and reporting, as well as the limited access to potential investors (such as the local community).

Prevalence in the U.S. Municipal Market

Only a handful of cities across the country have been offering such bonds, but this approach may become more prevalent in the future (Ebi 2014).

Examples

In 2014, the City of Denver, Colorado executed a public offering of \$12 million of mini-bonds that were earmarked for recreational and cultural facilities within the city. The bond offering sold out in an hour and hundreds of online orders had to be refunded. These bonds were open to all Colorado residents. Two types of bonds were sold: a 9-year, zero coupon bond that matures 50% to \$750, and a 14-year bond that matures 100% to \$1,000 (Stephens 2014). Although the City is paying more interest on these mini bonds than traditional bonds by providing returns at three times the typical bank rate of 1.5%, the goal was to involve more residents in infrastructure development, generate community enthusiasm about infrastructure improvements, and demonstrate to the market that there is demand for these bonds (Kim 2016). While Denver is one of only a handful of cities offering such bonds, it may eventually become one of many (Ebi 2014). Denver had offered mini-bonds for 5 years, but this was the first time it did so online.

In 2004, the Anchorage Water & Wastewater Utility (AWWU) sold junior lien “mini bonds” directly to the general public in an aggregate appreciated amount of \$2 million. The discount bonds had 10-year lives and paid interest and principal at final maturity, unless tendered early by the bondholder. The bond sale resulted in all bonds being sold in 1 day (AWWU 2005).

Crowdfunding Platforms

Description

Some believe that crowdfunding exchanges and platforms have the potential to be used for municipal infrastructure projects (Gasparro 2015). As an example of this confidence, in 2015, InfraShares developed a new crowdfunding platform that is aimed at providing a marketplace for direct investment in public infrastructure projects through a P3 approach (InfraShares 2016). Information contained on the InfraShares website indicates that the platform is applicable to a variety of public infrastructure projects, including water treatment plants. InfraShares partners with P3 sponsors to determine the size, type, and terms of the crowdfinancing campaign. Then the campaign is launched on the InfraShares website where potential investors can see project details, investment terms and comparable projects. If the funding goal is reached, the individual investors are syndicated into a project-specific fund, which participates as a limited partner in the P3 and acts as the single point of contact with the P3 developer (InfraShares 2016). Note that this platform is in its infancy and no public projects have yet been funded by this platform as of the date of this report.

OTHER NON-TRADITIONAL MUNICIPAL FINANCING OPTIONS

New and emerging variations on traditional municipal bond offerings, such as century bonds, green bonds, and catastrophe bonds have become more prevalent in recent years within the public sector generally, and in the water industry more specifically. Long-duration bonds, catastrophe or resilience bonds, and tax increment financing are discussed below.

Long-Duration Bonds

Description

Long-duration bonds are municipal bonds with a duration of more than 30 years. Century bonds are long-duration debt instruments designed to spread the costs of infrastructure, with a lifespan of 100 plus years, over the life of the asset.

Prevalence in the U.S. Municipal Market

Long maturity bonds are not entirely new, and were somewhat prevalent in the mid-1990s and early 2000s, when a few dozen companies issued them, including Norfolk Southern Corporation, Coca-Cola Enterprises, The Walt Disney Co, Ford Motor Co. and International Business Machines Corporation, among others (Burne 2010). More recently, as previously mentioned, DC Water issued a green century bond in 2014 (DC Water 2015a).

Advantages and Limitations

A benefit to the issuer of bonds with long durations, such as century bonds, is the ability to spread costs over a long period of time and thus: 1) reduce the magnitude of the annual debt service payments; and 2) improve intergenerational equity (i.e., the close matching of the payment of the

asset and the use of the asset over time). Proponents of very long-duration bonds argue that since multiple generations will benefit from and use the asset, it is fair to have multiple generations participate in paying for the asset (Farmer 2014b). As mentioned earlier, water utilities almost always have to factor in customer affordability into their funding decisions. Therefore, a major benefit of using a century bond for water projects is that major projects can be funded without existing ratepayers bearing the brunt of the cost. However, special conditions in the bond market are needed to make century bonds viable, such as a flat yield curve (Burne 2010). Otherwise, borrowers that are considering issuing century bonds may eliminate them from consideration if the interest rates and the overall cost of the bonds are too expensive.

Investors and Investor Perspectives

Potential investors in century bonds are heterogeneous. However, life-insurance companies and pension funds are the natural buyers for century bonds because they need to match their long-term liabilities with assets of a like maturity for risk-management purposes (Burne 2010). Institutional investors are motivated to create allocations to infrastructure investing in order to match long-tailed portfolio liabilities to long-lived, stable, high-quality assets. Pension funds are natural investors in long-duration infrastructure bonds because of their inherently long-term liabilities (Probitas Partners 2007).

Example

Century bonds, or other long-duration bonds, have not been prevalent in the U.S. water sector. However, as previously mentioned, one water agency, DC Water, issued century bonds on July 2014. When DC Water issued \$350 million in green century bonds, it was the first water and wastewater utility to issue a municipal century bond in the United States. This bond was designated to help fund the \$2.6 billion DC Clean Rivers Project (MarketWatch 2014). This project involves constructing a deep tunnel system intended to reduce combined sewer overflows (CSOs) to local waterways (DC Water 2014). The life expectancy of the tunnels aligns more closely with the maturity of a century bond versus a typical revenue or general obligation bond (DC Water 2014). The key reasons DC Water chose to issue century bonds included (MarketWatch 2014):

- Asset-liability matching – Century bonds permit DC Water to match its long-lived assets and liabilities on its balance sheet.
- Intergenerational equity and fairness – Century bonds spread the costs of the project more affordably and fairly to those who will benefit over the next 100 years.
- Committed, long-term, low-cost capital – Century bonds allow DC Water to take advantage of historically low interest rates and to lock-in funding costs for a very long-lived asset.

In marketing its Green Century Bonds and to solicit interest in its bond offering, DC Water conducted six one-on-one investor meetings, 10 teleconferences with potential investors, and seven group presentations with potential investors. In total, 37 separate investors viewed DC Water's road show presentations, including bond funds, hedge funds, money managers, insurance funds, pension funds, and corporations (Kim 2014b). The initial offering of these bonds was increased from \$300 million to \$350 million due to the amount of interest in the initial bond

offering. The bonds were over-subscribed within a few hours on the first day of sale, with more than \$1.1 billion in buy orders (Gale 2015).

Catastrophe and Resilience Bonds

Description

Catastrophe bonds were created in the mid-1990s, partly due to the large amount of monetary losses insurance companies sustained after Hurricane Andrew (Burton 2013). These debt instruments are used primarily by insurance companies to reinsure, or mitigate the risk of natural catastrophe. Catastrophe bonds allow insurance companies to transfer some of the risk related to catastrophic events like hurricanes or earthquakes to the capital markets. If the insurance company has a loss from a particular catastrophe, they can defer or forego interest payments and/or the principal amount to the investors.

Catastrophe bonds issued by insurance companies work as follows: an insurance company agrees to pay the bond holder the coupon payments on the catastrophe bond in return for the bond capital, and the capital is then reinvested in low risk securities by the insurance companies. If the catastrophe bond is triggered by a natural catastrophe, the coupon payments are suspended and the returns are diverted from the bondholder to the insurance company to settle policyholder claims (Burton 2013). Catastrophe bonds are known to have a higher yield than investment grade bonds due to the added risk involved with these bonds (Burton 2013).

Catastrophe bonds are now being considered as a tool to fund projects that prevent losses from occurring, instead of paying for them when they occur. A collaboration has been recently formed among Goldman Sachs, the Rockefeller Foundation, Swiss Re, RMS, and re:focus aimed to structure a catastrophe-like bond for infrastructure that is designed to make cities more resilient to natural catastrophes -- infrastructure such as seawalls or environmentally-friendly stormwater projects (Ossa 2015). This collaborative project is aimed at finding ways to improve the infrastructure that reduces the potential for significant losses in the future, as opposed to just making sure the issuer is paid back if it has a qualifying loss. Furthermore, this effort is more aimed at prestoration, essentially trying to find a way in which losses are prevented from happening in the first place. “There’s a post-disaster financing view of the world, which is what catastrophe bonds typically provide, but there are also investment opportunities in projects that increase the resilience against these disasters” (Ossa 2015). The conceptual framework for structuring resilience bonds is shown on [Figure 3.11](#).

Resilience bonds are intended to provide a municipality with a reduction in insurance costs that can be captured as a resilience dividend or a rebate. Resilience bond sponsors (municipalities or local governments) purchase insurance and have interest in reducing physical damages from disasters. They pay insurance premiums and receive payouts from the insurance if disasters strike. The resilience bond specifies triggers for when the sponsors receive insurance payouts, and also specifies the types of projects that are eligible to generate potential insurance rebates. If the sponsor implements projects that reduce risk, such as coastal protections, flood barriers, or other resilient infrastructure investments, and the risk reduction benefits are verified, then an insurance rebate is generated that effectively reduces the sponsors insurance premiums.

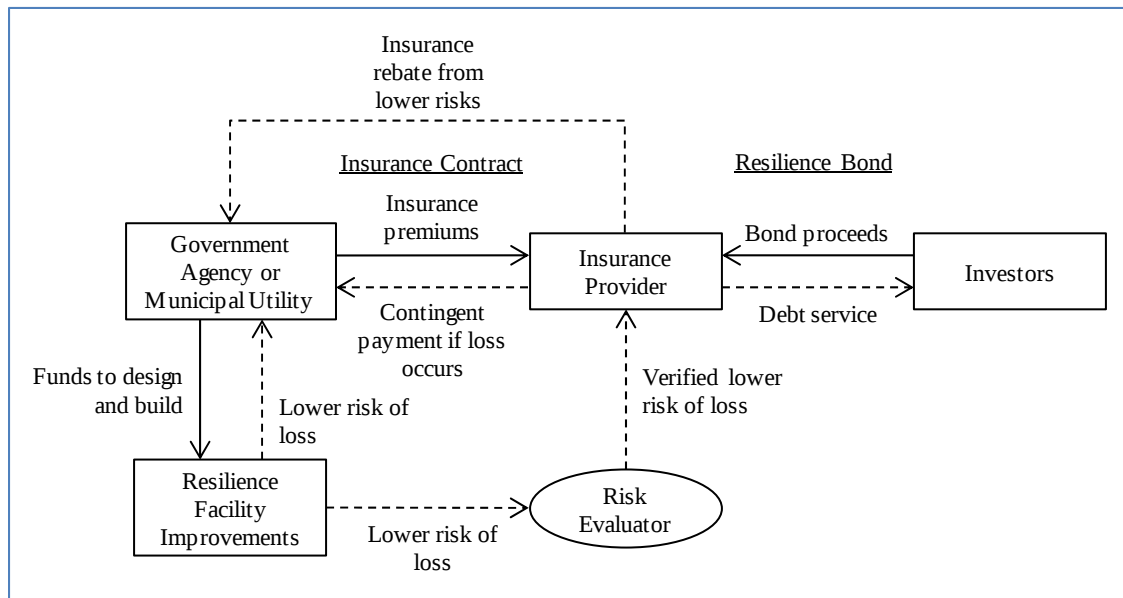


Figure 3.11 Resilience bond conceptual model

Prevalence in the U.S. Municipal Market

While catastrophe bonds are prevalent in the United States and used by insurance companies as a hedge on risks, resilience bonds are not yet present in the water sector and are currently in the concept stage. However, with the more recent focus on resiliency and sustainability, as well as integrated financing (see section on integrated financing below), there could be a place for resilience bonds in the water sector in the future as this alternative more fully develops.

Advantages and Limitations

Resilience bonds may be appropriate for local governments to increase both protection and insurance against disasters, such as due to flooding. Local governments that are required or desire to have flood insurance have experienced dramatic increases in flood insurance premiums since Hurricane Sandy. In 2004 alone, flood insurance premiums increased 20 to 25% (Sebayan 2014). Like mortgage lenders that demand proof of flood insurance, cities and public utilities are often required to hold different types and amounts of insurance to meet regulatory requirements. For example, in order for municipalities to qualify for Federal Emergency Management Agency disaster assistance, they are required to obtain insurance on facilities (buildings, equipment, contents, and vehicles) as a condition of receiving grant funding (FEMA 2008). Resilience bonds may be able to help meet these compliance obligations while creating a pathway for long-term savings and risk-reduction.

Another advantage of resiliency bonds is that the resilient infrastructure is especially difficult to finance with traditional revenue and payback models because the benefits are often diffuse and realized far into the future, and capturing the value can be difficult. Resilience bonds can serve as a tool to incentivize resilience projects, performance-based design for risk reduction, and timely completion, and enable direct value capture (Vajjhala 2015).

Issuers need to overcome a fair number of hurdles to sell a catastrophe bond. One hurdle is providing sufficient information regarding the assets that the issuer wants to cover, and providing the potential investors with a detailed understanding of what way the bonds will cover those assets. For example, will the trigger be parametric or indemnity, or somewhere in between? Under the indemnity model, the bond will be triggered when losses meet the agreed upon dollar amount. Under the parametric model, the bond is triggered not by the dollar amount of the losses which are sustained, but by the parameters of the event itself. For example, a catastrophe bond that insures against the losses caused by a hurricane might set the parameter that triggers the bond equal to a certain wind speed. Another hurdle for the issuer is the need to find a way to model the risk so it can be described to investors, and a way of triggering the risk so that the issuer can objectively state that a claim is being made (Ossa 2015).

Investors and Investor Perspectives

One of the benefits of catastrophe and resiliency bonds to an investor is diversification. Unlike traditional bonds, catastrophe bonds are generally not affected by market trends and thus, an investor can diversify risks in an investment portfolio. The only thing that affects catastrophe bonds are catastrophes (Waring 2013).

Catastrophe bonds have historically appealed to large pension funds, but are now attracting a wider array of buyers, such as investors looking for higher yields who might otherwise purchase corporate junk bonds (Yoon and Scism 2014). Large institutional investors comprise about 80% of the investors in catastrophe bonds (The Economist 2013).

Example

In 2013, the New York Metropolitan Transportation Authority (MTA) issued the first catastrophe bond in the United States that covers storm surge risk arising from named storms (Burton 2013). This deal was a \$200 million bond issue that was structured such that a storm surge of a certain size triggers the catastrophe bond, and allows MTA to use the proceeds of the bonds to cover its losses and reduce its payments to bondholders. At the time of sale, the demand for these bonds was strong enough that the amount of bonds offered for sale was increased from \$125 million to \$200 million and the interest rates on the bonds were lower than the earlier suggested price range of 5% to 5.5% (Burne and Mann 2013).

FEDERAL AND STATE GOVERNMENT SPONSORED FUNDING

Several new and emerging government sponsored programs have recently been implemented, or are currently being contemplated by federal law makers, that could expand upon the traditional financing alternatives available to fund water infrastructure or help facilitate the use of innovative capital financing approaches, such as P3s. These are discussed below.

Water Infrastructure Finance and Innovation Act

Description

On June 10, 2014, President Obama signed the Water Resources Reform and Development Act of 2014 (WRRDA 2014), which contained WIFIA. The WIFIA program makes available low-interest rate federal loans to partially fund water and wastewater infrastructure, up to 49% of large drinking water, wastewater, and water reuse projects. Individual projects must be reasonably anticipated to cost no less than \$20 million or \$5 million for communities of less than 25,000. Payments start 5 years after project completion with a maximum amortization schedule of 35 years (EPA 2014). For the first year of the program (2015), \$20 million has been appropriated to both the EPA and the U.S. Army Corps of Engineers. The appropriation increases annually, up to a maximum of \$50 million for each in 2019. The funds cover the risk of WIFIA project defaults, allowing for significant leverage given the historically low rates of defaults in water and wastewater project financing. This is a pilot program with current federal appropriation of \$100 million, which could support \$900 million to \$3.3 billion in WIFIA loans. WIFIA is open to those entities that meet the criteria, including corporations, partnerships, municipal entities, and SRF programs (EPA 2014). A schematic diagram of the WIFIA financing model is provided on [Figure 3.12](#).

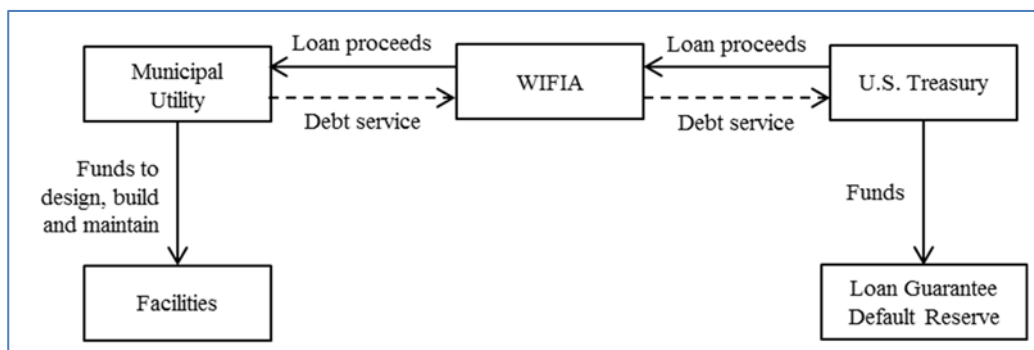


Figure 3.12 WIFIA financing model

WIFIA is modelled after TIFIA, originally enacted in 1998. TIFIA plays an essential role in the U.S. transportation P3 market by providing “credit assistance for qualified projects of regional and national significance” (U.S. DOT 2015). Particularly since the financial crisis, TIFIA has been instrumental in facilitation of transportation P3 activity. While WIFIA is modelled after TIFIA to encourage and enable more private investment in public water infrastructure, there are some notable differences that serve as significant challenges in utilizing WIFIA as a tool to fund water capital projects. As it was originally written, the law prohibits tax-exempt bonds from funding the remaining 51% of the project costs. However, for most water P3 projects, this means that taxable debt, private equity, and/or state grants or loans would be needed to make up more than half of the funding for proposed projects to be funded under WIFIA (Reinhardt 2014). This would make the overall cost of financing higher than if tax-exempt debt could be used, and limits the potential of the WIFIA program to promote public-private partnerships (Petersen and Howard 2014). TIFIA does not have this limitation, so tax-exempt PABs can be used in conjunction with TIFIA funds. Note that on December 1, 2015, the U.S. Senate and House leaders announced that they have reached an agreement on a transportation authorization and funding bill. One section of

this bill removes a section of WIFIA that prohibited tax-exempt debt from being used in conjunction with WIFIA loans (AWWA 2015).

Furthermore, the transportation sector has its own tax-exempt private activity bond volume cap (\$15 billion), whereas even when the financing rule was removed from WIFIA in December 2015, water projects still need to compete with housing, airports, solid waste, and industrial development projects for the limited exempt private activity bonds (\$100 per capita) that exist outside of the transportation sector (Petersen and Howard 2014). Therefore, if WIFIA expands from a pilot program to a full-scale program, it could provide water and wastewater utilities with an additional source of low-cost financing for qualifying capital projects. However, in its current form, it is not considered to be a significant driver for P3 projects.

Advantages and Limitations

Some advantages of WIFIA financing include the potential ability to provide a source of low-cost financing for qualifying capital projects, and the encouragement and facilitation of more private investment in public water infrastructure. The limitations of WIFIA include its relative newness and even its pilot scale program has been slow to be rolled out, and limit to projects of \$20 million in size or larger or \$5 million for communities of less than 25,000. In addition, WIFIA assisted projects must comply with Buy America provisions and the prevailing wage requirements of the Davis-Bacon Act, which can add to the underlying project costs. Furthermore, since water projects would still need to compete with housing, airports, solid waste, and industrial development projects for the limited exempt private activity bonds, this program in its current form may limit its attractiveness as a P3 enabler.

Examples

As of the date of this report, WIFIA has not yet been used to fund a water project in the United States. However, there are many examples of projects funded under the TIFIA program. See Chapter 4 and the case studies accompanying this report for more information.

In addition, Canada has created a program comparable to WIFIA through its Canada Strategic Infrastructure Fund, which was created to help fund large-scale projects that are designed to maintain economic growth and “enhance the quality of life for Canadians.” Canada’s federal government contributes a maximum of 50% of total eligible project costs. Projects are typically chosen according to regional and national infrastructure priorities, in consultation with provinces and territories. The most recent project listing of committed funds under this program shows a range of project sizes from \$2.3 million to \$450 million funded with this program. Some projects will receive federal funding from other sources such as the Building Canada Fund and the Municipal Rural Infrastructure Fund. (Infrastructure Canada 2015).

Qualified Public Infrastructure Bonds

On January 15, 2015, the Obama administration announced that it would initiate a new set of infrastructure tax proposals that will level the playing field for projects that combine public and private investment so that local and state governments can more easily work with the private sector to advance the public interest (White House Office of the Press Secretary 2015). The proposal includes the creation of an innovative new kind of municipal bond - Qualified Public Infrastructure

Bonds (QPIBs). If approved as conceptualized, QPIBs would offer a low-cost financing tool with many of the characteristics of Exempt Facility PABs to increase private participation in building U.S. infrastructure, including in the water sector. However, unlike PABs, QPIBs would have no issuance caps and could help level the playing field when it comes to financing P3 projects. The QPIB bond program would also have no expiration date and interest on these bonds would not be subject to the alternative minimum tax (White House Office of the Press Secretary 2015). A major advantage is that these bonds would allow tax-exempt financing of P3 projects with the possibility of having no state cap limits, meaning the \$100 per capita limit currently in place might disappear. This would allow water utilities the opportunity to access the benefits of PABs without having to compete with other sectors that are often prioritized, such as housing or airports. The overall impact of QPIBs would be to allow P3s, including transactions involving long-term leases and management contracts, to take advantage of the benefits of municipal bonds (White House Office of the Press Secretary 2015).

This is a tax proposal that has yet to be acted upon. If QPIBs are approved by the U.S. Congress and the President, P3s in the water sector could emerge as a significant source of new infrastructure funding. However, according to the Brookings Institute, the likelihood that the QPIB program will be enacted is slim since the Republican-controlled Congress has shown little appetite for any of the Obama administration's proposals (Sabol and Puentes 2015).

Guarantees through the SRF Program

Description

Similar to the WIFIA loan program, the SRF loan program can be used to guarantee the repayment of a loan, thereby minimizing risk to the investor and lowering debt interest costs. Under Title VI, Section 603(d)(1) through (6) of the SRF Financial Assistance Authority Act, a water pollution control revolving fund of a state can be used to guarantee, or purchase insurance for, local obligations where such debt obligations were incurred after March 7, 1985. Such loan guarantees allow the government to work with private investors and lenders to mitigate the financing risks associated with new projects. For example, the U.S. Department of Energy has awarded billions of dollars in loan guarantees for a wide variety of clean energy projects (Smart Cities Council 2014). A schematic diagram of the SRF loan guarantee program is provided on [Figure 3.13](#).

To date, the additional financial assistance associated with SRF debt guarantees remains largely untapped. The EPA's Clean Water Benefits Reporting System reported cumulative SRF financial assistance of \$52.6 billion, but of this amount, only \$5.5 million was categorized as SRF guarantee assistance for local debt obligations and another \$15.2 million was categorized as guarantees for sub-SRF loans. Further, despite the opportunity to better utilize existing SRF resources, not all state laws governing SRF administration have enabling legislation similar to the federal authority to allow SRF funds to be used for loan guarantees (EFAB 2014).

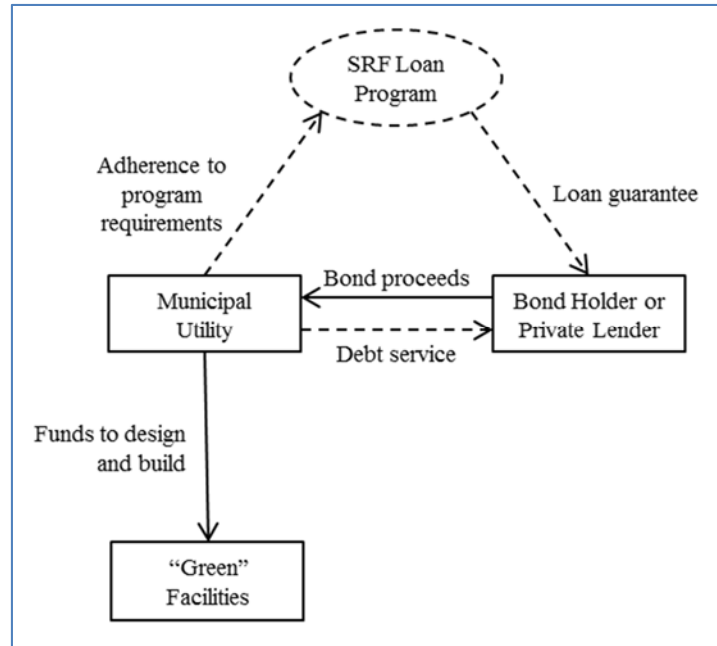


Figure 3.13 SRF loan guarantee model

The EFAB found that for each dollar of Clean Water SRF program equity, \$3 to \$14 of Clean Water SRF guarantee capacity could be provided in addition to the current project funding levels. This translates into \$28 billion in potential green infrastructure funding capacity nationwide (EFAB 2014). For eligible SRF projects that cannot be supported by below market rate financing due to their funding constraints, SRF financing assistance may be able to improve a property owner’s or developer’s financing terms (for implementing green infrastructure improvements) in the form of an SRF credit enhancement. If achieved, this could provide benefits in the form of lower financing costs.

Example

One example of using the SRF guarantee was the issuance of \$24 million in Residential Energy Efficiency Financing Revenues Bonds in 2013 by the New York State Energy Research and Development Authority (NYSERDA). The SRF guarantee of these bonds allowed for reduction of interest rates of about 2% on the borrowing, and allowed NYSERDA to support lending to commercial and residential property owners for energy efficiency projects through unsecured loans (Gebhardt 2016).

SELF-FINANCING

Self-financing is the funding of capital infrastructure through the reduction of costs or the enhancement of revenues that results in the ability to fund capital projects with cash or debt by unlocking additional capital financing capacity. Tax increment financing and internal funding may be two options for self-financing for some utilities.

Tax Increment Financing

Description

While not considered new and emerging, tax increment financing (TIF) is an approach that could be used as part of the financing solution for integrated projects. A TIF is a public financing method that essentially finances debt in anticipation of future tax revenues. TIFs can be used to finance both development and redevelopment projects, including infrastructure related to schools, roads, bridges, parking facilities, recreational facilities, and water and wastewater facilities. Tax increment financing is sometimes referred to as a self-financing approach because the increased tax revenues generated by the project being financed is used to pay for the financing. TIFs allow cities to begin infrastructure and community improvement projects with borrowed funds with a promise to pay those funds back with additional tax revenues generated from the increased property value in the area around the development (Smart Cities Council 2014). TIFs allow municipalities to promote economic development by earmarking property tax revenue from increases in assessed values within a designated TIF district. A schematic diagram of a typical TIF model is provided on [Figure 3.14](#).

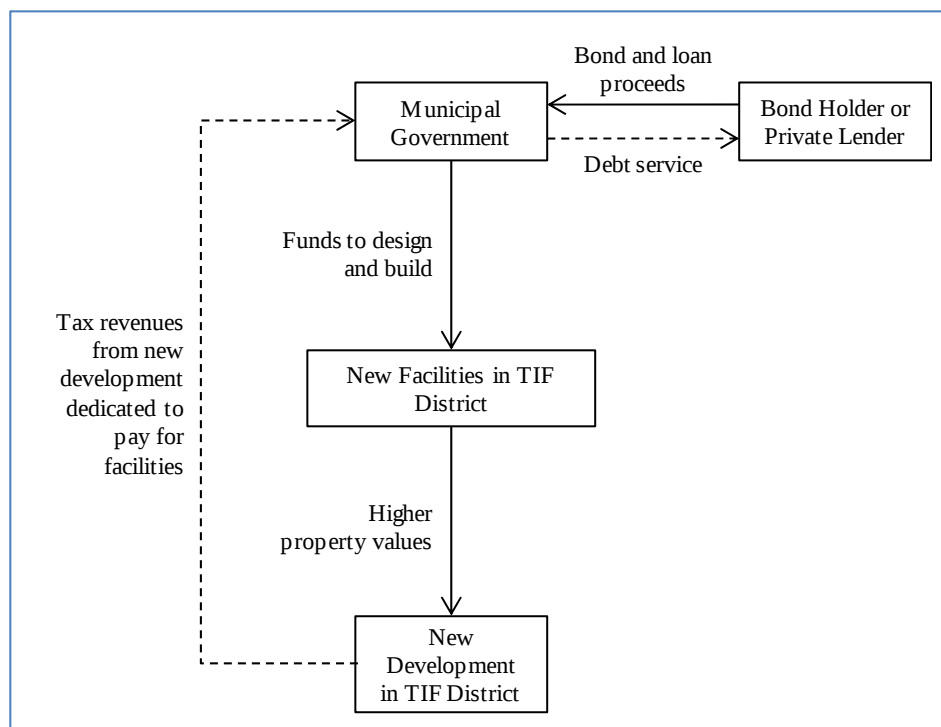


Figure 3.14 Example TIF model

State law generally determines the process for establishing and operating a TIF. This enabling legislation usually specifies detailed activities or checklists that localities must comply with. There are generally five steps for establishing a TIF district, as follows (Greifer 2005):

- Step 1 is the feasibility stage, which includes an assessment of the need and the economic benefits associated with a project.

- Step 2 involves preparing a formal plan, including identifying the legal boundaries of the TIF district, estimating timeline and costs, establishing the base assessed value and base revenue, and projecting the incremental assessed value and incremental revenue.
- Step 3 is the formal adoption of the plan that establishes the TIF district. This includes passing an ordinance, conducting public hearings, and developing public-private sector agreements that delineate the obligations of the two parties.
- Step 4 involves implementing the plan, including completing the project financing and generating the tax increment necessary to retire the debt.
- Step 5 involves monitoring the performance of the TIF district until the debt is paid off and the district is dissolved.

Municipalities can finance TIF expenditures using several options, including pay-as-you-go funding, developer financing, municipal financing (such as revenue or general obligation bonds), or municipal financing with developer participation. Pay-as-you-go financing involves funding expenditures as incremental revenue is realized, however, it often does not allow for the funding of major, upfront investments. With developer financing, the financing risk is shifted to the developer, and the government then reimburses the developer for TIF-eligible costs as the incremental tax revenue is received. It is common for a municipality to issue bonds for the TIF expenditures, which allow governments to finance major, upfront investments. Another alternative is for the municipality to issue bonds while the developer simultaneously pledges to purchase all or a significant portion of the bonds to guarantee a market for the bonds and keep interest and issuance cost low, while demonstrating the developer's commitment and faith in the project. Once the municipality begins to produce a reliable incremental tax revenue stream, these bonds may then be remarketed to new investors on a tax-exempt basis (Greifer 2005).

Advantages and Limitations

TIFs are a way to capture the benefit and value associated with a capital investment program with dispersed benefits. One the biggest advantages of TIFs is that they do not cost the taxpayer anything upfront. The repayment comes directly through new taxes from within the new development area. The original property taxes on the area before development are paid to the city and the balance goes to a special fund that subsidizes portions of the new development (Smart Cities Council 2014). Proponents of this financing approach point to evidence that assessed property value within TIF districts generally grows much faster than in the rest of the municipality and infer that TIF benefits the entire municipality. Others suggest to the contrary that the non-TIF areas of municipalities that use TIF grow no more rapidly, and perhaps more slowly, than similar municipalities that do not use TIF (Dye and Merriman 2006).

The most significant benefit of TIF loans is that there is no upfront cost to the taxpayer, and they do not require a direct increase in property tax rates. Rather, they attract private investments, strengthen the tax base, and increase economic activity. The repayment comes solely from revenue generated through new taxes from within the new development area. When areas are developed or redeveloped, new property taxes are generated. The original property taxes on the area before development are paid to the city and the balance goes into a special fund that subsidizes portions of the new development. In addition, TIF arrangements provide a level of secure revenue stream (future tax payments) that lowers the risk to investors and makes it easier, and sometimes

more cost effective, for municipalities and developers to finance capital improvements focused in development or redevelopment (Smart Cities Council 2014).

While TIF loans can have benefits, there are several drawbacks to TIFs. First, some TIF districts may not be financially successful in that the incremental tax revenue may not be sufficient to service the debt on the project. Second, some TIF districts may be misused and fail to pass the “but for” test. That is, the economic development would not occur within a designated area, but for the establishment of the TIF district. Seventeen states require that this “but for” test to be met (Greifer 2005). Third, there is considerable controversy over the use of TIF districts as to whether they are an effective tool for economic development, whether they create inequities among local governments and among property owners, and whether TIF districts create an uneven playing field between businesses located within and outside the TIF district, particularly if economic incentives are offered within the TIF district (Greifer 2015). Those who oppose TIFs point to them as a means of gentrification and unduly condemning private property under eminent domain. They also argue that TIFs may cost a city more money because of the need for increased public services that new developments demand, and point to the risks if developers become insolvent or otherwise underperform (Smart Cities Council 2014). TIF districts can also place additional strain on existing public resources like school districts and other tax funded public infrastructure like parks, since the funding for other government services can be frozen at base valuation levels while the growth in the district increases demand for their services (Blocher and Morgan 2008).

Prevalence in the U.S. Municipal Market

TIF financing has been used in many states across the country and has experienced a recent resurgence since 1952 when the first TIF law was passed in California. In fact, 49 states have approved the use of TIFs, with Arizona being the only exception (Smart Cities Council 2014). One example of the recent resurgence of the use of TIF districts to fund integrated urban revitalization projects is the state bill that recently passed in California. On January 1, 2015, SB 628 went into effect in California, which allows cities and counties to create enhanced infrastructure financing districts (EIFDs), a financing tool that lets cities capture property tax increases that would otherwise go to the state, to fund infrastructure projects. What makes them “enhanced” is that the EIFDs can support more than strictly infrastructure, like brownfield restoration and low- to moderate-income housing. EIFDs may raise funds in multiple ways, including (Snyder and Valdez 2015):

- Tax Increment Bonds – EIFDs may issue bonds to finance projects and other activities if 55% of qualified voters approve such issuance.
- Tax-increment financing – EIFDs are able to divert property tax from any participating tax entity, with the exception of a school district, within the EIFD.
- Loans – EIFDs may also obtain a loan to fund activities described in the IFP.
- Fees – Impact fees, development agreement fees, and user fees.
- Special assessments.

Example

One example of a development project involving water and sewer infrastructure is the National Harbor project in Prince George’s County in Maryland. The National Harbor project was

developed as a mixed-use development on an approximately 540-acre waterfront site in the Oxon Hill area of Prince George's County, Maryland. The project features approximately 1.25 miles of waterfront development along the banks of the Potomac River with views of the District of Columbia skyline. The development included approximately 7.3 million square feet of development, including retail and restaurant space, office space, a convention center, hotel rooms, and 2,500 residential units comprising a mix of apartments, condominiums, and townhomes, valued at over \$2 billion. Prince George's County issued Special Obligation Bonds in the amount of \$65 million to finance public infrastructure, including, roads, stormwater, sanitary sewer, and water. Security for the bonds include tax increment revenues, hotel tax revenues, and backup special tax revenues. This financing was completed in 2004, and additional bonds were issued in 2005 and 2009 to support the development of the project (Municap, Inc. 2015). A portion of this project was also financed directly by the developer and structured as notes. The TIF revenues were used to repay the developer for the financing.

Internal Funding

Description

Many utilities pay for some system improvements with current revenues on a pay-as-you-go basis. These internal funding sources can include rate revenue, dedicated tax revenue, impact fees, system development charges, and contributions from developers. For utilities with a revenue covenant that specifies maintaining a certain level of debt service coverage, the amount of the net revenues exceeding one times debt service can be used to pay for capital projects without issuing debt. Often, this pay-as-you-go funding is used to pay for smaller or shorter lived capital assets, or to reduce the amount of debt interest expense related to the financing of large capital projects (Fedder et al. 2014).

Reviewing and optimizing current business and operational practices can uncover ways to reduce costs or avoid expenses by increasing efficiencies. Municipal water and wastewater utilities in the U.S. are starting to incorporate “lean” techniques to focus on operational excellence by targeting root causes of inefficiencies and waste, and to design and implement more sustainable practices in maintenance, business processes and logistics, indirect cost reduction, energy and materials, procurement, and supply chain management (WEF 2015). These efforts commonly include making process improvements that save labor time, energy, materials, or equipment. Other areas of potential cost savings may include value engineering of capital projects, or outsourcing certain functions or activities, such as billing, capital program management, and certain engineering activities. In addition, revenue enhancements can be considered to raise additional revenue to support the funding of capital improvements. These enhancements may include additional interest earnings from careful management of idle funds, revenues generated from miscellaneous services, such as charges for connecting and disconnecting service, special meter readings, temporary hydrant use, new account charges, connection fees, equipment rental income, and services provided to other utilities, such as laboratory testing and customer billing (Ziebertz and Giardina 2012).

The reduction of costs or the enhancement of revenues can result in increased capital funding capacity. Every one dollar of annual cost reduction or revenue enhancement will add one dollar of capital funding capacity each year if projects are funded on a pay-as-you-go basis. Alternatively, every one dollar of annual cost reduction or revenue enhancement can support many

times that amount of capital funding assuming the capital projects are financed with debt. For example, \$1 million in annual cost savings or revenue enhancement will support an estimated \$14.9 million in capital funding assuming the capital projects are financed over 20 years at 3.0% interest per annum.

Advantages and Limitations

The advantages of self-financing capital projects through efficiency savings are obvious. These include the ability to unlock capital funding capacity, realize a positive effect on a utility's financial condition over time, maintain or improve credit rating, help ensure the ability to secure lower cost capital financing, and reduce the need for more significant rate increases over time (WEF 2015). Some of the challenges associated with identifying and realizing savings through operational improvements in the public sector include the potential need for additional capital outlay to achieve the cost savings and the complexity of working in the public sector (EPA 2012).

Examples

Numerous utilities throughout the country have reported success in achieving significant operational initiative savings. These have included:

- Charleston Water System in South Carolina, which realized \$10.5 million per year savings from implementing lean, six sigma, and effective utility management projects (EPA 2012)
- Clean Water Services in Oregon, which achieved nearly \$100 million in operating cost savings through business process reengineering, improved procurement processes, and collaborative improvement efforts (EPA 2012)

INTEGRATED FINANCING

Description

Integrated financing is the coordination and planning by multiple departments within a municipality or multiple municipal agencies working together to finance a capital program with disperse benefits using multiple financing and funding sources.

Prevalence in the U.S. Municipal Market

Currently, most water systems in the United States are managed as centralized and single-purpose water infrastructure systems, each focusing on one part of the whole: drinking water, wastewater, and stormwater. However, there is a growing consensus that such siloed systems are not effectively adapted to the challenges that the water industry faces (The Johnson Foundation at

Wingspread 2012). Other industry research concludes that utilities of the future need to reflect the realities of the physical world and provide integrated services under a common organizational structure that optimizes resource use and minimizes waste. Proponents of integrated finance argue that when possible, water utilities should coordinate with other local departments (e.g., transportation, parks and recreation) to leverage funding for joint projects, using diligent accounting methods to ensure the integrity of separate enterprise and governmental funds (The Johnson Foundation at Wingspread 2014).

Existing and potentially new state and federal water regulations have driven utilities to consider integrated financing and implement innovative approaches to regulatory compliance at a local level. These approaches integrate multiple regulatory requirements (such as wastewater and stormwater) and have leveraged limited funding from different programs. For example, linking program objectives and permit requirements for stormwater and wastewater through integrated planning is a way to facilitate sharing funding sources, thereby reducing overall compliance costs. Another example is the potential for cost sharing for green infrastructure project implementation involving sharing resources and funding between the department of transportation and a municipal stormwater agency (WEF 2014).

More broadly, several cities around the United States and the world are contemplating integrated approaches to resiliency, regulatory compliance, and urban redevelopment. To this end, the Smart Cities Council has encouraged local administrators and elected representatives to consider not only the sum of the parts of their projects, but the parts themselves. Communities may be able to achieve significant savings when breaking down the components and financing them discretely as opposed to lumping them together (Smart Cities Council 2014).

The financing of individual projects or groups of projects within a municipal function has long been the industry standard for public and private investment in infrastructure. This approach relies on collecting an anticipated stream of revenues, such as water rate revenues, to secure upfront financing for a large-scale project. This approach drives projects toward simple, single sector cash flow opportunities. In the case of resilient infrastructure investments, the benefits generated from these capital improvements are more diffuse, and it is less likely that any single benefit is sufficiently large enough to fund a whole project. However, a systems approach, rather than a project approach, can bring integrated design solutions (RE.invest 2015).

Advantages and Limitations

The advantages of using an integrated financing approach include the ability to cost share, the potential for overall cost savings, and the ability to recover the costs and capture the value and benefit of the capital project or program from those who benefit from its implementation. One of the challenges is that municipalities and investors are very good at understanding a single asset with standalone cash flows. But to tackle more complex and integrated financing challenges, multisector coordination is required: roads, rail, land-use, zoning, power, water, and sanitation must work together. Some experts believe that this is where integrated financing and new financing alternatives such as social impact bonds can play a role (Macomber 2016).

According to RE.invest, a collaboration among eight partner cities and leading engineering, law, and finance firms to create new public-private partnerships for resilient infrastructure, there are several building blocks necessary to support resilient infrastructure project finance (RE.invest 2015). These include the following:

- Assessment of the types of capital available based on project type;
- Analysis of how to stabilize and secure project-specific cash flow streams;
- Collaboration with engineering and legal experts to iteratively adjust the project economics for city-specific proposals through design changes; and
- Development of options for mechanisms that could be utilized by cities to access private capital for resilient infrastructure.

A recent report issued by RE.invest details how cities can leverage private investment in building more integrated and resilient infrastructure. RE.invest launched the RE.invest Initiative in 2013 with the support of the Rockefeller Foundation to help cities solve two problems at once: building resilience and attracting new funding for infrastructure. According to RE.invest, traditional investments to make infrastructure more resilient are seen as extra costs. However, by focusing on new integrated approaches to developing resilient infrastructure solutions, the reverse could be true, i.e., planning for resilience up front could create cost savings and open up new financing opportunities for local governments. Since 2013, the RE.invest team has worked with eight cities across the United States to design environmentally and financially sustainable infrastructure projects. These cities have included Milwaukee, Norfolk, Miami Beach, San Francisco, New Orleans, Honolulu, El Paso, and Hoboken. Each of the partner cities identified a range of challenges, such as protecting communities from severe weather events and coastal flooding, and RE.invest was brought in to help craft new cross-sector infrastructure solutions to meet these local needs and to help cities rethink the way they design, plan, implement, and finance urban infrastructure (RE.invest 2015).

Example

The City of Hoboken used an integrated financing approach to revitalize a portion of its city. This project focused on options to reduce flooding within the City and reduce CSOs into the Hudson River. The planning efforts were facilitated by a collaboration between the City and re:focus and concluded that the set of integrated infrastructure upgrades necessary to address the environmental issues and protect Hoboken from another Superstorm Sandy was too large an investment for the City to make alone, and private sector action alone was unlikely to achieve the scale required to solve the problem. Given this gap, the partnership focused on designing a multi-purpose flood management solution that could meet several local needs and generate more than one type of revenue. Part of the solution in Hoboken was to design a combined stormwater retention structure with a new parking structure and surface recreational areas with green infrastructure that would capture stormwater and also solve a parking issue within the City. Financing options focused on funding the project as a single structure to capture the distributed, but related benefits. One financing structure that was explored was a P3 structure including a Special Purpose Vehicle (SPV) that would serve as the landowner and would be financially responsible for the infrastructure. The SPV structure would allow for CSO capacity payments through fees and long-term lease agreements, parking revenues, and there would be added benefits of avoided flood damage. The partnership also explored other value capture mechanisms, such as tax-increment financing districts to direct investments in certain areas of the City (RE.invest 2015).

Financing strategies that combine multiple funding sources and financing alternatives, such as TIFs, new bonds categories (such as green bonds), private placements, public-private

partnerships, etc., are on the rise and could become more prevalent in the future to help solve broad resiliency, sustainability, and environmental challenges.

SUPPORTING AGENCIES AND ORGANIZATIONS

Several governmental agencies and public and private organizations have been created recently to provide access to information regarding emerging municipal financing alternatives, and serve as intermediaries between municipal issuers and investors. Several of these are discussed below.

EPA Water Infrastructure and Resiliency Finance Center

In January 2015, the EPA launched the Water Infrastructure and Resiliency Finance Center (WIRFC) to help communities across the country improve their wastewater, drinking water and stormwater systems, particularly through innovative financing and by building resilience to climate change. The center is part of the White House Build America Investment Initiative – a government-wide effort to increase infrastructure investment and promote economic growth by creating opportunities for state and local governments and the private sector to collaborate, expand P3s, and increase the use of federal credit programs (EPA 2016a). The WIRFC is initiating a Water Infrastructure Public-Private Partnership and Public-Public Partnership Study and Local Government Training with the University of North Carolina Environmental Finance Center and West Coast Infrastructure Exchange. The Center is working with its partners to complete research to explore alternative market-based tools for integrated green stormwater infrastructure, and is focusing on stormwater financing by developing a clearinghouse of information to support communities to develop dedicated sources of revenue for stormwater programs (EPA 2016a). The creation of the WIRFC demonstrates the Obama administration's commitment to support innovative water infrastructure finance, and could help encourage the expansion of P3s in the water sector in the future.

Project Financing Intermediaries

In recent years, intermediaries have emerged to help identify, aggregate, and accelerate P3 projects. One such example is Partnerships British Columbia (BC) in Canada. Partnerships BC was created in May 2002 to support the Province of British Columbia's commitment to the delivery of affordable, performance-based infrastructure, and is a company owned by the Province and governed by a Board of Directors that reports to BC's Minister of Finance. Partnerships BC provides a number of services ranging from procurement management to advisory services during the planning and design, construction, and operations phases of P3 projects (Partnerships BC 2016).

Similarly, the states of California, Oregon, Washington, and the Providence of British Columbia have formed a nonprofit entity, the West Coast Infrastructure Exchange, to explore alternative funding and delivery methods (Knowles et al. 2013). This organization was formed with funding from the Rockefeller Foundation with the following goals:

- Develop standards for private sector participation that addresses stakeholder concerns and protects the public interest;

- Share best practices in infrastructure development, finance, and operations;
- Ensure infrastructure investment decisions consider the impact of climate change;
- Provide unbiased advice and technical assistance to public sector decision makers;
- Engage the expertise of infrastructure innovators, such as Partnerships BC;
- Pre-screen projects to evaluate advantages and disadvantages of traditional and alternative financing/procurement investment; and
- Connect projects to private capital.

In 2015, the West Coast Infrastructure Exchange provided technical assistance for a project located in Yakima Valley, Washington to provide a water pumping plant to provide irrigation to local irrigation districts, and provided financial planning assistance to the Pacific Forest Trust to demonstrate how small fees paid by water and power customers could improve large tracks of federal and private forests in Northern California (WCX 2015b).

In addition, the West Coast Infrastructure Exchange completed a project in 2015 to demonstrate the viability of aggregating small drinking water and wastewater projects to reach the economies of scale necessary to make a P3 approach viable. The following conclusions were drawn from this project:

- A single public entity with the legal authority to negotiate and contract on behalf of all participating jurisdictions is an essential structural element that would be needed.
- For the private sector to participate in an aggregation effort, there must be a common plan and structure of the transaction that ensures a single set of covenants and debt maturities, and meets all necessary collateral and reserve requirements.
- Blending of public and private financing could lower overall costs and facilitate a pipeline of Design-Build-Finance-Maintain (DBFM) water infrastructure projects.
- Strong political backing is essential to fostering the public's understanding of the potential benefits of DBFM aggregation projects.
- Aggregation efforts may be most likely to garner support in jurisdictions facing a cluster of similar needs. These regional drivers can potentially align political leadership and other key stakeholders around a common issue.

A key challenge in the aggregation effort is the mismatch between government knowledge and procurement responsibilities. Government agencies with statewide jurisdiction that may have insight into where the best aggregation opportunities exist do not have responsibility for leading infrastructure procurements. By contract, the state of Pennsylvania's Department of Transportation recently bundled over 500 bridges needing repair and maintenance into a single Request for Proposals for a public-private partnership to complete the work. In this case, there was not a governance challenge because a single agency had knowledge of the aggregation opportunities and also the sole responsibility for completing the bridges' repair and maintenance (WCX 2015a).

Several intermediaries have also emerged to support and grow the pay for success or social impact bond financing model. These include Social Finance and Third Sector capital partners, both non-profit organizations that were created to assist the government and private sectors assess, evaluate, prepare for, and pursue pay for success projects.

PREPARING FOR FINANCING

Regardless of the mix of financing alternatives that a municipality decides to pursue, whether new and emerging alternatives, or more conventional alternatives such as general obligation or revenue bonds, it is important that utilities implement practices and take steps to be as enticing as possible to investors and credit rating agencies from a credit perspective. Effective financial management practices can help to mitigate operational and financial risks for a water utility, and a lower risk profile can translate into higher credit ratings and lower interest rates on utility debt financing. Lower interest rates can help utilities maintain affordable user rates for the long-term benefit of its customers and help close the infrastructure gap.

Utilities can follow several financial management practices to help improve their ability to secure low cost financing. These practices, summarized below, are based on a literature review, discussions with financial managers from several utilities across the country, and input from S&P.

- Establish and meet formalized fiscal targets and policies recognized as prudent in the industry by rating agencies. At a minimum, these policies should include targets for debt service coverage and cash reserves to help maintain financial strength and prepare for uncertainty. Utilities should strive to exceed the minimum debt-service coverage required in their bond ordinance or trust indenture, as adequate excess revenues can allow the system to cash-fund a greater portion of capital needs. (Fedder et al. 2014). Maintaining sufficient cash balances to allow for reimbursement financing was also identified by utilities that were interviewed as a strong financial management practice, as was adopting financial targets and goals yearly as part of the budget process. Utilities should also adopt formal debt-management policies that specify the types of projects that can be funded through debt issuance, debt terms and structuring, criteria for refunding bonds, and limitations on exposure to variable-rate debt, swaps and other contingent liabilities. Fiscal targets for debt management may include debt ratio, long-term debt per customer, and operating margin, in addition to debt service coverage.
- Develop and maintain a long-range business plan and financial projections. Utility management should establish and officially adopt long-term business plans, such as master plans, capital facility plans, and financial plans, that focus on the operational, capital, and financial aspects of running the utility business. Long-term planning is essential for establishing and maintaining a strong utility business foundation (Fedder et al. 2014). Attention to long-term planning, including capital planning that goes beyond 10 years has been identified as an influencing factor affecting utility credit ratings. For example, S&P in its ratings criteria identifies long-term financial planning, capital planning and asset management as among several management practices and policies that are most likely to affect credit quality (S&P 2016). These long-term plans for water utilities should include ensuring an adequate water supply so that water demands can be met for the foreseeable future, establishing business principles that provide the basis for long-term decision-making for the utility that are aligned with stakeholder expectations, adopting fiscal policies and performance measures, including a formal debt management policy (Fedder et al. 2014).
- Establish a track record of the willingness and ability to raise rates, and implement timely and sufficient rate increases to maintain strong fiscal management. Utilities that were interviewed as part of this research project stated the importance of this track

record to maintaining its financial condition. In addition, S&P includes a rate-setting practice assessment into its ratings criteria to evaluate whether management has acted in a manner generally supportive of credit quality when tough decisions regarding rate increases needed to be made. The criteria cite the importance of prudent rate-setting decisions, rather than decisions that are simply politically expedient that could be to the detriment of a utility's financial health (S&P 2016). Automatic rate indexing clauses should be considered to annually adjust rates automatically based on inflation or to pass through increased expenses without a formal hearing (Fedder et al. 2014). Several strategies and tools can help utilities establish a track record of the willingness and ability to raise rates. See Water Research Foundation project #4455 *Rate Approval Process Communication Strategy and Toolkit* for more information (Mastracchio et al. 2016).

- Maintain a rate structure that generates stable revenues (i.e., through fixed charges). Water sales and the corresponding revenues attached to such sales are subject to volatility due to conservation, economic factors, and other issues, such as weather and season. While many objectives need to be considered when developing service rates, revenue stability is valued by rating agencies and investors because it is directly linked to financial risk. For example, in its rating criteria, Fitch Ratings views utilities favorably that have base charges or fixed charges that generate revenues that represent more than 30% of the total revenue stream (The Fitch Ratings 2012). S&P's rating criteria does not establish a preference toward a certain water and sewer utility rate structure, rather it considers financial risk factors and a utility's means of addressing the risks based on its policies and practices (S&P 2016).
- Plan for affordable user rates. Local economic and demographic factors can affect a community's financial capacity to support and pay for utility service, and the ability of customers to pay for utility service is an influencing factor in credit ratings. S&P includes affordability in its rating criteria as part of its evaluation of enterprise risk profile factors. It measures the relative affordability of utility rates given the income and relative poverty of the service area, as well as comparability with rates with other peers (S&P 2016). Fitch ratings also identifies affordability as a metric in determining whether rates are financially burdensome (The Fitch Ratings 2015). Therefore, controlling costs through efficiency savings and continuous improvement can be an important means to mitigate the cost of service and help address affordability. In addition, developing a realistic capital plan that prioritizes the capital needs of the system based on asset management principles can help identify critical projects and those that could potentially be deferred due to limited funds (Fedder et al. 2014).
- Minimize dependence on non-recurring revenues. It is best management practice not to utilize revenues that are non-recurring, such as system development charges, to pay for annual debt service. While this practice may result in lower user rates during periods of high growth, these revenues are likely to diminish during economic downturns, potentially resulting in revenue shortfalls for debt service payments or the requirement to significantly raise rates to cover the shortfall (Fedder et al. 2014). In its ratings criteria, S&P identifies this practice as important to its industry risk factor and identifies the need to include non-recurring cash inflows to achieve debt service coverage as a negative influencing factor (S&P 2016).

- Limit non-utility-related transfers to the General Fund. It is best management practice to limit transfers from the utility to the general government so that revenues can be used to operate, maintain, improve, or otherwise support the utility. Often the term “closed-loop system” is used to describe this best practice where the revenues generated through system operations generally remain within the system. Any such transfers to the General Fund, such as indirect cost transfers and payments-in-lieu-of-taxes, should be justified through indirect cost studies, or other cost-based documentation (Fedder et al. 2014). Rating agencies prefer closed-loop systems since the revenues collected by the utility can be used to pay for system improvements, debt service, and other financial obligations.
- Plan for contingencies. Having a contingency plan is an important risk management tool to be able to adjust to economic, environmental, and regulatory changes that can affect revenues and expenditures. Utilities should perform sensitivity analyses on their financial plans and have operational and financial contingencies in place to address the downside risk of the unexpected occurring. Utilities may address these contingencies with some level of working capital cushion, or emergency and contingency funds, rate stabilization reserves and other cash.
- Maintain transparency and accountability. The ratings criteria published by S&P identifies transparency and accountability as an important influencing factor in credit ratings. It is best practice for utility management to produce annual independently audited financial statements that comply with generally accepted accounting principles, and to voluntarily disclose alternative financing and exposure to contingent risks as they are entered into, and also maintain an overall continuing disclosure that is robust and timely (S&P 2016).

For more information on best financial management practices for preparing for financing, please refer to the following publications:

- Water Utility Capital Financing, Manual of Water Supply Practices M29, Fourth Edition (AWWA 2014)
- The Effective Water Professional, Leadership, Communication, Management, Finance, and Governance (WEF 2015)
- Financial Management for Water Utilities, Principles of Finance, Accounting, and Management Controls (AWWA 2012b)
- U.S. Water and Sewer Revenue Bond Rating Criteria, September 3, 2015 (The Fitch Ratings 2015)
- U.S. Municipal Utility Revenue Debt Rating Methodology, December 15, 2014 (Moody’s Investors Service 2014)
- U.S. Public Finance Waterworks, Sanitary Sewer, and Drainage Utility Systems: Rating Methodology and Assumptions, January 19, 2016 (S&P 2016)

CHAPTER 4 CAPITAL FINANCING TOOLS

INTRODUCTION

Based on the research described in the preceding section, capital financing tools were prepared to provide the reader with examples of where some of the new and emerging capital financing alternatives have been utilized with advantages, challenges, and lessons learned highlighted. In addition, the research team created a new and emerging capital financing decision support tool. This tool was constructed in Microsoft Excel and was intended to help the user identify potential applicability of the various capital financing alternatives that were identified in this research report. A description of these tools is provided below.

CASE STUDIES

A total of 10 case study examples were prepared as part of this research project covering financing alternatives including green bonds, century bonds, public-private partnerships, public-public partnerships, private placements, WIFIA, and integrated financing. A summary of these case studies is provided in [Table 4.1](#), below. These case studies accompany this research report, and are provided separately.

Table 4.1
Summary of case studies

Municipality	Case Study Topic	Overview
City of Allentown and the Lehigh County Authority, Pennsylvania	Authority Concession Public-Public Partnership	Public-public partnership concession for the operation and financing of an existing water and wastewater system. Drivers for this arrangement were the poor fiscal condition of the municipality and the desire for future utility rate certainty and transfer of risk.
Bayonne Municipal Utilities Authority, New Jersey	Authority Concession Public-Private Partnership	P3 concession agreement for management, operation, and maintenance of an existing water distribution, wastewater collection, stormwater, and combined sewer systems. The driver was the poor fiscal condition of the municipality.
Metropolitan Water Reclamation District (MWRD) of Greater Chicago, Illinois	Green Bonds	Using green bonds to finance a portion of MWRD's wastewater capital program, without using an independent third party green certification.
District of Columbia Water and Sewer Authority (DC Water)	Green Century Bonds	Using both green bonds and long-duration bonds to finance a portion of DC Water's wet weather Clean Rivers project, where an independent party provided a green opinion and certified the bond offering.

(continued)

Table 4.1 (Continued)

Municipality	Case Study Topic	Overview
City of Los Angeles, California	Bank Funding	Private placement bank lending to finance a portion of the City's capital improvement needs. The driver for this approach included lowering the effective cost of issuance, shortening the financing timeline, and limiting the City's exposure to its bank facility providers.
City of Norfolk, Virginia	Integrated Financing and Resilience Bond	Potential application of integrated financing and catastrophe/ resilience bonds and how Norfolk is proceeding to assess the suitability of this financing approach to improve its storm resiliency.
Port of Miami, Florida	Water Infrastructure Finance and Innovation Act (WIFIA)	How TIFIA was leveraged to help finance the Port of Miami Tunnel project and an example of how WIFIA could be leveraged to finance water projects in the future.
Puerto Rico Aqueduct and Sewer Authority (PRASA)	Public-Private Partnership	P3 agreement with a private energy services company (ESCO) to provide turnkey services for energy projects at PRASA's facilities, and finance capital projects from the anticipated savings associated with the projects being financed.
San Antonio Water System (SAWS), Texas	Vista Ridge Regional Supply Project Public-Private Partnership	P3 arrangement for the design, construction, operation, and financing of a new water supply for SAWS. Example of the transfer of additional responsibilities and risks not typically assumed by a private project company.
San Diego County Water Authority, California	Carlsbad Seawater Desalination Plant Public-Private Partnership	P3 arrangement for the design, construction, operation, and financing of a seawater desalination plant located in Carlsbad California. The driver for this P3 arrangement was the municipality's interest in transferring risk to the private sector.

INTERACTIVE DECISION TOOL

An interactive decision support tool was created to assist utility finance managers assess the potential applicability of the various new and emerging capital financing alternatives highlighted in this research report. The tool contains a dashboard with a series of questions to be answered by the user (see [Figure 4.1](#), below). Once the user answers the questions, the potentially relevant capital financing alternatives are highlighted and the user can select the financial alternative, and an information page opens that provides more information on the alternative along with a summary of advantages and limitations. This tool was constructed in Microsoft Excel and is available on the WRF website on the #4617 project page. A screen image of the financing decision support. This tool is not a specific endorsement or recommendation for any specific capital financing approach. Neither the Water Research Foundation nor Arcadis is a municipal advisor registered with the Securities and Exchange Commission are not subject to the statutory fiduciary duty applicable to municipal advisors under Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act. Users of this tool should discuss capital financing alternatives with any and all internal or external registered municipal advisors that it deems appropriate before making any capital financing decisions. WRF assumes no responsibility for the content of the research study reported in this publication or for the opinions or statements of fact expressed in the report. The mention of trade names for commercial products does not represent or imply the approval or endorsement of WRF. This report is presented solely for informational purposes.



NEW AND EMERGING CAPITAL PROVIDERS FOR INFRASTRUCTURE FUNDING (PROJECT #4617)

NEW AND EMERGING FINANCING DECISION SUPPORT TOOL

[How does the tool work?](#)

The financing options tool can be used to help determine financing options that may be most appropriate for your utility. This tool focuses on new and emerging financing options, rather than more traditional financing options, such as revenue bonds, general obligation bonds, and state revolving fund (SRF) loans. Traditional financing methods may also be appropriate for consideration when determining the optimal financing strategy for your entity. Determine financing options that may best fit your circumstances by answering the questions below.

Questions

Project Type:

What is the size of the project(s) to be financed?	Greater than \$100M
Are the projects being financed considered "green" projects?	☐ Yes
Will the project have a useful life longer than 30 years?	☐ Yes
Will the project spur additional economic development?	☐ Yes

Issuer Characteristics:

Strong financial condition and capacity to take on new debt	☐ Yes
Weak financial condition and limited ability to access the public debt market	☐ No
Do you pay flood insurance premiums for existing utility assets?	☐ Yes
Has your state passed PPP enabling legislation?	☐ Yes

Financing Objective:

Do you want to gain access to Environment, Social, and Governance (ESG) investors?	☐ Yes
Is one of your primary drivers to minimize transaction or issuance costs?	☐ No
Is one of your primary interests to complete the financing in the shortest time possible?	☐ No
Is one of your primary interests to minimize ongoing administration or disclosure efforts?	☐ No
Do you desire to spread debt service payments over the entire life of a long lived asset?	☐ No
Do you desire to make investing in the project directly accessible to the local community?	☐ No
Are you looking to transfer project risk to the private sector?	☐ No

Options to consider:

[Traditional Financing](#)
[Green Bonds](#)
[Long-Duration Bonds](#)
[Mini / Micro Bonds](#)
[Private Placement](#)
[Public-Private Partnership](#)
[Public-Public Partnership](#)
[Resiliency Bonds](#)
[Securitization](#)
[Social Impact Bonds](#)
[Tax Increment Financing](#)
[WIFIA Loan](#)

Developed by:



Disclaimer:

This tool is intended to increase awareness of new and emerging capital financing alternatives and the situations in which the alternatives may be most applicable. The tool may be used as a preliminary step in the identification of possible new and emerging capital financing alternatives that may be applicable to a utility. After answering the questions, the highlighted alternatives may be ones that the utility may want to explore further. However, the utility may also want to explore some of the other non-highlighted alternatives as well, since answering a limited number of questions may not fully capture the utility's specific circumstances. Furthermore, this tool is not intended to replace the complex capital financing decision process that a utility goes through to develop a financing strategy. This tool is not a specific endorsement or recommendation for any specific capital financing approach. Neither the Water Research Foundation nor Arcadis is a municipal advisor registered with the Securities and Exchange Commission and is not subject to the statutory fiduciary duty applicable to municipal advisors under Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act. Users of this tool should discuss capital financing alternatives with any and all internal or external registered municipal advisors that it deems appropriate before making any capital financing decisions.

This study was funded by the Water Research Foundation (WRF). WRF assumes no responsibility for the content of the research study reported in this publication or for the opinions or statements of fact expressed in the report. The mention of trade names for commercial products does not represent or imply the approval or endorsement of WRF. This report is presented solely for informational purposes.

Copyright © 2016.

Figure 4.1 Financing decision support tool dashboard

CHAPTER 5

CONCLUSIONS AND FUTURE RESEARCH NEEDS

CONCLUSIONS

The following are the most significant conclusions regarding this research:

- The infrastructure gap is the difference between the current level of spending on water infrastructure and the future need for additional investment. The infrastructure gap for U.S. drinking water and wastewater totals over \$650 billion over the next 20 years. The issue at hand is not the lack of availability of traditional or innovative financing alternatives, but rather the limited amount of sufficient and sustainable revenue funding sources that can pay for the financing, primarily from water and wastewater rates.
- Traditional financing alternatives can pose certain challenges for utilities, such as managing relatively high debt service costs over the life of the debt, which is often shorter than the useful life of the underlying asset, and raising utility rates to fund debt obligations given the limited willingness and ability to raise rates due to customer affordability concerns. The extraordinary capital funding needs, and the demands and expectations of water utility stakeholders create a challenging capital financing environment for water utilities, leading policymakers to look for innovative ways of lowering borrowing costs and achieving other benefits, such as risk mitigation, greater public awareness, and value capture. New and emerging financing alternatives may be able to help utilities obtain these benefits while helping to close the infrastructure funding gap.
- Several new and emerging capital financing alternatives are gaining momentum in the U.S. municipal market that may be suitable for water utilities today and in the future. These include:
 - Public-private partnerships
 - Public-public partnerships
 - Direct lending through private placements
 - Securitization
 - Green Bonds
 - Social and environmental impact bonds
 - Mini or micro bonds
 - Long-duration bonds
 - Catastrophe or resilience bonds
 - Funding through WIFIA
 - Guarantees through the SRF program
 - Tax increment financing
 - Internal funding
 - Integrated financing
- Conclusions regarding P3s:
 - Private sector participation in the U.S. municipal water sector through P3 arrangements is expected to grow in the future due to the advantages that P3s can offer a municipality. These advantages include risk sharing between the public and

private sectors, enabling the accelerated implementation of capital projects, the provision of relative certainty regarding costs, future rate increases, and the funding of infrastructure, and providing opportunities to incentivize private sector innovations to achieve cost and operational efficiency savings over an asset's life-cycle.

- The extent to which the U.S. P3 water market expands in the future will depend in part on federal government policies that can either enable or prohibit the ability to realize the benefits of P3s. One hurdle is the public versus private cost of money which requires efficiency savings and the transfer of risk to be significant enough to overcome the higher private sector cost of money. The federal government could dedicate some exempt facility PABs to water-related projects, similar to the transportation sector, to help level the playing field regarding the cost of money.
- Another significant hurdle to the use of P3s is the political risks associated with private sector participation stemming from the discomfort in placing infrastructure assets into the private hands, loss of control, and concerns over transparency and accountability issues. These political risks can potentially be mitigated with additional stakeholder involvement, training, and education. The concern over loss of control can potentially be addressed through the balancing of responsibilities, risks, and rewards in a P3 contract.
- The lack of private investment in the U.S. P3 market is not due to a lack of capital, rather it is due to a limited number of viable P3 project opportunities. The typical size of a P3 project that would attract investors is in the range of \$100 million to \$500 million or more due to the transaction costs and the need to realize value through economies of scale. This significantly reduces the potential number of projects that may be considered for P3 approach due to the fragmented nature of water and wastewater utilities in the United States.
- Private investors are generally very interested in pursuing additional investment opportunities in the P3 water sector, and there has been a greater interest from institutional investors recently. There are also a number of issues or factors that investors look for, and municipalities can control, that can influence the U.S. P3 water market. Among these include obtaining legislative approval to move forward a P3 project. This relates to political risk and having legislative approval demonstrates that there is the political commitment for the project. Also, municipalities should provide a very clear description of what they are asking for in a P3 arrangement in terms of the balance of responsibilities. The quality (readability and traceability) of P3 contracts was another factor that was cited as important to a viable P3 deal.
- Aggregation of a number of similar capital needs in a State or region, bringing together political leadership and other stakeholders together around a common issue, could expand the market for P3s. However, such aggregation efforts are anticipated to be very challenging to form at the local level due to political and control factors.
- Conclusions regarding public-public partnerships:
 - Public-public partnerships are relatively uncommon in the water industry as a financing approach, but may offer the collaborative advantages of private

partnerships, such as the transfer of risk and cost or rate certainty, while providing a source for capital funding that does not involve the private sector.

- Conclusions regarding direct lending through private placements:
 - Only a small fraction (3% to 7% in recent years) of municipal tax-exempt debt is privately placed. However, private placement of municipal debt has become more prevalent in recent years due to several factors, such as: bank loans that can offer a more flexible structure than traditional municipal bonds and can be structured to mimic many of the features of variable-rate bonds; the cost of issuing direct debt is often lower and the timeline shorter than that of publicly offered debt; and some of the regulatory burdens associated with publicly offered debt can be avoided with private placements.
 - Limitations associated with the use of private placements include the limited access to public markets and competition (by their nature), the potential for arduous or non-uniform covenants that could create significant liquidity issues if covenants are breached, and disclosure concerns by rating agencies and investors making credit evaluations more difficult. Rating agencies and organizations such as the GFOA have stressed the importance of disclosure of private placement debt due to the potential for hidden credit risk exposure from the terms and covenants that may be associated with this type of debt.
- Conclusions regarding securitization:
 - Securitization bonds offer several benefits to municipal issuers. They can allow a utility that might otherwise not be able to issue debt on favorable terms to finance capital projects with lower interest rates and debt service costs. A utility with a strong credit rating may be able to utilize securitization financing without having to generate excess cash flows to meet debt service coverage requirements because typically these bonds are structured with debt service coverage requirements of only slightly greater than one times. Securitization will not dilute the debt service coverage of a utility's existing municipal revenue bonds. Since securitization bonds are issued by a separate entity, it may broaden the potential investor base available to the utility by bringing in investors who have either not purchased the bonds of the underlying issuer, or who have reached their exposure limits to the utility.
 - Securitization requires special enabling legislation so it may not be a viable option for utilities in many states. New York, Louisiana, Texas, Florida, and West Virginia are states where securitization has been used in the past. Puerto Rico is currently in the process of approving securitization legislation that will enable water and wastewater securitization bonds.
- Conclusions regarding green bonds:
 - The current municipal green bond market is around \$10 billion (cumulative), and investors believe that a global green bond market size of \$100 billion per year is feasible, with municipal bonds comprising about 7 to 10% of the global supply.
 - The advantages of green bonds to an issuer include investor demand and diversification, publicity, and image. They can give an issuer access to a broader range of investors than traditional bonds, resulting in greater demand for the bonds. The drawbacks of green bonds include the upfront investment needed to define the bond's green criteria and sustainability objectives, and the ongoing costs to the issuer associated with tracking, monitoring, and reporting.

- While there is currently a lack of rules, regulations, and concrete definitions of “green,” there are several evolving standards and guidelines on green bonds, such as the Green Bond Principles, and the Climate Bonds Standard, however, these are currently voluntary. Green Bond Principles provide a broad guideline that makes the standard very inclusive to various types of green projects, whereas the Climate Bond Standards are more focused on the mitigation of climate change. It is currently very difficult to say definitively that the green bond aspect of a bond issue is responsible for a reduction in interest rates for the issuer.
- Two independent green opinion providers have led the market in the United States, Sustainalytics and Cicero, both European firms that have a presence in this country. However, most municipal green bonds have not had green certification or opinion because there is an implicit level of trust and transparency in municipalities regarding the use of the proceeds.
- Six broad categories of investor groups are particularly active green bond buyers. These are asset managers and investment consultants, foundations and endowments, faith-based investors, investment banks, corporations and insurers, and public pensions. However, U.S. endowments and pension funds may be less interested in tax-exempt municipal green bonds because these investors typically do not benefit from the tax exemptions that municipal green bonds offer. Rather, the demand for municipal green bonds in the U.S. is more of a grass roots driven demand, as retail investors request green investments, and money managers seek green products to meet this request.
- Issuers can make their green bonds more attractive to the market by focusing on transparency, including enhancing internal and external reporting of the use of green bond proceeds, and reporting the benefits of the investments over time through various performance metrics. Further, most green bonds have been issued by municipalities with very strong credit ratings, and there is interest by investors for green bonds with higher yields that are issued by municipalities with lower credit.
- Conclusions regarding social and environmental impact bonds:
 - Social impact bonds are not publicly offered bonds, but rather loans provided by private investors intended to provide funding to achieve specific social outcomes by encouraging collaboration between government agencies and nongovernment investors. They work more like an equity instrument because repayment is at risk and is contingent upon specific outcomes being achieved. They have been used to address all sorts of social problems, including early childhood education, homelessness, health, and criminal justice.
 - The advantages to the issuer of social impact bonds include risk transfer, access to socially responsible capital investors, and often the degree of savings that are associated with the underlying project. One significant limitation of social impact bonds is that the concept is still very new, and there are a limited number of actual arrangements to learn from, with none currently in the water and wastewater market. However, one utility, DC Water, is planning to develop the social impact bond model for green infrastructure projects in the water sector.
 - Most social impact bonds have been funded by a combination of investors, such as large investment banks, foundations, and local investors, and there has been a

growing interest in these arrangements by socially responsible investors. Furthermore, the millennial generation may drive the prevalence of social impact investing in the future because they may be willing to accept a higher risk profile or receive lower returns to invest in opportunities that create positive social or environmental impact.

- Based on the social impact bonds that have been arranged thus far, several lessons learned may help expand the market interest in these deals. Some social impact bonds in the past had sharp drop-offs in repayment based on the metrics to be achieved. To attract more interest from investors, it may be necessary to eliminate these sharp distinctions between program success and failure, and provide a smooth curve for more traditional investors. It is also appealing to investors if the program can demonstrate early indications of success prior to entering such arrangements to provide investors with confidence of the success of the program. Finally, transaction costs will need to be reduced if social impact bonds are to become more common.
- Conclusions regarding mini or micro bonds:
 - Mini or micro bonds are a form of crowdfunding where capital is raised for a project from individual investors through what amounts to an open call for proposals. These bonds can provide local investors with access to invest in local projects whereas they may be precluded from investing in more traditional municipal bonds because of the high bond minimum denominations.
 - These bonds can offer several benefits to the issuer, including: direct access to local investors that have a vested interest in the project as future users; increased support from stakeholders and elected officials because success in the financing of the project depends upon community engagement, participation, and support during the early stages of infrastructure development; and the ability to build community engagement as these bonds can be used as a way to engage and educate constituents throughout the development of the infrastructure. The disadvantages of these bonds are the upfront investment needed to establish the program, the ongoing administration that is required, and the limited access to potential investors (i.e., primarily only the local community).
 - There have only been a handful of cities across the country offering such bonds, such as the City of Denver and Anchorage Alaska, but this approach may become more prevalent in the future.
- Conclusions regarding long-duration bonds:
 - Long-duration bonds are not entirely new. They were somewhat prevalent in the mid-1990s and early 2000s when a few dozen companies issued them, such as the Ford Motor Company. More recently, one municipal water utility, DC Water, issued them in 2014.
 - The benefits of long-duration bonds include the ability to reduce the magnitude of the annual debt service payments, improve asset-liability matching, and improve intergenerational equity, i.e., the ability to spread the cost of the asset over the life of the asset and to those who will benefit from the use of the asset of this time period. A limitation of long-duration bonds is that the market conditions need to be right to make them viable, such as a relatively flat yield curve. Otherwise,

borrowers may eliminate them from consideration because the overall cost of the bonds may be too expensive.

- The potential investors of long-duration bonds are heterogeneous. However, life-insurance companies and pension funds are the natural buyers because they need to match their long-term liabilities with assets of a like maturity for risk-management purposes.
- Conclusions regarding catastrophe and resilience bonds:
 - Catastrophe bonds have historically primarily been used by insurance companies to transfer some of the risk of catastrophic events, like hurricanes or earthquakes to the capital markets. These bonds are now being considered as a tool to fund projects that prevent losses from occurring, instead of paying for them when they occur.
 - Resilience bonds are in the concept stage but are intended to provide a municipality with the ability to reduce insurance costs if they implement projects that reduce risk of loss, such as coastal protection, flood barriers, or other resilient infrastructure investments. Under the resilience bond model, municipalities purchase insurance and pay insurance premiums. If they implement risk mitigating projects, where the benefits are verified, then they qualify for an insurance rebate that effectively reduces the insurance premium. This rebate could potentially be used to fund the repayment of debt associated with the project.
 - One of the benefits of catastrophe or resilience bonds to an investor is diversification since these bonds are generally not affected by market trends like traditional bonds. In addition, for the issuer, these bonds offer the ability to incentivize resilience projects and allow for the capture of the value of these projects through the financing mechanism, which is difficult to accomplish using a traditional financing approach. The challenges of resilience bonds are that they are relatively unproven and are only in the concept stage, and they require significant modeling of the benefits and parameters associated with the risk and the metrics that trigger the rebate feature of the bonds.
 - There could be a place for resilience bonds in the water sector in the future with the more recent focus on resiliency and sustainability. Furthermore, this approach could be a component of an integrated financing approach for a city in the future that includes projects that have multiple beneficiaries and are supported by multiple funding sources. Currently, the City of Norfolk is one city in the United States that is exploring just such an approach to address their resiliency and sustainability needs.
- Conclusions regarding Government Sponsored Programs:
 - If WIFIA expands from a pilot program to a full-scale program, it could provide water and wastewater utilities with an additional source of low-cost financing for qualifying capital projects. The limitations of WIFIA include its relative newness (even its pilot-scale program has been slow to be rolled out) and the limitation to projects of \$20 million in size or larger or \$5 million for communities of less than 25,000. In addition, WIFIA assisted projects must comply with Buy America provisions and the prevailing wage requirements of the Davis-Bacon Act, which can add to the underlying project costs. Also, in its current form, it is not considered to be a significant driver for P3 projects primarily, because of the limited

availability of PABs to be used in conjunction with the program to lower the overall cost of financing.

- An infrastructure tax proposal that was introduced to Congress in 2015 includes the creation of QPIBs. This new form of municipal bonds would offer a low-cost financing tool with many of the characteristics of PABs that could increase the prevalence of P3s in the U.S. municipal water market. However, this tax proposal has not yet been acted upon by the U.S. Congress.
- The SRF program can be used to guarantee the repayment of a municipal loan, thereby minimizing the risk to the investor and lowering debt interest costs, and the financial assistance associated with SRF debt guarantees has remained largely untapped. Approximately \$28 billion in potential funding capacity is available for this purpose nationwide.
- Conclusions regarding tax increment financing:
 - TIF financing has been used across the United States since the 1950s, and enabling legislation exists in 49 states for its use. While not considered new and emerging, TIF could be used as part of a financing solution for integrated projects to finance development and redevelopment projects with no upfront cost to the tax payer.
 - The advantages of using TIFs is the ability to capture the benefit and value associated with a capital investment program with dispersed benefits, and the ability to repay the cost of development or redevelopment projects through new taxes from the additional value created in the development area. The drawbacks to TIFs include the risk associated with a failed development, which could strap the municipality with debt from the capital improvement if the revenue stream is insufficient to support the debt. There is also the potential for inequities to be created among property owners if economic incentives are offered within a TIF district but not outside of the district, and there is also the potential for added strain on other existing public resources, like school districts and other tax funded public infrastructure, if their tax funding is frozen at base valuation levels while the growth in the district increases the demand for their services.
- Conclusions regarding internal funding:
 - The advantages of internal funding capital projects through efficiency savings include the ability to unlock capital funding capacity, realize a positive effect on a utility's financial condition over time, maintain or improve credit rating, help to ensure the ability to secure lower cost capital financing, and reduce the need for more significant rate increases over time. Challenges associated with identifying and realizing savings through operational improvements include the capital outlay that may be needed to achieve the savings, and the complexity of working in the public sector.
 - Several utilities throughout the United States have embraced "lean" techniques to focus on operational excellence and efficiency. The use of these techniques has been reported to be successful in achieving savings and freeing up capital funding capacity.
- Conclusions regarding integrated financing:
 - Integrated financing is the coordination and planning by multiple departments within a municipality or multiple municipal agencies working together to finance a capital program with disperse benefits using multiple financing and funding

sources. Government challenges and existing regulations have driven utilities to consider innovative approaches to integrated financing. These approaches integrate multiple regulatory requirements (such as wastewater and stormwater) and have leveraged limited funding from different programs.

- A number of cities across the United States are exploring such integrated financing approaches that are centered on building more integrated and resilient infrastructure. The Rockefeller Foundation and re:focus are two organizations that are helping to lead this focus on integrated financing through collaboration with forward thinking cities around the country. As a result, financing strategies that combine multiple funding sources and financing alternatives are on the rise and could become more prevalent in the future to help solve resiliency, sustainability, and environmental challenges.
- Conclusions regarding financing intermediaries:
 - In recent years, there has been the emergence of intermediaries that have been established to support the adoption of new and emerging capital financing alternatives in the U.S. municipal sector. These have included the West Coast Infrastructure Exchange, which is focused on connecting municipal capital projects to private capital and providing advice, best practices, and technical assistance to public sector decision makers, Social Finance and Third Sector capital partners, which were created to assist the government and private sectors assess, evaluate, prepare for, and pursue pay-for-success projects, as well as foundations, such as the Rockefeller Foundation and Ford Foundation, which provide funding to support the development of various new and emerging capital financing alternatives.
 - One intriguing concept that intermediaries, such as the West Coast Infrastructure Exchange, are exploring is the concept of aggregation of smaller projects into a larger offering that will be feasible for financing using a P3 approach. In order for this concept to work, there must be a common plan and structure of the transaction that ensures a single set of covenants and debt maturities, and meets all necessary collateral and reserve requirements, as well as a strong political backing, which is essential to fostering the public's understanding of the potential benefits of aggregation projects. Aggregation efforts may be most likely to garner support in jurisdictions facing a cluster of similar needs. These regional drivers can potentially align political leadership and other key stakeholders around a common issue. However, such aggregation efforts are anticipated to be very challenging to form at the local level due to political and control factors.
- Conclusions regarding preparing for financing
 - Regardless of the mix of financing alternatives that a utility decides to pursue, whether traditional or new and emerging financing alternatives, it is important that utilities implement practices and take steps to be as enticing to investors and credit rating agencies from a credit perspective as possible. Effective financial management practices can help mitigate operational and financial risks and lower a utility's risk profile, which can translate into lower borrowing costs. Lower borrowing costs can help utilities maintain affordable user rates for the long-term benefit of its customers, and also help close the infrastructure funding gap.
 - Utilities can follow several financial management practices to help improve their ability to secure low cost financing. These include:

- Establishing and meeting formalized fiscal targets and policies recognized as prudent in the industry;
- Developing and maintaining a long-range business plan and financial projections;
- Establishing a track record of the willingness and ability to raise rates, and implementing timely and sufficient rate increases to maintain strong fiscal condition;
- Maintaining a rate structure that generate stable revenues;
- Controlling costs through efficiency savings and continuous improvement to mitigate the cost of service and help address affordability issues;
- Minimizing the dependence on non-recurring revenues, such as system development charges;
- Limiting non-utility transfers to the general fund;
- Planning for uncertainty by having contingency plans; and
- Maintaining fiscal transparency and accountability through voluntary internal and external reporting.

If alternative financing is to expand, there needs to be (1) enabling legislation that allows for the use of some of the alternatives, (2) additional knowledge, education, and training to improve awareness, understanding, and willingness to use the alternatives, (3) more standards and best practices to guide the adoption and implementation of the alternatives, (3) more developed and proven models and templates to lower transaction costs, and (4) more collaboration among municipal departments and across municipal agencies to capture value and benefits, provide economies of scale, and improve viability and investor attractiveness.

FUTURE RESEARCH NEEDS

A number of ideas were developed during the course of the project, representing opportunities to further the knowledge base of utilities. These ideas are listed below:

- Exploring ways to enable P3s to be used to help fund smaller infrastructure projects (such as through aggregation), as P3 projects tend to be suitable only for projects of size in the range of \$100 million to \$500 million or more due initial transaction costs and economies of scale factors.
- Researching ways of raising utility management and public awareness of new and emerging capital financing alternatives.

REFERENCES

- 100RC (100Resilient Cities). 2015. “100RC & Social Finance Launce Resilience Pay for Success Initiative.” http://www.100resilientcities.org/blog/entry/100rc-social-finance-launch-resilience-pay-for-success-initiative#/-/_/.
- Anderson, R.F. 2010. *Trends in Local Government Expenditures on Public Water and Wastewater Services and Infrastructure: Past, Present and Future*. Washington, D.C.: U.S. Conference of Mayors – Mayors Water Council.
<https://www.usmayors.org/publications/201002-mwc-trends.pdf>
- ASCE (American Society of Civil Engineers). 2013. “2013 Report Card for America’s Infrastructure.” <http://www.infrastructurereportcard.org/>.
- AWWA (American Water Works Association). 2009. *Study on Private Activity Bonds and Water Utilities*. Denver, Colo.: AWWA.
<http://www.awwa.org/portals/0/files/legreg/documents/pabreport.pdf>.
- AWWA (American Water Works Association). 2012a. *Buried No Longer: Confronting America’s Water Infrastructure Challenge*. Denver, Colo.: AWWA.
<http://www.awwa.org/portals/0/files/legreg/documents/buriednolonger.pdf>.
- AWWA (American Water Works Association). 2012b. *Financial Management for Water Utilities: Principles of Finance, Accounting, and Management Controls*. Denver, Colo.: AWWA.
- AWWA (American Water Works Association). 2014. *Water Utility Capital Financing, Manual of water Supply Practices M29, Fourth Edition*. Denver, Colo.: AWWA.
- AWWA (American Water Works Association). 2015. “AWWA Applauds House-Senate Agreement to Fix Water Infrastructure Tool in Transportation Bill.”
<http://www.awwa.org/resources-tools/public-affairs/press-room/press-release/articleid/3917/awwa-applauds-house-senate-agreement-to-fix-water-infrastructure-tool-in-transportation-bill.aspx>.
- AWWU (Anchorage Water & Wastewater Utility). 2005. *Anchorage Water & Wastewater Utility*. Anchorage, AK: Municipality of Anchorage.
<https://www.muni.org/Departments/budget/utilitiesEnterprise/200607%20Apv%20Util/Anchorage%20Water%20and%20Wastewater.pdf>.
- Blocher, J. and J.Q. Morgan. 2008. “Questions About Tax Increment Financing in North Carolina.” *UNC School of Government Community and Economic Development Bulletin*, Number 5.
- Bodek, D.N., G.E. Buswick, J.J. Previdi, R.L. Prunty, V.D. White, and H.G. Aldrete-Sanchez. 2014. *Alternative Financing: Disclosure Is Critical to Credit Analysis in Public Finance*. New York: Standard & Poor’s Ratings Services.
<http://www.treasurer.ca.gov/cdiac/seminars/2014/20140205/sp.pdf>.
- Breckinridge Capital Advisors. 2014. “The Impact of Private Placements & Direct Lending on the Municipal Market.” <http://www.breckinridge.com/insights/whitepapers/the-impact-of-private-placement-bonds/>.
- Burne, K. 2010. “Bankers Pitch 100-Year Bonds.” *Wall Street Journal*. August 23.
<http://www.wsj.com/articles/SB10001424052748704488404575442021845873594>.

- Burne, K. and T. Mann. 2013. "MTA Sells Storm Bond – Agency Gets Creative in Disaster Planning as Usual Sources of Insurance Dry Up." *Wall Street Journal*. July 31. <http://www.wsj.com/articles/SB10001424127887323681904578640401075075198>.
- Burton, P. 2013. "Sandy's High Costs Spur Municipal Finance Innovation." http://www.bondbuyer.com/issues/122_207/sandys-high-costs-spur-municipal-finance-innovation-1056788-1.html.
- Burton, P. 2015. "Social Impact Bonds to Target Resilience." *Bond Buyer*, 1 (F331): 26.
- Carter, J., E. Means, and D. Owen. Forthcoming. *Research and Innovation Within Water Utilities*. Project #4642. Denver, Colo.: Water Research Foundation.
- CDIAC (California Debt and Investment Advisory Commission). 2015. *Alternative Financing in the Municipal Market: Financial and Policy Considerations for Municipal Borrowers*. www.treasurer.ca.gov/cdiac/issuebriefs/201507.pdf.
- Ceres. 2014. *Green Bond Principles 2014: Voluntary Process Guidelines for Issuing Green Bonds*. Boston, MA: Ceres. <https://www.ceres.org/resources/reports/green-bond-principles-2014-voluntary-process-guidelines-for-issuing-green-bonds/view>.
- Choi, A. 2014. *Sustainable Investing, Imperative and Opportunity*. New York: Morgan Stanley Institute for Sustainable Investing. http://www.morganstanley.com/sustainableinvesting/pdf/Sustainable_Investing_Imperative_Opportunity.pdf.
- Clark, C., B. Thornley, and J. Emerson. 2013. "Impact Investing 2.0-What \$3 Billion Tells Us About the Next \$300 Billion." http://www.huffingtonpost.com/cathy-clark/impact-investing_b_3850296.html.
- Climate Bond Standard. 2015. "Climate Bond Standard, Climate Bonds Initiative." <https://www.climatebonds.net/standards/resources/climate-bond-standard>.
- Coen, A. 2015. "New York State Pricing \$475M of Green Bonds." *Bond Buyer*, 1 (34346): 1.
- Cohen, R. Sir, and W. Sahlman. 2013. "Social Impact Investing Will Be the New Venture Capital." *Harvard Business Review*. January 17. <https://hbr.org/2013/01/social-impact-investing-will-b>.
- Collier, K. 2016. "San Antonio Utility Approves Vista Ridge Takeover." *The Texas Tribune*. May 18. <https://www.texastribune.org/2016/05/18/san-antonio-utility-approves-vista-ridge-takeover/>.
- Costa, K. 2014. "Investing for Success, Policy Questions Raised by Social Investors." <https://www.americanprogress.org/issues/general/report/2014/03/03/85099/investing-for-success/>.
- Costa, K. and L. Tomasko. 2014. "Networking for Success: Building Networks is Essential to Investment in Social Impact Bonds." <https://www.americanprogress.org/issues/general/report/2014/03/03/85106/networking-for-success/>.
- DC Water (District of Columbia Water and Sewer Authority). 2014. "DC Water Wins Regional 'Deal of the Year' Award by The Bond Buyer." https://www.dewater.com/site_archive/news/press_release691.cfm.
- DC Water (District of Columbia Water and Sewer Authority). 2015a. "DC Water Announces Successful Sale of \$350 Million Green Century Bonds." https://www.dewater.com/site_archive/news/press_release739.cfm.

- DC Water (District of Columbia Water and Sewer Authority). 2015b. “DC Water Awarded Grant from Harvard University to Develop Innovative Green Infrastructure Financing Model.” https://www.dewater.com/site_archive/news/press_release711.cfm.
- DC Water (District of Columbia Water and Sewer Authority). 2016. *Fact Sheet: DC Water Environmental Impact Bond*. Washington, D.C.: District of Columbia Water and Sewer Authority, Goldman Sachs, and Bethesda, MD: Calvert Foundation. <https://www.dewater.com/news/listings/documents/DC%20Water%20EIB%20Fact%20Sheet%20FINAL%2009-29-16.pdf>.
- Deye, A. 2015. “US Infrastructure Public-Private Partnerships: Ready to Takeoff?” *The Harvard Kennedy School Review*, volume xvi. <http://harvardkennedyschoolreview.com/us-infrastructure-public-private-partnerships-ready-for-takeoff/>.
- Drexler, M. I. Mendelssohn, and O. Wyman. 2014. *Direct Investing by Institutional Investors: Implications for Investors and Policy-Makers*. Geneva: World Economic Forum. http://www3.weforum.org/docs/WEFUSA_DirectInvestingInstitutionalInvestors.pdf.
- Dye, R. and D. Merriman. 2006. “Tax Increment Financing. A Tool for Local Economic Development.” http://www.lincolnst.edu/pubs/1078_Tax-Increment-Financing.
- Ebi, K. 2014. “How Crowdfunding and Mini-Bonds Are Paying for Better Denver.” <http://smartcitiescouncil.com/article/how-crowdfunding-and-mini-bonds-are-paying-better-denver>.
- EFAB (Environmental Financial Advisory Board). 2014. *Utilizing SRF Funding for Green Infrastructure Projects*. Washington, D.C.: Environmental Financial Advisory Board https://www.epa.gov/sites/production/files/2014-04/documents/efab_report_srf_funding_for_greeninfra_projects.pdf.
- Eicher, J. 2015. “How Public Pensions Are Getting Smart About Infrastructure. Governing the States and Localities.” <http://www.governing.com/gov-institute/voices/col-public-pension-investment-management-infrastructure.html>.
- Emerson, J. and L. Norcott. 2014. “Millennials Will Bring Impact Investing Mainstream, Stanford Social Innovation Review.” http://ssir.org/articles/entry/millennials_will_bring_impact_investing_mainstream.
- EPA (U.S. Environmental Protection Agency). 2012. *Resource Guide to Effective Utility Management and Lean: Improving Performance and Addressing Key Management Priorities at Water-Sector Utilities*. Washington, D.C.: Environmental Protection Agency. <https://www.epa.gov/sites/production/files/2016-01/documents/eum-and-lean-resource-guide.pdf>.
- EPA (U.S. Environmental Protection Agency). 2013. “Drinking Water Infrastructure Needs Survey and Assessment Fifth Report to Congress.” <https://www.epa.gov/tribaldrinkingwater/drinking-water-infrastructure-needs-survey-and-assessment-fifth-report-congress>.
- EPA (U.S. Environmental Protection Agency). 2014. “Water Infrastructure Finance and Innovation Act (WIFIA).” http://water.epa.gov/grants_funding/cwsrf/wifia.cfm.
- EPA (U.S. Environmental Protection Agency). 2015. “EPA Launches Finance Center to Improve Community Water Infrastructure and Resiliency.” <https://www.epa.gov/newsreleases/epa-launches-finance-center-improve-community-water-infrastructure-and-resiliency>.
- EPA (U.S. Environmental Protection Agency). 2016a. “Water Infrastructure and Resiliency Finance Center.” <https://www.epa.gov/waterfinancecenter>.

- EPA (U.S. Environmental Protection Agency). 2016b. "Leading Edge Financing for Water Infrastructure." <https://www.epa.gov/waterfinancecenter/leading-edge-financing-water-infrastructure>.
- Ernst & Young. 2013. *The US Water Sector on the Verge of Transformation: Global Cleantech Center White Paper*. London: Ernst & Young.
http://www.ey.com/Publication/vwLUAssets/Cleantech_Water_Whitepaper/%24FILE/Cleantech-Water-Whitepaper.pdf.
- Farmer, L. 2014a. "Are Muni Bonds Being Replaced by Direct Loans?" <http://www.governing.com/topics/finance/gov-muni-bonds-replaced-direct-bank-loans.html>.
- Farmer, L. 2014b. "D.C. Water Considers First-Ever Century Bond by a Public Utility." <http://www.governing.com/topics/finance/gov-dc-water-considers-first-ever-century-bond-by-a-public-utility.html>.
- Farmer, L. 2015. "Are Governments 'Paying for Failure' with Social Impact Bonds?" <http://www.governing.com/topics/finance/gov-social-impact-bonds.html>.
- Fedder, R., E. Hofeld, and J. Mastracchio. 2014. *M29 Water Utility Capital Financing*. Fourth Edition. Denver, Colo.: AWWA.
- FEMA (Federal Emergency Management Agency). 2008. *Disaster Assistance Fact Sheet, DAP9580.3, Insurance Considerations for Applicants*. Washington, D.C.: FEMA.
https://www.fema.gov/pdf/government/grant/pa/9580_3.pdf.
- Field, A. 2015. "\$36.6B in Green Bonds Issued Last Year." <http://www.forbes.com/sites/annefield/2015/01/15/36-6b-in-green-bonds-issued-last-year/#6d5a09d031fa>.
- Food and Water Watch. 2012. "Public-Public Partnerships." <http://www.foodandwaterwatch.org/insight/public-public-partnerships>.
- Funds Europe. 2015. "Institutional Investors Demand SRI/ESG Mandates." <http://www.funds-europe.com/home/news/15007-institutional-investors-demand-sri-esg-mandates>.
- Gabriel, B. and R. Devlin. 2015. *Market Update: A Review of the US Public Private Partnership (P3) Sector in 2014*. New York: Practical Law.
- Gale, S. 2015. "Green Bonds: Are Your Projects a Good Fit?" *WaterWorld*, 31 (3).
- Gasparro, K. 2015. *Funding Municipal Infrastructure: Integrating Project Finance and Crowdfunding*. Stanford, CA: Stanford Global Projects Center.
<https://gpc.stanford.edu/sites/default/files/wp87.pdf>.
- Gebhardt, J. 2016. US EPA Sponsored Funding Programs. Presented at Credit Suisse 2016 Conservation Finance Conference, New York, January 21, 2016.
- GFOA (Government Finance Officers Association). 2015a. *GFOA White Paper: Green Bonds*. Chicago: GFOA.
<http://www.gfoa.org/sites/default/files/GFOA%20Green%20Bond%20White%20Paper.pdf>.
- GFOA (Government Finance Officers Association). 2015b. *Fifty Shades of Green: Demystifying Green Bonds*. Presented at GFOA Annual Conference, Philadelphia, PA, May 31-June 3, 2015.
- GFOA (Government Finance Officers Association). 2016. "GFOA Alert: Bank Loan Disclosure." <http://www.gfoa.org/gfoa-alert-bank-loan-disclosure>.

- Grant, J. and M. Pooler. 2015. "Financing for London's 'Super Sewer' Gets Go-Ahead." *Financial Times*, August 24. <http://www.ft.com/cms/s/0/e596801c-4a29-11e5-9b5d-89a026fda5c9.html#axzz4CmbCRxVE>.
- Greifer, N. 2005. *An Elected Official's Guide: Tax Increment Financing*. Chicago: Government Finance Officers Association.
- Harvard Business School. 2014. *Business for Social Impact Forum*. Boston: Harvard Business School. <http://www.hbs.edu/socialenterprise/Documents/BUSIForum2014Summary.pdf>.
- HM Treasury. 2014. *National Infrastructure Plan*. London: HM Treasury. <https://www.gov.uk/government/publications/national-infrastructure-plan-2014>.
- Howard, J. 2016. Email correspondence, Morgan Stanley.
- Humphreys, J. and R. Sanders. 2014. *What Investors Want, how to Scale Up Demand for U.S. Clean Energy and Green Bonds*. Montpelier, VT: Clean Energy Group, and Durham, NC: Croatan Institute. www.cleanegroup.org/wp-content/uploads/CEG-Croatan-What-Investors-Want.pdf.
- InfraShares. 2016. "Frequently Asked Questions (FAQ)." <http://www.infrashares.com/faq.com>.
- Infrastructure Canada. 2015. "Government of Canada Other Programs." <http://www.infrastructure.gc.ca/prog/other-autres-eng.html>.
- Kable. 2016. "Carlsbad Desalination Project, San Diego, California, United States of America." <http://www.water-technology.net/projects/carlsbaddesalination/>.
- Kamins, J. M. 2014. "Direct Purchases of Bonds by Banks: An Increasingly Popular Alternative for Municipalities." *Foster Swift Municipal Law News*, September 2014. <http://www.fosterswift.com/publications-Direct-Purchases-Bonds-by-Banks-Alternative-Municipalities.html>.
- Kidney, S. 2014. 2013 "Overview: The Dawn of an Age of Green Bonds?" <https://www.climatebonds.net/2014/05/2013-overview-dawn-age-green-bonds>.
- Kim, J. 2014a. *Understanding and Mitigating Political Risks of Public-Private Partnerships in U.S. Infrastructure*. Stanford, CA: Stanford Global Projects Center.
- Kim, J. 2016. *Handbook on Urban Infrastructure Finance*. Montréal: New Cities Foundation.
- Kim, M. T. 2014b. 100 Year Green Bonds. Presented to Anacostia Watershed Steering Committee. November 12, 2014. <http://www.anacostia.net/Archives/AWSC/documents/DCWaterAWSCenturyGreenBondPresentation111214.pdf>.
- Knowles, D., M. Matichich, and M. Wilson. 2013. "Multijurisdictional Partnership Aims to Deliver Projects Across State and National Boundaries." *Public Works*, 144 (2): 18-22.
- KPMG International Cooperative. 2015. "Sustainable Insight: Gearing up for Green Bonds." <https://home.kpmg.com/xx/en/home/insights/2015/03/gearing-up-for-green-bonds.html>.
- LIPA (Long Island Power Authority). 2015. *LIPA Rate Case*. Plainview, NY: New York State Department of Public Service. <http://www.lipower.org/newscenter/docs/DepartmentRateRecommendation.pdf>.
- Lloyd, C. 2013. "Making Public-Private Partnerships Work for Everyone." *Public Works Financing*, volume 279.
- Macomber, J.D. 2016. "The Future of Cities Depends on Innovative Financing." <https://hbr.org/2016/01/the-future-of-cities-depends-on-innovative-financing>.
- MarketWatch. 2014. "DC Water Announces Successful Sale of \$350 Million Green Century Bonds." <http://www.marketwatch.com/story/dc-water-announces-successful-sale-of-350-million-green-century-bonds-2014-07-10>.

- Mastracchio, J., A. Santos, R. Giardina, R. Raucher, K. Raucher, M. W. Tiger, and J. Hughes. 2016. *Rate Approval Process Communication Strategy and Toolkit*. Project #4455. Denver, Colo.: Water Research Foundation.
- Matchich, M., F. Yeager, R. Brauer, Y. Hasit, A. Ispass, L. Kelly, D. Pitzler, G. Rapagna, S. Whipp, and M. Tiger. 2016. *Capital Funding Imperatives: Best Practices for Capital Improvement Programs*. Project #4493. Denver, Colo.: Water Research Foundation.
- Mauro, C. 2014. *Municipal Securitization – A New Financing Trend in the Municipal Market?* RBC Capital Markets. <https://www.rbccm.com/municipalfinance/file-826934.pdf>.
- Metro Planning Council. 2013. *Allentown, PA Case Study*. Chicago: Metro Planning Council. http://www.metroplanning.org/uploads/cms/documents/case_study_allentown.pdf.
- Moody's Investor Service. 2014. "U.S. is poised to become largest public-private partnership (P3) market in the world." https://www.moody's.com/research/Moodys-US-is-poised-to-become-largest-public-private-partnership--PR_308002.
- MS&B. 2012. "United Water, KKR Finance \$175m P3 in Bayonne, N.J." *Public Works Financing*, volume 277.
- Municipal, Inc. 2015. "National Harbor Development Case Study, Prince George's County, Maryland." <http://www.municipal.com/case-study-national-harbor.htm>.
- NACWA (National Association of Clean Water Agencies). 2015. *Opportunities & Challenges in Clean Water Utility Financing and Management*. Washington, D.C.: NACWA.
- NCPPP (National Council for Public-Private Partnerships). 2014. "A Tale of Two Cities: The Rialto and Allentown Water/Wastewater System Transactions." <http://www.ncppp.org/wp-content/uploads/2014/07/Rialto-and-Allentown1.pptx>.
- NCPPP (National Council for Public-Private Partnerships). 2015. "U.S. Ripe for International Investments in P3s, Expert Predicts." <http://www.ncppp.org/u-s-ripe-for-international-investment-in-p3s-expert-predicts/>.
- NCPPP (National Council for Public-Private Partnerships). 2016. "Top Ten Facts About P3s." <http://www.ncppp.org/ppp-basics/top-ten-facts-about-ppps/>.
- North, J. 2016. Personal Interview. Government Innovation Fellow at the Harvard Kennedy School of Government.
- Olstein, M., P. Eisenhardt, R. Geist, R. King, and J. Jennings. 2009. *Improving Water Utility Capital Efficiency*. Project #3119. Denver, Colo.: Water Research Foundation.
- Ossa, F. 2015. "The Next Big Thing in Cat Bonds: Prevention." <http://www.asreport.com/news/abs/the-next-big-thing-in-catastrophe-bonds-prevention-257365-1.html>.
- Partnerships BC (Partnerships British Columbia). 2016. "About Us." <http://www.PartnershipsBC.ca>.
- PEI (Private Equity International). 2015. "The Infrastructure Investor 30: The World's Biggest Capital Raisers." *Infrastructure Investor*, issue 67. https://www.infrastructureinvestor.com/uploadedFiles/Infrastructure_Investor/Pagebuilder/Aliased/Rankings/II_30/II67_II30hyperlinked.pdf.
- Petersen, E. and S. Howard. 2014. "Tax-Exempt Financing for P3 Projects." *Public Works Financing*, volume 292.
- Pinsent Masons. 2015. "Financing Model for Thames Tideway Super-Sewer Gets Regulatory Approval." <http://www.out-law.com/en/articles/2015/august/financing-model-for-thames-tideway-super-sewer-gets-regulatory-approval/>.

- Prall, D. 2014. "Best of Both Worlds: Public-Private Partnerships from Across the Country." http://americancityandcounty.com/public-works/best-both-worlds-public-private-partnerships-across-country#slide-0-field_images-57841.
- Preclaw, R. and A. Bakshi. 2015. *The Cost of Being Green*. New York: Barclays. https://www.environmental-finance.com/assets/files/US_Credit_Focus_The_Cost_of_Being_Green.pdf.
- Price Waterhouse Coopers. 2010. *Public-Private Partnerships: The US Perspective*. Price Waterhouse Coopers.
- Probitas Partners. 2007. *Investing in Infrastructure Funds*. San Francisco: Probitas Partners. <http://probitaspartners.com/pdfs/infrastructure.pdf>.
- P3 Canada. 2016. "About P3s: Frequently Asked Questions." <http://www.p3canada.ca/en/about-p3s/frequently-asked-questions/>.
- RE.invest. 2015. *Hoboken Feasibility Study*. http://www.reinvestinitiative.org/reports/RE.invest_Hoboken-City-Report.pdf.
- Reinhardt, W. 2014. "Public Works Financing Exclusive: WIFIA: A Would-Be King with No Clothes." <http://www.ncppp.org/public-works-financing-exclusive-wifia-a-would-be-king-with-no-clothes/>.
- Rockcliffe Ltd. 2015. "Vista Ridge Water Project Texas." *P3 Bulletin*. London: Rockcliffe Ltd.
- Rudd, T., E. Nicoletti, K. Misner, and J. Bonsu. 2013. *Financing Promising Evidence-Based Programs: Early Lessons from the New York City Social Impact Bond*. New York: MDRC. http://www.mdrc.org/sites/default/files/Financing_Promising_evidence-Based_Programs_FR.pdf.
- S&P (Standards & Poor's Rating Services). 2016. *U.S. Public Finance Waterworks, Sanitary Sewer, and Drainage Utility Systems: Rating Methodology and Assumptions*. Standards & Poor's Rating Services.
- Sabol, P. and R. Puentes. 2015. "Building Better Infrastructure with Better Bonds." <http://www.brookings.edu/research/papers/2015/04/22-building-better-infrastructure-with-better-bonds-sabol-puentes>.
- Sebayan, D. 2014. "How Has Hurricane Sandy Impacted Insurance Rates?" <https://smartasset.com/mortgage/how-has-hurricane-sandy-impacted-insurance-rates-2>.
- Serap, Z., M. Koc, and M. Akgun. 2015. "Turkey: Green Bonds or Green Wash." <http://www.mondaq.com/turkey/x/395004/Climate+Change/Green+Bonds+Or+Greenwash>.
- Smart Cities Council. 2014. *Smart Cities Financing Guide*. Redmond, WA: Smart Cities Council.
- Snyder, G. and M. Valdez. 2015. "Enhanced Infrastructure Districts: A Flexible Tool for Local Governments." <http://www.law360.com/articles/644563/calif-s-flexible-new-tool-for-infrastructure-development>.
- Social Finance. 2016. "About Us." <http://socialfinance.org/about-social-finance/>.
- Stephens, A. 2014. "Crowdfunding Fans Are Crazy about Denver's Mini-Bonds." <https://nextcity.org/daily/entry/denver-mini-bonds-500-crowdfunding-cities>.
- Thames Water. 2016. "About Us: Thames Water Utilities Limited." <http://www.thameswater.co.uk/about-us/825.htm>.
- The Bond Buyer. 2016. "Primary Market Statistics." <http://www.bondbuyer.com/marketstatistics/>.

- The Economist. 2013. “Perilous Paper, Bonds that Pay Out When Catastrophe Strikes Are Rising in Popularity.” <http://www.economist.com/news/finance-and-economics/21587229-bonds-pay-out-when-catastrophe-strikes-are-rising-popularity-perilous-paper>.
- The Fitch Ratings. 2012. *U.S. Water and Sewer Revenue Bond Rating Criteria*. New York: Fitch Ratings.
- The Fitch Ratings. 2015. *U.S. Water and Sewer Revenue Bond Rating Criteria*. New York: Fitch Ratings.
- The Johnson Foundation at Wingspread. 2012. *Charting New Waters: Financing Sustainable Water Infrastructure*. Racine, WI: The Johnson Foundation at Wingspread. http://www.johnsonfdn.org/sites/default/files/reports_publications/WaterInfrastructure.pdf.
- The Johnson Foundation at Wingspread. 2014. *Navigating to New Shores. Seizing the Future for Sustainable and Resilient U.S. Freshwater Resources*. Racine, WI: The Johnson Foundation at Wingspread. http://www.johnsonfdn.org/sites/.../CNW_NavigatingToNewShoresExecSummRpt.pdf.
- Third Sector Capital Partners. 2016. “About Us.” <http://www.thirdsectorcap.org/mission/>.
- Tideway. 2016. “The Thames Tideway Tunnel is a Major New Sewer, Urgently Needed to Protect the Tidal River Thames from Pollution.” <https://www.tideway.london/the-tunnel/>.
- United States Securities and Exchange Commission. 2012. *Report on the Municipal Securities Market*. Washington, D.C.: U.S. Securities and Exchange Commission. <https://www.sec.gov/spotlight/municipalsecurities.shtml>.
- U.S. DOT (United States Department of Transportation). 2015. “Transportation Infrastructure Finance and Innovation Act (TIFIA).” <https://www.fhwa.dot.gov/ipd/tifia/>.
- US SIF (The Forum for Sustainable and Responsible Investment). 2014. “Report on US Sustainable, Responsible, and Impact Investing Trends.” <http://www.ussif.org/trends>.
- US SIF (The Forum for Sustainable and Responsible Investment). 2016. “About Us.” <http://www.ussif.org/about>.
- Vajjhala, S. 2015. “Financing Infrastructure through Resilience Bonds.” <http://www.brookings.edu/blogs/the-avenue/posts/2015/12/16-financing-infrastructure-through-resilience-bonds-vajjhala>.
- Velez, E. 2016. “House Passes Prasa’s Securitization Bill.” <http://caribbeanbusiness.com/house-passes-prasas-securitization-bill-to-allow-for-public-works/>.
- Waring, D. 2013. “Catastrophe Bonds – What They Are and How They Work?” <http://learnbonds.com/15205/catastrophe-bonds/>.
- WCX (West Coast Infrastructure Exchange). 2015a. *Drinking and Wastewater Infrastructure Project Aggregation and Design-Build-Finance-Maintain (DBFM) Public-Private Partnerships*. Portland, OR: West Coast Infrastructure Exchange.
- WCX (West Coast Infrastructure Exchange). 2015b. *West Coast Infrastructure Exchange Annual Update for 2015*. Portland, OR: West Coast Infrastructure Exchange. <http://westcoastx.com/assets/documents/WCX%20Annual%20Update%20-%202015.pdf>.
- WCX (West Coast Infrastructure Exchange). 2016. *WCX Brochure*. Portland, OR: West Coast Infrastructure Exchange. <http://westcoastx.com/assets/documents/WCX%20brochure%20NEW%20v2.pdf>.
- WEF (Water Environment Federation). 2004. *Financing & Charges for Wastewater Systems: WEF Manual of Practice No. 27*. Alexandria, VA: WEF Press.

- WEF (Water Environment Federation). 2014. *Green Infrastructure Implementation*. Alexandria, VA: Water Environment Federation.
- WEF (Water Environment Federation). 2015. *The Effective Water Professional: Leadership, Communication, Management, Finance, and Governance*. Alexandria, VA: Water Environment Federation.
- Wharton (Wharton School at University of Pennsylvania). 2015a. “Making the Most of Public-Private Partnerships, Law and Public Policy U.S.”
<https://knowledge.wharton.upenn.edu/article/making-the-most-of-public-private-partnerships/>.
- Wharton (Wharton School at University of Pennsylvania). 2015b. *Investing in America’s Public Water Systems – Making Public-private Partnerships Work*. Philadelphia, PA: Initiative for Global Environmental Leadership.
<http://d1c25a6gwz7q5e.cloudfront.net/reports/2015-06-10-Investing-in-Americas-Public-Water-Systems.pdf>.
- White House Office of the Press Secretary. 2015. “Fact Sheet: Increasing Investment in U.S. Roads, Ports and Drinking Water Systems through Innovative Financing.”
<https://www.whitehouse.gov/the-press-office/2015/01/16/fact-sheet-increasing-investment-us-roads-ports-and-drinking-water-syste>.
- Williams, M. and S. Nesbitt. 2009. *Infrastructure Investment Opportunities*. Marina del Rey, CA: Cliffwater LLC. <https://www.cliffwater.com/documents/988604>.
- World Bank. 2014. *Public Private Partnerships Reference Guide: Version 2.0*. Washington, D.C.: World Bank and Inter-American Development Bank; and Mandaluyong City, Philippines: Asian Development Bank.
- World Bank. 2015a. “Green Bonds Attract Private Sector Climate Finance.”
<http://www.worldbank.org/en/topic/climatechange/brief/green-bonds-climate-finance>.
- World Bank. 2015b. “Green Bonds Are Changing Investor Expectations & Making Sustainable Investing Easier.” <http://www.worldbank.org/en/news/feature/2015/01/22/green-bonds-changing-investor-expectations-three-trends>.
- WRF (Water Research Foundation). 2014. “Rates Handbook: Case Studies on Utility Rates and Financing Challenges – 4543.” Accessed 2016.
<http://www.waterrf.org/Pages/Projects.aspx?PID=4543>.
- WRRDA. 2014. Water Resources Reform and Development Act of 2014. Pub. L. 113-121. 128 Stat. 1193.
- Yoon, A. and L. Scism. 2014. “Investors Embrace ‘Catastrophe Bonds.’” *The Wall Street Journal*. April 23.
- Zieburtz, B. and R. Giardina. 2012. *M1 Principles of Water Rates, Fees, and Charges, Manual of Water Supply Practices*. Sixth Edition. Denver, Colo.: AWWA.

ABBREVIATIONS

100RC	100 Resilient Cities
ASCE	American Society of Civil Engineers
AWWA	American Water Works Association
AWWU	Anchorage Water & Wastewater Utility
BMUA	Bayonne Municipal Utilities Authority
CalPERS	California Public Employees Retirement System
CalSTRS	California State Teachers Retirement System
CDFI	Community Development Financial Institutions
CDIAC	California Debt and Investment Advisory Commission
CIP	Capital Improvement Program
DBFM	Design Build Finance Maintain
DBFOM	Design Build Finance Operate Maintain
DBO	Design Build Operate
DC Water	District of Columbia Water and Sewer Authority
EIFD	Enhanced Infrastructure Financing District
EPA	U.S. Environmental Protection Agency
EPC	Energy Performance Contract
ESCO	Energy Services Company
ESG	Environmental, Social, and Corporate Governance
FEMA	Federal Emergency Management Agency
G8	Group of Eight
GFOA	Government Finance Officers Association
ICMA	International Capital Markets Association
ICMIF	International Cooperative and Mutual Insurance Federation
INCR	Investor Network on Climate Change
IRS	Internal Revenue Service
KKR	Kohlberg Kravis Roberts & Co
LCA	Lehigh County Authority
LIPA	Long Island Power Authority
MCWT	Massachusetts Clean Water Trust
MTA	Metropolitan Transportation Authority
MWRD	Metropolitan Water Reclamation District of Greater Chicago

NACWA	National Association of Clean Water Agencies
NCPPP	National Council for Public Private Partnerships
NYC	New York City
NYSERDA	New York State Energy Research and Development Authority
O&M	Operate and Maintain
PABs	Private Activity Bonds
PEI	Private Equity International
PRASA	Puerto Rico Aqueduct and Sewer Authority
P3 or PPP	Public-Private Partnerships
QPIB	Qualified Public Infrastructure Bonds
S&P	Standard & Poor's
SAWS	San Antonio Water System
SDCWA	San Diego County Water Authority
SPV	Special Purpose Vehicle
SRF	State Revolving Fund
SRI	Socially Responsible Investing
TIF	Tax Increment Financing
TIFIA	Transportation Infrastructure Finance and Innovation Act
U.K.	United Kingdom
U.S.	United States
WCX	West Coast Infrastructure Exchange
WEF	Water Environment Federation
WIFIA	Water Infrastructure Finance and Innovation Act
WIRFC	Water Infrastructure and Resiliency Finance Center
WRF	Water Research Foundation
WRRDA	Water Resources Reform and Development Act